



## JUNE 2016 MEETING AGENDA

**June 13-16, 2016**

Courtyard Newark (sleeping rooms)  
400 David Hollowell Drive, Newark, DE 19716  
Telephone 302-737-0900

University of Delaware – Clayton Hall (meeting),  
100 David Hollowell Drive, Newark, DE 19716  
Telephone 302-831-2998

### Monday, June 13<sup>th</sup>

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**1:00 p.m. – 5:00 p.m.**

#### **Ecosystem and Ocean Planning Committee (Tab 1)**

- Fishing activities that impact habitat – draft policy document
  - Review input from Advisory Panel
  - Provide comments/revisions to draft document
- Other Committee updates

### Tuesday, June 14<sup>th</sup>

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**9:00 a.m.**

#### **Council Convenes**

**9:00 a.m. – 10:00 a.m.**

#### **Mackerel, Squid, Butterfish Specifications, Meeting as a Committee of the Whole (Tab 2)**

- Review fishery performance and 2017 specifications
- Review butterfish cap operation
- Review butterfish/longfin squid mesh information

**10:00 a.m. – 11:30 a.m.**

#### **River Herring/Shad, Meeting as a Committee of the Whole (Tab 3)**

- Review cap operation and management progress
- Review “Stock in the Fishery” white paper outline

**11:30 a.m. – 12:00 p.m.**

#### **Squid Capacity Amendment (Tab 4)**

- Review Action Plan

**12:00 p.m. - 1:00 p.m.**

#### **Lunch**

**1:00 p.m. – 2:30 p.m.**

#### **Climate Change and Mid-Atlantic Fisheries (Tab 5)**

*Jon Hare – NOAA Fisheries*

*Malin Pinsky – Rutgers University*

2:30 p.m. – 3:30 p.m.

**BOEM’s Renewable Energy Activities (Tab 6)**

*Brian Hooker - BOEM*

3:30 p.m. – 4:30 p.m.

**Mid Atlantic Ocean Data Portal Presentation (Tab 7)**

*Jay Odell – Nature Conservancy*

4:30 p.m. – 5:30 p.m.

**eVTR Framework – Meeting 1 (Tab 8)**

*Andy Loftus – Loftus Consulting*

**Wednesday, June 15<sup>th</sup>**

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9:00 a.m.

**Council Convenes**

9:00 a.m. – 12:00 p.m.

**Industry-Funded Monitoring Amendment (Tab 9)**

- Review draft EA and select preferred mackerel alternatives for public hearings

12:00 p.m. – 1:00 p.m.

**Lunch**

1:00 p.m. – 1:30 p.m.

**Law Enforcement Report**

- NOAA Office of Law Enforcement
- U.S. Coast Guard

1:30 p.m. – 3:00 p.m.

**Surfclam and Ocean Quahog Specifications (Tab 10)**

- Develop recommendations for 2017 – 2018 specifications

3:00 p.m. – 5:00 p.m.

**Blueline Tilefish 2017 Recreational Specifications/Possible Reconsideration (Tab 11)**

- Consider alternatives to proposed blueline tilefish recreational specifications

**Thursday, June 16<sup>th</sup>**

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9:00 a.m.

**Council Convenes**

9:00 a.m. - 1:00 p.m.

**Business Session**

**Organization Reports (Tab 12)**

- NMFS Greater Atlantic Regional Office
- NMFS Northeast Fisheries Science Center
- NOAA Office of General Counsel
- Atlantic States Marine Fisheries Commission

**Liaison Reports (Tab 13)**

- New England Council
- South Atlantic Council
- Regional Planning Body

**Executive Director's Report (Tab 14)**

*Chris Moore*

## Science Report

*Rich Seagraves*

## Committee Reports

- Ecosystem and Ocean Planning Committee
- SSC

## Continuing and New Business

April 2016 Motions

### Unmanaged Forage Fish

Move to accept list recommended by EOP Committee:

Engraulidae (anchovies)  
Clupeidae (herrings, sardines)  
Argentinidae (argentines)  
Atherinopsidae (silversides)  
Ammodytidae (sand lances)  
Sternoptychidae (pearlsides)  
Chlorophthalmidae (greeneyes)  
Scomber colias (chub mackerel)  
Scomberesox saurus (Atlantic saury)  
Hemiramphidae (halfbeaks)  
Ophidiiformes (cusk eels)  
Pelagic molluscs (squids, cuttlefish etc.)  
Copepods, Krill, Amphipods and any other species under 1 inch as adults  
Myctophidae (lanternfish)  
Elliott/Nowalsky

Move to amend to add bullet mackerel, frigate mackerel, and false albacore.

McMurray/Anderson (14/6/0)

Motion carries

Amended motion becomes main motion.

(20/0/0)

Motion carries

Move to substitute to add bullet mackerel and frigate mackerel.

Nowalsky/Kaelin (5/14/0)

Motion fails

Move to amend to add two species of decapod crabs to the list of unmanaged forage species: Lady crabs (also called calico crabs), scientific name *Ovalipes ocellatus*; and rock crab, scientific name *Cancer irroratus*.

deFur/McMurray (5/14/0)

Motion fails

Move on behalf of EOP Committee:

ALTERNATIVE 2: Alternatives to regulate harvest

- A. Prohibit possession of all EC species
- B. Prohibit possession of all EC species, but allow an incidental possession with trip limits of:
  - I. 1,500 pounds per trip for each EC species
  - II. 1,700 pounds/trip – 99th percentile of trip-level landings for all the species with documented catch for 1996-2015
- C. Prohibit possession of all EC species but allow incidental possession of some EC species EC species with a per trip possession limit.
  - I. Prohibit possession of:
    - a. Families: Engraulidae (anchovies), Argentinidae (argentines), Atherinopsidae (silversides), Ammodytidae (sand lances), Sternoptychidae (pearlsides, marine hatchetfishes), Chlorophthalmidae (greeneyes), and Myctophidae (lanternfish)
    - b. Orders: Ophidiiformes (cusk eels).

- c. Groups: Copepods, krill, amphipods, and other species under 1 inch as adults: including the families of Calanidae (copepods) and Euphausiidae (euphausid krill), the orders: Amphipoda (amphipods) and isopoda (isopods), and the class Ostracoda (ostracods).
- II. Limited possession of all remaining EC species (round herring, scaled sardine, thread herring, Spanish sardine, halfbeaks, Atlantic saury, pelagic molluscs except sharptail shortfin squid) with a per trip possession limit of:
- a. 1,500 pounds per trip for each EC species
- b. 1,700 pounds/trip – 99th percentile of trip-level landings for all the species with documented catch for 1996-2015

Move to amend to strike section C and strike “Prohibit possession of all EC species, but” from section B from alternative set 2, which would apply to all EC species, excluding chub mackerel.

McMurray/Kaelin (20/0/0)

Amended motion carries

Amended motion is main motion.

(20/0/0)

Motion carries

Move to include chub mackerel alternatives in public hearing document, as shown in table below:

3A: Manage chub mackerel as an EC species	3Ai: Prohibit possession once an annual fishery-wide landings limit is met	Annual landings limit alternatives: <ul style="list-style-type: none"> <li>• 2.86 million pounds/year</li> <li>• 1.75 million pounds/year</li> <li>• 900,127 pounds/year</li> <li>• 5.25 million pounds/year</li> </ul>
	3Aii: Allow an incidental possession limit once an annual fishery-wide landings limit is met	Annual landings limit alternatives: <ul style="list-style-type: none"> <li>• 2.86 million pounds/year</li> <li>• 1.75 million pounds/year</li> <li>• 900,127 pounds/year</li> <li>• 5.25 million pounds/year</li> </ul> Incidental possession limit alternatives: <ul style="list-style-type: none"> <li>• 10,000 pounds</li> <li>• 40,000 pounds</li> </ul>
3B: Manage chub mackerel as a stock in the fishery	3Bi: Prohibit possession once an annual fishery-wide landings limit is met	Annual landings limit alternatives: <ul style="list-style-type: none"> <li>• 2.86 million pounds/year</li> <li>• 1.75 million pounds/year</li> <li>• 900,127 pounds/year</li> <li>• 5.25 million pounds/year</li> </ul>
	3Bii: Allow an incidental possession limit once an annual fishery-wide landings limit is met	Annual landings limit alternatives: <ul style="list-style-type: none"> <li>• 2.86 million pounds/year</li> <li>• 1.75 million pounds/year</li> <li>• 900,127 pounds/year</li> <li>• 5.25 million pounds/year</li> </ul> Incidental possession limit alternatives: <ul style="list-style-type: none"> <li>• 10,000 pounds</li> <li>• 40,000 pounds</li> </ul>
3C: Manage chub mackerel through the Council’s discretionary authority under MSA	3Ci: Prohibit possession once an annual fishery-wide landings limit is met	Annual landings limit alternatives: <ul style="list-style-type: none"> <li>• 2.86 million pounds/year</li> <li>• 1.75 million pounds/year</li> <li>• 900,127 pounds/year</li> <li>• 5.25 million pounds/year</li> </ul>

303(b)(12) and National Standard 9	3Cii: Allow an incidental possession limit once an annual fishery-wide landings limit is met	Annual landings limit alternatives: <ul style="list-style-type: none"> <li>• 2.86 million pounds/year</li> <li>• 1.75 million pounds/year</li> <li>• 900,127 pounds/year</li> <li>• 5.25 million pounds/year</li> </ul> Incidental possession limit alternatives: <ul style="list-style-type: none"> <li>• 10,000 pounds</li> <li>• 40,000 pounds</li> </ul>
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Elliott on behalf of committee (20/0/0)  
Motion carries

On behalf of the committee, move to add to public hearing document alternatives 4Ai and 4Aii and 4b (in table below), with the addition of options for no action and an option for no new or expanded fisheries for EC species in the amendment.

Elliott/Kaelin (20/0/0)  
Motion carries

Alternative	Sub-Alternative
4A: Require EFP prior to development of new or expansion of existing fisheries for ECs	4Ai: <i>Status quo</i> EFP process
	4Aii: Develop policy for Council review of EFP applications relating to ECs
4B: Consideration of stock in the fishery designation prior to new fisheries/expansion of existing fisheries for ECs	--

Move that alternatives 5A, 5B, 5Ci and ii, 5Di and ii, and 5Ei-iv in table below be added to public hearing document.

Elliott/Anderson (20/0/0)  
Motion carries

Alternative	Sub-Alternative
5A: List of fisheries and gear types (50 CFR 600.725)	--
5B: Require GARFO permit for possession of EC species	--
5C: Monitoring /reporting	5Ci: Develop a process that provides the Council with data on annual catch of EC species in its jurisdiction.
	5Cii: Add EC species to SAFIS, VTRs, CDFRs, and other required reporting mechanisms.
5D: Geographic scope of amendment	5Di: Federal waters, bounded by seaward lines extending from CT/NY boundary and VA/NC boundary

	5Dii: Federal waters, bounded by seaward lines extending from CT/NY boundary and Cape Hatteras, NC
5E: Frameworkable items	5Ei: List of EC species
	5Eii: Possession limits and landings limits
	5Eiii: Spatial and seasonal closures
	5Eiv: Recreational fishing regulations

Move to take alternatives approved today to public hearings.  
Anderson/McMurray  
Approved by consent

**Golden Tilefish Framework 2 – Meeting 2**

In section 5.5, move alternative 5.5.3 (alternative 3), restrict the recreational golden tilefish fishery to rod and reel fishery only – with a five hook limit per rod as the preferred alternative.

King/DiLernia (17/0/0/1) - Recusal by Laurie Nolan  
Motion carries

In section 5.6, move alternative 5.6.1 (alternative 1), No action/ *Status quo* as the preferred alternative.  
Hemilright/Kaelin

Move to substitute alt 3 (5.6.3) - incidental permit holders cannot possess golden tilefish at the time of landings in excess of 50% of the total of all combined species landed as the preferred alternative.

Nowalsky/Nolan (16/2/0/1) - Recusal by Laurie Nolan  
Motion carries

Substitute motion become main motion.

17/1/0/1 - Recusal by Laurie Nolan  
Motion carries

Move to submit Tilefish Framework 2 to NMFS.

King /Linhard - Recusal by Laurie Nolan  
Motion Approved by Consent

**Scup GRAs**

Move as a preferred alternative, alternative 3B with the addition of removing statistical area 632 and the sliver of 631.  
Nolan/Luisi

Move to substitute “3G” April 2016 AP proposal as preferred option.

Nowalsky/King (15/1/2)  
Motion to substitute carries

Substitute motion becomes main motion.

(15/0/3)  
Motion carries

Motion to submit framework to Agency.

Luisi/Elliott  
Approved by consent

### **Omnibus Industry-Funded Monitoring Amendment**

Move to modify the IFM alternatives as recommended by the Committees.  
King/Linhard (17/0/1)  
Motion carries

Move that an additive approach be used for portside/EM in the IFM Amendment.  
Bullard/DiLernia (15/0/0)  
Motion carries

### **Blueline Tilefish**

Move that we adopt the SSC's ABC of 87,031 pounds for 2017.  
O'Reilly on behalf of Committee (16/3/1)  
Motion carries

Move that the Council recommend 2a and 2c for the management unit and objectives.  
O'Reilly on behalf of Committee (19/0/1)  
Motion carries

Move that the Council recommend as a preferred alternative, Alt 3 regarding status determination criteria.  
O'Reilly on behalf of Committee (19/0/1)  
Motion carries

Move to recommend 4a as preferred, to use the golden tilefish permit for commercial reporting.  
O'Reilly on behalf of Committee (19/0/1)  
Motion carries

Move to recommend 4c and 4e as preferred, the standard commercial vessel/dealer reporting options.  
O'Reilly on behalf of Committee (19/0/1)  
Motion carries

Move to recommend 5a and 5c as preferred for for-hire permitting and reporting.  
O'Reilly on behalf of Committee (19/0/1)  
Motion carries

Move to recommend 6a (vessel-level permitting) and 6d as preferred alternatives.  
O'Reilly on behalf of Committee (17/1/2)  
Motion carries

Move to amend to remove 6d and refer reporting requirements for the recreational sector back to the tilefish committee.  
Nowalsky – motion fails for lack of second

Move to recommend Alts 7 and 8 as preferred (including using tilefish AP). Allocation changes could also be made via a framework.  
O'Reilly/Elliott

Move to amend to add that allocation changes within the range of actual allocations in the Blueline Tilefish Amendment could be frame-workable.  
DiLernia/O'Reilly (15/4/1)  
Motion carries

Amended motion become main motion.  
(16/3/1)  
Motion carries

Move to amend to remove the frame-workable aspect regarding allocations.  
Nowalsky/Nolan (8/10)  
Motion fails

Move to table to time certain.  
DiLernia/McMurray (3/17)  
Motion fails

Move to recommend Alt 9 as preferred (use the standard specifications process including control rule and risk policy).  
O'Reilly on behalf of Committee (19/0/1)  
Motion carries

Move to recommend 10b1 as preferred, median 2009-2013 catch - 73% Recreational, 27% commercial.  
O'Reilly on behalf of Committee (16/2/2)  
Motion carries

Move to substitute to adopt option 10c1 as preferred (2004-2013 median catch %s – 76% Recreational – 24% Commercial).  
DiLernia/O'Reilly (8/10/2)  
Motion fails

\*Use in Specifications

<u>REC</u>	<u>COM</u>	<u>(all pounds)</u>
ACL 63,533		23,498
ACT 63,533		23,498
TAL 62,262		23,263

Move to accept above ACLs/ACTs/TALs.  
O'Reilly/deFur (17/2/1)  
Motion carries

Move 11c, a 300 pound commercial trip limit as preferred.  
O'Reilly on behalf of Committee (18/1/1)  
Motion carries

Move to substitute using a 500-pound trip limit beginning on June 5, 2016, continuing until 80% of the 23,263 pound commercial ACL is caught, at which time the trip limit would revert to 300 pounds (continuing into the future with 300 pounds on January 1, going to 500-pounds on July 1, and then reverting to 300 pounds when 80% of the ACL is caught).  
Hemilright/Linhard (4/15/1)  
Motion fails

Move Alternative 12a for 2016 (7 fish per person) and staff's recommendation for 2017:  
-Switch to Jan 1 fishing year (commercial and recreational), but keep with Golden Tilefish Process  
-Close Jan 1-April 30, Open May 1, Close October 31.  
-7 for-hire inspected/5 for-hire uninspected/3 Private  
O'Reilly on behalf of Committee (13/3/3)  
Motion carries

Move to amend to also close the season in Wave 6.  
DiLernia/O'Reilly (13/4/3)  
Motion carries

Move to amend the term Party to for-hire inspected and charter to for-hire uninspected.  
DiLernia/Heins (14/2/3)  
Motion carries

Move to adopt 13b, set EFH according to life history information, not extending up Great South Channel or Gulf of Maine.  
O'Reilly/Anderson (19/0/1)  
Motion carries

Move that concerning AMs that the Council adopt 14a, AMs with allocations, and use the Black Sea Bass AMs for the recreational sector (3-year averaging and stock-status dependent paybacks).  
O'Reilly/DiLernia (14/2/1)  
Motion carries

Move that if NMFS projects that the Commercial landings will reach 100% of the commercial TAL that NMFS will close the season.  
Nolan/Michels (17/0/1)  
Motion carries

Move to submit the amendment to the Agency as passed today.  
O'Reilly/DiLernia (13/3/2)  
Motion carries



**Spiny Dogfish**

Request that NMFS increase the Federal dogfish trip limit to 6,000 pounds.

Luisi/King (16/0/1)

Motion carries

**New Business**

Move to nominate Paul Rago to the SSC.

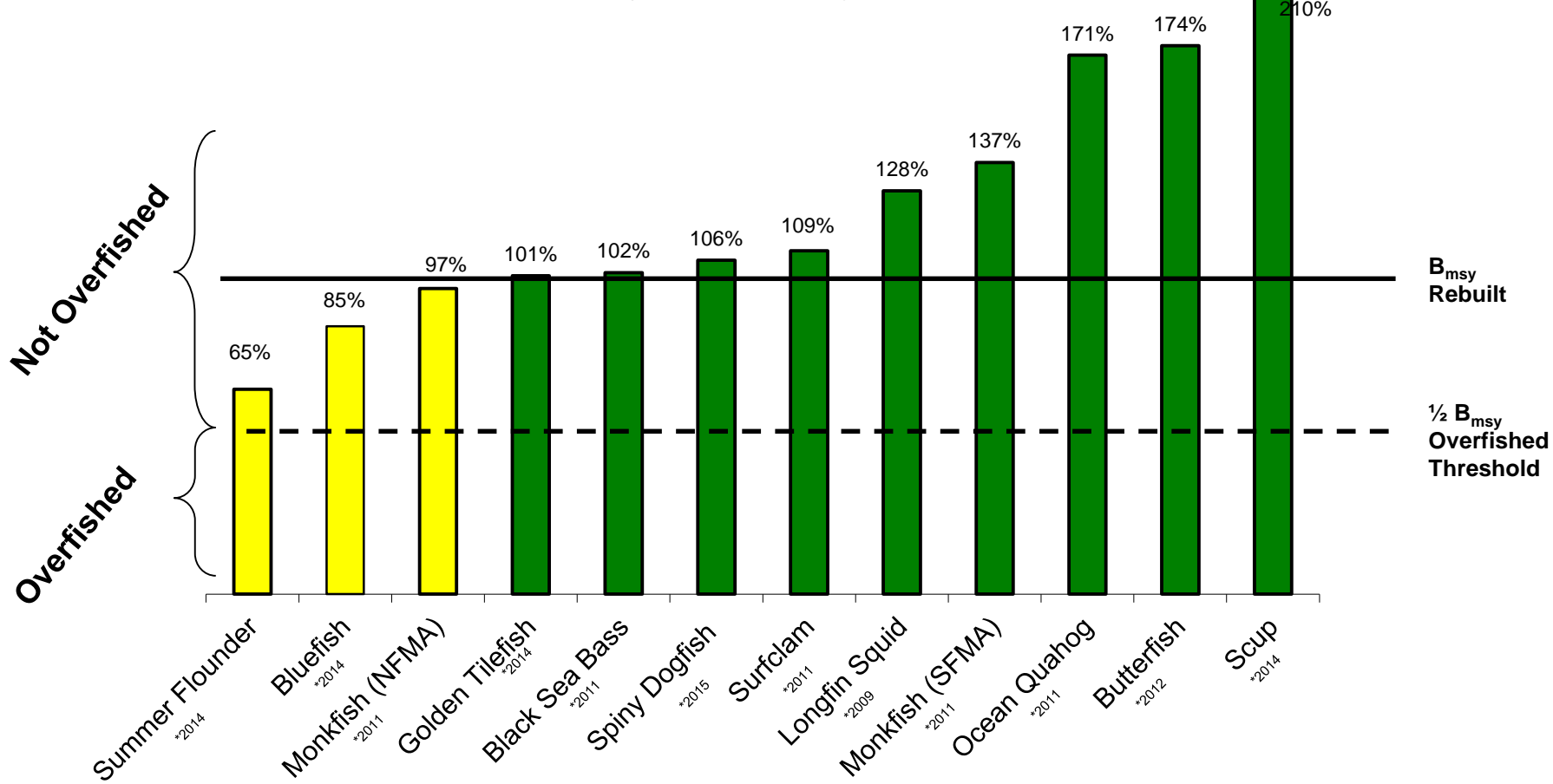
Heins/Nolan

Moved by consent

The above agenda items may not be taken in the order in which they appear and are subject to change as necessary. Other items may be added, but the Council cannot take action on such items even if the item requires emergency action without additional public notice. Non-emergency matters not contained in this agenda may come before the Council and / or its Committees for discussion, but these matters may not be the subject of formal Council or Committee action during this meeting. Council and Committee actions will be restricted to the issues specifically listed in this agenda. Any issues requiring emergency action under section 305(c) of the Magnuson-Stevens Act that arise after publication of the Federal Register Notice for this meeting may be acted upon provided that the public has been notified of the Council's intent to take final action to address the emergency. The meeting may be closed to discuss employment or other internal administrative matters.

# Stock Size Relative to Biological Reference Points

(as of June 3, 2016)

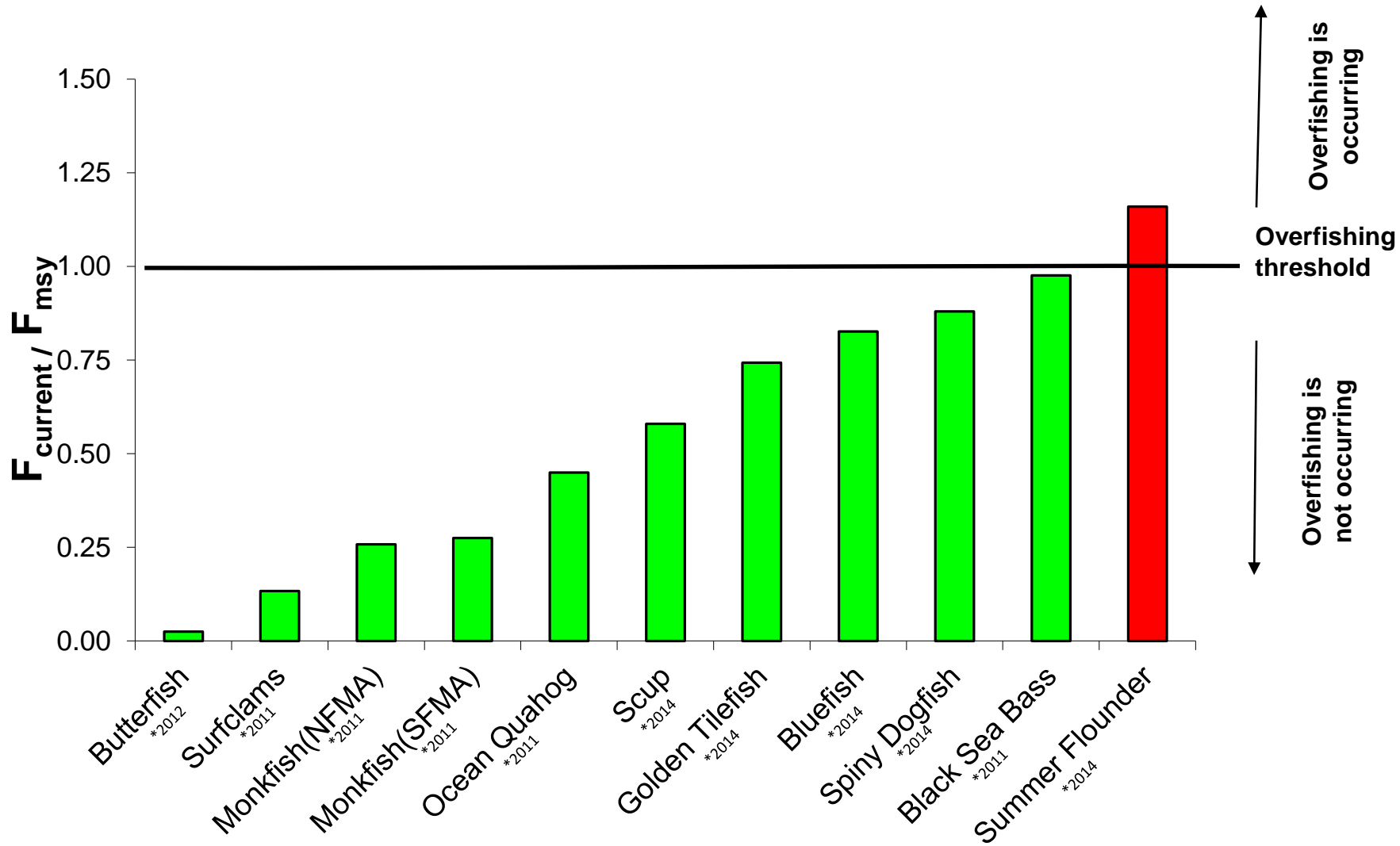


\* Year of the data used to determine stock size.

NOTE: Unknown  $B_{msy}$  - *Illex* squid, and mackerel.

NOTE: Of the 14 stocks managed by the Council, 9 are above  $B_{msy}$ , 3 are under  $B_{msy}$ , and 2 are unknown.

# Fishing Mortality Ratios for MAFMC Managed Species
















\* Year of the data used to determine fishing mortality.

NOTE: Unknown - *Illex* squid, Longfin squid, and mackerel.

## MID-ATLANTIC FISHERY COUNCIL - SPECIES STOCK STATUS

(AS OF JUNE 3, 2016)

SPECIES		STATUS DETERMINATION CRITERIA		OVERFISHING	OVERFISHED	REBUILDING PROGRAM / STOCK STATUS
		Overfishing $F_{\text{threshold}}$	Overfished $\frac{1}{2} B_{\text{MSY}}$			
Summer Flounder		$F_{35\% \text{MSP}}=0.31$	69 million lbs	Yes	No	Most recent benchmark assessment was 2013. Most recent assessment update was 2015.
Scup		$F_{40\% \text{MSP}}=0.22$	96.23 million lbs	No	No	Most recent benchmark assessment was 2015.
Black Sea Bass		$F_{40\% \text{MSP}}=0.44$	12 million lbs	No	No	Most recent assessment update was 2012. Most recent benchmark assessment was 2011.
Bluefish		$F_{35\% \text{SPR}}=0.19$	111.7 million lbs	No	No	Most recent benchmark assessment was 2015.
<i>Illex</i> Squid (short finned)		Unknown	Unknown	Unknown	Unknown	Most recent benchmark assessment was 2006; not able to determine current exploitation rates or stock biomass.
Longfin Squid		Unknown	46.7 million lbs	Unknown	No	Most recent benchmark assessment was 2010; not able to determine current exploitation rates.
Atlantic Mackerel		Unknown	Unknown	Unknown	Unknown	Most recent benchmark assessment was 2010; not able to determine current exploitation rates or stock biomass.
Butterfish		$F_{\text{Proxy}}=2/3M=0.81$	50.3 million lbs	No	No	Most recent benchmark assessment was 2014.

SPECIES		STATUS DETERMINATION CRITERIA		OVERFISHING	OVERFISHED	REBUILDING PROGRAM / STOCK STATUS
		Overfishing $F_{\text{threshold}}$	Overfished $\frac{1}{2} B_{\text{MSY}}$			
Surfclam		$F=M=0.15$	1,071 million lbs	No	No	Most recent benchmark assessment was 2013.
Ocean Quahog		$F_{45\%MSP}=0.022$	3,064 million lbs	No	No	Most recent assessment update was 2013. Most recent benchmark assessment was 2009.
Golden Tilefish		$F_{25\%MSP}=0.370$	5.68 million lbs	No	No	Most recent benchmark assessment was 2014.
Spiny Dogfish (Joint management with NEFMC)		$F_{\text{MSY}}=0.2439$	175.6 million lbs Female SSB	No	No	Most recent assessment update was 2015. Most recent benchmark assessment was 2010.
Monkfish (Joint management with NEFMC)		NFMA & SFMA $F_{\text{MAX}}=0.2$	NFMA - 1.25 kg/tow SFMA - 0.93 kg/tow (autumn trawl survey)	No (north and south management areas)	No (north and South management areas)	Most recent assessment update was 2013. Most recent benchmark assessment was 2010.

SOURCES: Office of Sustainable Fisheries - Status Report of U.S. Fisheries; SAW/SARC and TRAC Assessment Reports.



**Mid-Atlantic Fishery Management Council**  
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Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman  
Christopher M. Moore, Ph.D., Executive Director

## MEMORANDUM

**DATE:** June 1, 2016

**TO:** Ecosystem and Ocean Planning (EOP) Committee

**FROM:** Jessica Coakley, Staff and George Lapointe, Contractor

**SUBJECT:** Draft Policy on Fishing Impacts that Impact Habitat and Other Committee Updates

The following materials are enclosed for the Committee to consider:

- 1) Summary of the May 11 EOP Advisory Panel (AP) Meeting
- 2) Draft Policy – Fishing Impacts on Habitat
- 3) Questions for EOP Committee Discussion
- 4) Proposal for Council Policy - Prepared by EOP AP member Joseph Gordon, and supported by EOP members Brad Sewell, Fred Akers, and Pam Lyons-Gromen
- 5) Essential Fish Habitat Review Action Plan
- 6) Update on Regional Habitat Activities from GARFO (attachments in online materials only)

**MAFMC EOP AP meeting notes**  
**11 May 2016**

**Attendees:**

Fred Akers, Great Egg Harbor Watershed Association  
Bonnie Brady, Long Island Commercial Fishermen's Association  
Jessica Coakley, MAFMC staff  
Greg DiDomenico, Garden State Seafood Association  
Warren Elliott, MAFMC member, Chair of EOP Committee  
Joseph Gordon, Pew Charitable Trust  
Monty Hawkins, Charter captain  
Jeff Kaelin, MAFMC member, EOP Committee member  
David Kaplan, VIMS  
Lauren Latchford, NMFS Habitat Div.  
Meghan Lapp, Seafreeze Ltd  
George Lapointe, MAFMC contractor  
Terra Lederhouse, NMFS Habitat Div.  
Peter Moore, MARACOOS  
Purcie Bennet-Nickerson, Pew Charitable Trust  
Brad Sewell, Natural Resources Defense Council  
David Stevenson, NMFS GARFO  
David Wallace, David Wallace and Associates  
Judith Weis, Rutgers Univ.

**Meeting Notes:**

1) Introductions

George Lapointe introduced himself as facilitator of the Fishing Impact on Habitat Policy development process. AP members and other attendees introduced themselves.

George Lapointe discussed how the EOP AP and Committee got to where we are today; to advance development of a Council policy on the impact of fishing gear on habitat. AP members were reminded that policies are not management actions, rather they set forth guidelines and principles from which action oriented measures can be developed by Council Committees and the Council. Others added that the policy needed to support future management actions to be useful. Other AP members also added that the policy can be used as a link to funding and research priorities.

He asked if there were any additions to the draft agenda. Some AP members tabled a proposed draft policy for the AP's consideration (Attached – Prepared by Joseph Gordon). There was not consensus on using this document as a substitute for the draft policy document.

**MAFMC EOP AP meeting notes**  
**11 May 2016**

2) Discussion topics regarding draft fishing impacts policy

The first discussion topic was the separation of historically fished areas from other areas, called Frontier Fishing areas and historically fished areas in the draft policy document. Also discussed were how different areas and degree of use could be mapped and defined.

Historically fished versus unlisted areas – questions of how you would map this and define this. Nearshore, offshore, and I fished (I.e., corals areas)

Some AP members thought that calling areas fished versus unfished has too much fishing focus, and not enough habitat focus. Others thought that having the labels may not have value for the draft policy and suggested making the definition less of a centerpiece of the document. They thought that there are areas that should be a priority for protection and, accordingly, the policy should be more oriented to the habitats.

There was discussion about a balance between detail and talking about guiding principles, and that the policy should consider areas that are unfished be treated differently than areas that are fished. Other AP members replied that this is the intention of the draft document with “frontier fishing areas” and areas that have historically been fished.

Some AP members expressed concerns about the implications of the policy that the Council should keep in mind. This includes:

- The sea is greening (eutrophying) and abundance of fish is changing. In this direction, we could lock up offshore fishing because of the policy.
- Shifting environment over time. A lightly fished area may not be important in the future, or may be more important to current fisheries as fish move to adapt to changing ocean conditions.
- The fishing impact policy may impose more restrictions on fishermen, in addition to restrictions imposed by the forage fish amendment.
- The cumulative impact of various habitat and ecosystem actions, e.g. forage fish amendment, coral protection, on ability of fishermen to fish in a changing environment.

Some AP members felt that we need to understand what the spatial implications of this type of policy might be. Others noted that the purpose of the draft policy and the AP is not to draw maps and define areas. Rather, the draft policy should craft high-level recommendations that other Council committees can use to formulate specific fishery management measures. Others thought that there was some value to having principles that can be applied across all the plans and guide general management approaches. For example, having a different approach to lightly fished area allows for a more proactive approach because there are not jobs on the line.

The AP discussed the various essential fish habitat (EFH) efforts that would take place in the next few years, in part to establish an EFH baseline. The Council is conducting a 5-year review of EFH, as required by law. The Council will conduct an EFH review that will begin with a scientific



**MAFMC EOP AP meeting notes**  
**11 May 2016**

review process which may take a couple of years. This should result in improved mapping of fish habitat and fishing activities.

One AP member thought that the proposed policy is like an architectural drawing of a building that has burned down because bottom habitat has been lost and therefore the landscape has changed substantially from what it was historically. The information on what habitats have been lost could be used to conduct habitat restoration, a concept that shouldn't be overlooked in the Council's habitat efforts.

Some AP members suggested that the Council do the EFH work first before working on the Fishing Impact on Habitat Policy. For example, we don't know where fluke habitat is, so where does fishing interact with fluke nursery habitat. Is trawling occurring in SAV beds? The AP discussed that the Fishing Impacts on Habitat Policy will not close areas to protect fluke habitat but perhaps the policy should consider the vulnerability of habitats because this is an important issue.

Some AP members think that the impact of decreasing vessels and effort in the fishing fleet is a mitigating factor on fishing impacts on habitat; reducing effort may be a way of mitigating fishing impacts on habitat. There has already been an enormous reduction in fishing participants and communities have been negatively impacted. One AP member said that past trawling heavily impacted the bottom, removing all growth in fished areas, but that this type of impact hasn't been seen in a number of years. The objective of the draft policy cannot be putting people out of business. An open minded discussion is needed in how to protect habitat and the fishermen and communities that rely on them.

AP members mentioned that the NEFMC did an evaluation of the habitat vulnerability first (using SASI model) and then looked at the sensitivity of those habitats to specific gear types. Think policy should acknowledge that MSA requires you to minimize impacts on habitat. Finding balance between protecting areas that are heavily fished versus lightly fished. The NEFMC Habitat Committee spent much time with their advisors on impacts of fishing on habitat. This included are there areas other than spawning aggregations, and whether fishing should not be allowed in complex habitats. There is a difficult balance of effort versus the amount of coverage by a given gear. AP members noted that the habitat in the Mid-Atlantic is less complex than in New England which makes the job of habitat protection easier because "you don't have to protect every rock."

Some AP members thought that the draft policy should concentrate on lightly fished areas because there is more "more bang for your buck" from the lightly fished areas. There is a reason that some areas are heavily fished, i.e. the most productive areas are probably the most highly fished.

Another AP member stated that there seems to be consensus on discussion on the inclusion of more habitat protection in the policy, beyond what has been done so far with coral protection and non-fishing impacts. The fishing and non-fishing breakdown is more about where to target

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how to improve the situation. They added that there's been a suggestion that impacts must be proven before acting but there are legal requirements and potential biological implications which suggest actions to minimize impacts and improve the situation vis a vis habitat impacts from fishing activity.

The AP discussed what is happening with respect to EFH. Staff indicated that the EFH review and designations are all required by law. The Council's EFH actions will be for the science folks to put together available information and then look to provide this information the Council with their policy. Think there are a set of things that the Council can articulate in advance.

GARFO staff went over the EFH strategic plan highlights which are to maintain sustainable fisheries, ecosystems, and habitat in the mid-Atlantic. The strategic plan at <http://www.greateratlantic.fisheries.noaa.gov/habitat/garfohcdstrategicplan.pdf> contains the following sections:

- 1.0 Introduction
- 2.0 Strategic Planning Process
- 3.0 Implementation
- 4.0 Habitat Conservation Division Mission and Goals
- 5.0 Strategic Plan – Habitat Conservation Division Administration
- 6.0 Strategic Plan – Northern Subregions
  - 6.2 Southern New England
  - 6.3 Long Island Sound
  - 6.4 New York Bight
  - 6.4 Upper Chesapeake Bay (double numbering in strategic plan)
  - 6.5 Lower Chesapeake Bay
  - 6.6 Offshore, Outer Continental Shelf

Note – each of these sub-region sections contains the following sections:

- a. Priority Habitats and Associated Species
- b. Potential Threats to Habitat
- c. Habitat Goal for Sub-region

Links to the strategic plan to describe the foundation for what ends up in the policy. The first step is to identify what habitats need a higher level of protection.

Some AP members felt that the mapping of habitat is an important component of habitat protection in the Mid-Atlantic, i.e. without better habitat mapping, managing to minimize impacts of fishing gear on habitat will be limited.

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Specific suggestions on draft document (attached)

**1) Include preamble or language regarding EFH and MSA language pertinent to habitat protection**

Some AP members thought that the draft policy document should include language referring to Essential Fish Habitat (EFH) and sections of the Magnuson-Stevens Act (MSA) relevant to habitat protection. Some AP members thought that the preamble should include what is required by laws and guidelines.

There was not opposition to this idea but some reservations were expressed about how broad this come become and that specific language in an introduction or preamble would been to be carefully crafted.

**2) Want the non-fishing and fishing impact policies to be different**

Because the non-fishing impact policy is externally oriented, giving Council policies to other organization and efforts, and the fishing impact policy is internally oriented, giving direction to the Council and Committees as they work on fishery management issues.

**3) Policy adaptation for changing conditions**

Some AP members felt that it is important for the policy to be able to adapt to changing conditions in the Mid-Atlantic region, including habitat changes and changes in fish abundance and distribution.

**4) Separation of frontier from historically fished areas.**

Replace 5 (Frontier Fishing Areas) and 6 (Historically Fished Areas) with “any areas”.

Some AP members thought that the distinction between no or light fishing and heavier fishing in an area is an important distinction to retain. Others thought that the distinction was a proxy for good (little or no fishing) and bad (heavier fishing) which raises the issues of what management actions are needed to address the different types of impacts. Others thought that the dichotomy between fished and unfished is too stark, creating boxes or lines where they might not be needed.

There was consensus to look for other terms than “frontier” and “historically fished”. One member suggested “impacted” and “un-impacted” habitat designations.

Some AP members said that the labels might make sense but delineating the different areas would be impossible because of lack of mapping based on whatever criteria, fished vs. non-fished, historically fished vs not historically fished, was included in the policy.

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Other AP members thought the distinction should be what areas need higher levels of protection from fishing impacts.

**5) Include state waters or apply only to federal waters**

There was consensus to recommend inclusion of state waters in the draft policy because (1) it is an important part of the habitat for many Council managed fisheries, and (2) it would promote a dialogue on important nearshore habitat issues with state managers and other Councils.

Advocate for state waters and other areas to be included in the policy - would advocate for the Council to include that so it can have dialogue with state managers, and other Councils.

**6) Inclusion of specific habitat types of concern**

The AP discussed whether to include specific habitat types, such as methane seeps, hard bottom, or clay bank areas, in the policy.

The consensus was to refer to unique habitat types as examples but not necessarily to drive down the policy to individual, unique habitat types.

**7) Seasonal Habitat Protection**

The AP discussed whether to include seasonal habitat protection in the draft policy. Some AP members favored discussion of seasonal aspects of habitat use and opportunities to mitigate impacts. There was discussion about the need to separate seasonal measures to protect habitat versus seasonal measures to protect fish. If policies are included addressing seasonal habitat protection measures, the policy should be kept at a high level and leave the specifics to Council species / fisheries committees.

Some AP members thought that an analysis of seasonal protections including seasonal and time/area closures should be included in the draft to help inform fishery management decisions to reduce impacts on habitat (Joe Gordon Language). It was noted that this type of analysis is often not prioritized.

Some AP members thought that if seasonal protections are included in the policy, they should be segregated into single event, versus short term and long term impacts.

**8) Include forage fish as habitat impacted by fishing?**

Some AP members thought that forage fish should be included as habitat to be considered for "impacts of fishing activities" under the draft policy. They said this was because forage fish is considered a habitat component in MSA.

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Other AP members said that the draft fishing impacts on habitat policy did not need to include forage fish as habitat because the Council is addressing forage fish in a separate process, similar to what was done by the Council with coral protection measures.

**9) Include ghost fishing gear?**

The AP discussed the merit of including lost or ghost gear in the fishing impacts on habitat policy. Some AP members thought that ghost gear is an issue in some areas. They thought that this included two components. First, encouraging policies that prevent gear loss or incentivize gear retention. The second component is encouraging policies for making gear biodegradable and for biodegradable escape panels or vents (where appropriate).

Some AP members thought that marine debris is a major issue and that fishing gear is a minor component of the marine debris discussion.

There was discussion that ghost fishing gear is an issue mortality causing habitat, suggesting that the overall topic be retained. This could be through incentives to best practices with respect to ghost gear or using the policy as a way of the Council supporting initiatives and funding to remove ghost gear and other debris.

**10) Include gear modifications?**

AP members expressed a variety of views on whether to include gear modifications as an option for mitigating fishery impacts on habitat. Some AP members argues for excluding gear modification because the process for modifying gear correctly is slow, expensive, and very technical which requires expertise that most AP and Council members do not have. They added that many “top down” driven gear modifications are not effective or practical for the fishery to use all the time.

Other AP members thought that gear modification to protect habitat could be a tool that should be retained as an option in the Fishing Impacts policy. They added that inclusion of gear modification in the policy could be used to support gear research and to incentivize gear and methods that minimizes habitat impacts. They also thought that gear modification as an option for Committees and PDTs to discuss would provide a mitigation option for consideration, e.g. choosing a gear modification option over area closures.

There was general agreement that we all want gear to have the lowest impact on habitat as possible.

**11) Background document on different gear types**

Staff noted that there was much discussion about how the background document should be modified to accurately describe different types fishing gear, both generally and specific to the Mid-Atlantic region. Because the document isn't needed to draft the Fishing Impacts policy

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document, it was suggested that the AP recommend setting the document aside given that the draft policy is general in nature and specific gear descriptions are more suited to action by specific FMP Committees, PDTs and APs as they consider how to incorporate the policy in future actions.

There is general agreement that the background document is not necessarily needed to consider the policy discussion and would be a distraction.

**12) Other Issues discussed by AP members**

- a. The Fishing Impact Policy should
  - i. Support future actions to be useful.
  - ii. Not be too prescriptive. We can't freeze or accurately predict the future
- b. Habitat improvement or restoration

Some AP members felt that habitat improvement or restoration were important concepts for the Council to incorporate in future actions. They thought that much damage has been done to habitat and that restoration could be an important tool to make habitat better rather than just reducing current and future impacts

- c. Outreach and education about EFH

Some AP members think that the Council consider doing more education and outreach about EFH because many people do not understand the connection between healthy habitat and healthy fisheries. They added that there was extensive outreach done on the deep sea corals and people collectively supported the effort because they understood it. They thought that it would be beneficial to connect people to habitat.

- d. Background documents on fishing impacts on habitat

Some AP members expressed concern about the background information and scientific studies used to document fishing impacts on habitat. They said that many of the studies were old, occurred in areas not representative of conditions in the Mid-Atlantic, and had sample sizes that were too small to draw conclusions from.

Other AP members thought that the background information and scientific studies were robust enough to draw conclusions from and from which to develop the Fishing Impacts on Habitat Policy.

## Council Fish Habitat Policies – Preamble

Fish require healthy surroundings to survive and reproduce. A fish’s habitat is a combination of physical factors, such as water temperature and bottom type, chemical factors such as oxygen levels and dissolved minerals, and biological and ecological characteristics such as prey and forage. Many species of fish have different habitat requirements for each life stage (i.e., egg, larvae, juvenile, adult). Habitat plays an essential role in the reproduction, growth, and sustainability of commercial and recreational fisheries and is essential to the biodiversity of marine and coastal ecosystems.

Human activities have significantly altered coastal and marine habitat over time. A variety of factors have contributed to the degradation or destruction of fish habitat, including coastal development, land-based pollution, fishing gear impacts, invasive species, dams and other blockages that restrict the movement of migratory fish species, and changes in the volume and delivery of freshwater to estuaries. In addition, climate change and growing demands for new energy sources have the potential to cause wide-ranging impacts on fish habitat. Given the continued population growth and development in coastal areas, these pressures on coastal and marine habitats are expected to increase in the future. Also, it is important to note that once habitat is damaged or lost, it is difficult and costly to recover.

The Mid-Atlantic Fishery Management Council is responsible for the management of marine fisheries in the Exclusive Economic Zone. The Council develops management plans and management measures for fourteen species of fish and shellfish. Most of the Council’s managed resources have strong nearshore and coastal linkages to habitat, and in many cases the nearshore and offshore environment for these managed resources is a continuum.

Fish stocks cannot be managed sustainably in the absence of a healthy marine ecosystem, and healthy fish habitat, which starts inland with freshwater stream and river inputs, and continues offshore to the outer continental shelf of the US Atlantic. Anthropogenic activities and projects within the Greater Atlantic region (i.e. Northeast region, including the Mid-Atlantic and New England waters) have the potential to impact the productivity of the Council’s managed fishery resources<sup>1</sup>, other federally-managed fish resources<sup>2</sup>, state-managed fish resources<sup>3</sup>, and the forage on which these fish rely. In addition, many of these activities have the potential to impact species protected under the Endangered Species Act and Marine Mammal Protection Act<sup>4</sup>, such as marine mammals and sea turtles.

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<sup>1</sup> Mid-Atlantic Council managed stocks: Atlantic mackerel, black sea bass, Atlantic bluefish, butterfish, shortfin squid (*Illex*), longfin squid (*Loligo*), ocean quahogs, scup, spiny dogfish, summer flounder, Atlantic surfclams, golden tilefish, and monkfish.

<sup>2</sup> Other Federally-managed fish stocks: American lobster, Atlantic herring, Atlantic salmon, Atlantic sea scallop, Atlantic sturgeon, shortnose sturgeon, red crab, river herrings, skates, whiting and other hakes, cod, haddock, yellowtail flounder, pollock, plaice, witch flounder, white hake, windowpane flounder, Atlantic halibut, winter flounder, redfish, Atlantic wolffish, and ocean pout (<http://www.nefmc.org>), highly migratory species such as tunas, sharks, swordfishes, and billfishes (<http://www.nmfs.noaa.gov/sfa/hms/>), as well as other southern Atlantic fish species (<http://www.safmc.net>).

<sup>3</sup> For lists of state managed fish stocks, see <http://www.asmf.org>.

<sup>4</sup> For lists of protected resources, see: <http://www.nmfs.noaa.gov/pr/species/index.htm>.

## Draft – Fishing Impacts on Habitat Policy 25 May 2016 – Draft

The Council has the ability to address impacts of fishing gear and practices on fish habitat through management of fisheries under its jurisdiction, and through cooperative management for fishing activities and practices under the jurisdiction of other management organizations. The National Marine Fisheries Service (NMFS) and the Council have the ability to regulate fishing activities that reduce habitat quantity and function through the fishery management plan development, amendment, and regulatory process. However, the application of this authority to protect habitat from fishing activities is a difficult and complex task which requires quantification of habitat impacts by fishing gear, identification of habitats needing protection, and development of practical, targeted management actions that will achieve the desired habitat protection objective while simultaneously minimizing negative impacts on the region's fisheries.

The Council's implementation of Ecosystem Approaches to Fisheries Management (EAFM) is comprised of a number of components which are intended to be complementary and not redundant to each other. This includes the following components:

- Policies on Non-Fishing Activities and Projects that Impact Fish Habitat
- Deep Sea Corals Amendment to the Mackerel, Squid, and Butterfish Fishery Management Plan (FMP)
- Unmanaged Forage Fish amendment
- Other actions?
- Policy on fishing gear and activities that impact fish habitat

This policy applies to managing the impact of fishing on sensitive benthic habitat areas.

The following principles guided the development of these policies:

1. Take an ecosystem approach, which includes consideration of benthic communities and habitat, and their linkages within the ecosystem, is fundamental to the sustainable use of our marine resources.
2. To ensure healthy and productive marine ecosystems, it is imperative that the impacts of fishing in sensitive benthic habitats be considered in fisheries management decision making.
3. Sustainable use that safeguards ecological processes is a priority of fisheries management decision making.
4. Not all benthic areas require equal levels of protection, as not all areas are equally ecologically or biologically significant or vulnerable to particular fishing gear or practices.



## Draft – Fishing Impacts on Habitat Policy 25 May 2016 – Draft

**To support these overarching principles, the Council’s policy direction on fishing impacts on habitat is focused in three areas:**

- 1) Actions that apply to all areas of the marine ecosystem
- 2) Actions that apply to areas of the marine ecosystem where there is a history of significant fishing; this includes ongoing fishing activity
- 3) Actions that apply to areas of the marine ecosystem where there is little or no history of fishing. In the Mid-Atlantic this includes deep areas of Outer Continental Shelf

There is a higher level of scientific uncertainty about benthic habitat and its associated communities in areas of little or no fishing areas as contrasted with areas of significant fishing.

### ***Policies that apply to all areas of the marine ecosystem***

1. The Council will consider measures which avoid or reduce the potential for lost gear, or “ghost gear”, should be considered in fishery management plans, where practicable.
2. The Council will consider fishing gear modifications or substitutions which reduce the impacts on benthic habitats should be considered in fishery management plans, where practicable. It is understood that gear modifications are complex, costly, and require much testing. This policy should be used to promote and incentivize gear research identified as having the potential to minimize the impacts of fishing gear on marine ecosystem habitat.
3. The Council will consider measures that apply to all areas of a species habitat use.
4. The Council will consider measures that apply seasonally or temporarily to minimize the impacts of fishing gear or practices on habitat for a particular species or fishery

### ***Policies that apply to areas of the marine ecosystem where there is a history of significant fishing; this includes ongoing fishing activity***

1. The Council will identify benthic areas and high productivity areas that may be more at risk than others within areas of significant fishing activity, and prioritize the work and fisheries management actions that may be required to mitigate or avoid harm. This will include consideration of the cumulative impacts of all fisheries and fisheries gears on Mid-Atlantic fish benthic habitat through fishing gear impact analyses.
2. Evaluate the effectiveness of existing fisheries management measure for minimizing fish habitat impacts, and determine whether changes are required.

**Draft – Fishing Impacts on Habitat Policy 25 May 2016 – Draft**

3. Implement management measures across fishery management plans that may reduce impacts on benthic habitat. For example, efficiencies in the fisheries such as trip limits, or other existing measures impact the time gear may spend on the seabed.

***Policies that apply to areas of the marine ecosystem where there is little or no history of fishing. In the Mid-Atlantic this includes deep areas of Outer Continental Shelf***

1. In areas of little or no history of fishing, the Council will evaluate the expansion of existing or new fisheries or new fishing gears for potential impacts to benthic habitats, and determine the sensitivity of these areas to the proposed fishing activity.

## Questions for EOP Committee members about Fishing Impacts on Habitat Policy development

1) Term to differentiate fished vs. less fished areas?

The terms used to describe areas based on the relative amount of fishing that has taken place, or is taking place, are important but the policy development process has not brought forth terms that are clear and get agreement from AP members.

Among the terms discussed are:

- a) Historically fished areas – frontier fishing areas
- b) Fished areas – unfished areas
- c) Areas with significant fishing – areas with little or no fishing
- d) Other designations

2) Include state waters in the policy?

The AP recommended that state waters be included in the policy because of the importance of estuarine and nearshore habitats for Council managed species. The AP did acknowledge the difficulties that could arise by addressing fishery impacts on habitat in state waters.

Given that the policy includes principles for habitat protection as compared with specific actions on individual fisheries, the policy objective for including state waters would be that habitat protection should consider all areas important to a particular fishery.

3) Include temporary habitat protections in the policy?

The AP discussed including temporary habitat protections in the policy to address habitats that are important seasonally such as spawning or juvenile habitats.

4) Include habitat restoration in the policy?

Some AP members felt that habitat restoration should be included as a component of the fishing impacts policy, using examples of oyster reefs and “harder” bottom areas such as exposed peat banks that have been impacted by fishing but could be restored to provide significant fishery and ecological benefits.

**Fishing Impacts to Essential Fish Habitat**  
**Proposal for Council Policy**

**Prepared by EOP AP member Joseph Gordon and supported by EOP members Brad Sewell, Fred Akers, and Pam Lyons-Gromen**

**Preamble**

Marine habitats provide fish with shelter, food, and places to grow and reproduce. Habitat includes more than just structures; it describes a combination of physical factors, such as water temperature and bottom type, chemical factors such as oxygen levels and dissolved minerals, and biological and ecological characteristics such as forage and trophic interactions. Many species of fish have different habitat requirements for each life stage (i.e., egg, larvae, juvenile, adult). Habitat plays an essential role in the sustainability of commercial and recreational fish populations and is essential to the biodiversity of marine and coastal ecosystems.

The relationship between the integrity of habitat and the health of wild animal populations is indisputable. Habitat loss through degradation is prominent among factors leading to the impacts to species' populations and consequently is a key focus of the Magnuson-Stevens Fishery Conservation and Management Act (MSA).<sup>1</sup> Over time, fishing activities and fishing gear have impacted our ocean ecosystems, sensitive benthic habitat, spawning areas, juvenile fish habitat, species age structures, biodiversity, species interactions, and predator prey interactions. As a result, ecosystem function and fisheries productivity have been impaired. These fishing impacts are compounded by a variety of other anthropogenic impacts that have contributed to the degradation or destruction of fish habitat, including coastal development, offshore energy development, land-based pollution, invasive species, dams and other blockages that restrict the movement of migratory fish species, and changes in the volume and delivery of freshwater to estuaries. In addition, climate change is causing wide-ranging impacts on the suitability fish habitat for certain species through increases in water temperature and acidity. Once habitat is damaged it can be difficult and costly to recover.

The MSA recognizes the loss or degradation of marine and estuarine habitat as a significant and long-term threat to ocean ecosystems and sustainable U.S. fisheries. The MSA defines Essential Fish Habitat (EFH) in broad terms that are fundamentally grounded in ecological science and oriented toward species needs, requiring that the Council's EFH management efforts focus on "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity."<sup>2</sup> The term "substrate" is further defined in the MSA's implementing regulations to include "sediment, hard bottom, structures underlying the waters, and associated biological communities."<sup>3</sup>

The MSA requires NOAA Fisheries and regional councils to develop and implement fishery management plans that, to the extent practicable, minimize adverse effects caused by fishing to Essential Fish Habitat in the marine environment.<sup>4</sup> This includes places where young fish can

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<sup>1</sup> 16 U.S.C. §§ 1801-1884 (2007).

<sup>2</sup> 16 U.S.C. § 1802 (10).

<sup>3</sup> 50 CFR § 600.10.

<sup>4</sup> 16 U.S.C. § 1853(a)(7): Every fishery management plan must "describe and identify essential fish habitat for the fishery . . . and minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat."

find refuge, food, and other conditions promoting growth to maturity and successful spawning, and the places where spawning fish aggregate. All of these key aspects of the behavioral ecology of fish must be considered when developing EFH policy.

The Mid-Atlantic Fishery Management Council is responsible for the management of marine fisheries in the U.S. Exclusive Economic Zone (EEZ) off the coasts of New York, New Jersey, Delaware, Maryland, Virginia and North Carolina. The Council develops management plans and management measures for fourteen species of fish and shellfish. Most of the Council's managed resources have strong nearshore and coastal linkages to habitat.

**The following principles and policies apply to managing adverse effects on Essential Fish Habitat including Habitat Areas of Particular Concern:**

Ecosystem Based Management:

1. Take an ecosystem approach when describing and identifying EFH, which includes consideration of communities, habitat, and their linkages within the ecosystem that are fundamental to the sustainable use of our marine resources.
2. Evaluate and manage for impacts of climate change to EFH when making fishery management decisions. This evaluation should include climate change impacts to spawning habitat, forage species, sensitive benthic habitats, juvenile fish habitat, and alterations in species' range and interactions. Provide stronger protections and buffers for habitats that are sensitive/vulnerable to climate change and disturbance.
3. Comprehensively evaluate individual and cumulative impacts from fishing and other anthropogenic and natural damage to EFH. Specifically consider impacts to sensitive benthic habitat, spawning grounds, forage, and other essential fish habitat elements.
4. Protect and enhance habitat, biological diversity, trophic interactions, and the physical, biological, and chemical elements of the ecosystem that support its overall stability.
5. Understand and manage for the overlap of gears, habitats, species, and fisheries, and consider the impacts of each decision on the others.
6. Protect essential forage needed for feeding and growth of managed species. The MSA clearly identifies feeding and growth as essential elements of EFH. With few exceptions, the relevant food sources are animal populations such as small fish, crustaceans, mollusks and other benthic invertebrates. These populations occupy places in the water column and on the bottom. Habitat that provides food and promotes growth to maturity of these food resources must be conserved as an element of EFH for managed species.
7. Account for and protect from both long-term and short-term adverse effects on habitat related to management decisions.

Describe, Identify, Conservation and Enhance EFH:

8. Ensure healthy and productive marine ecosystem habitats by identifying and describing (mapping) EFH, identifying potential impacts to EFH, and ensure conservation by minimizing adverse impacts to EFH as required by the MSA.

9. Engage in consultations with federal and state government agencies regarding non-fishing anthropogenic actions that may adversely impact EFH. Under the MSA the Council may comment and make recommendations to the Secretary of any Federal or State agency considering any activity that, in the view of the Council, may affect the EFH of a fishery resource under its authority. The Council should engage in federal actions authorizing release of pollutants, construction, dredging, or other anthropogenic actions that may adversely impact EFH to ensure conservation of EFH.
10. Protect shallow and deep coral habitats and sensitive soft-bottom habitats from adverse impacts associated with fishing and fishing gear.
11. Require best practices in anchoring, particularly in sensitive habitats.
12. Evaluate and mitigate single vessel impacts, fishery-wide impacts, and fishery-wide cumulative adverse impacts on EFH.
13. Consider time/area closure alternatives in all management actions like quota setting.
14. Use tools to ensure adequate abundance and availability of forage. Some potential tools to consider are time, area, and age class protections, migration corridor protections, and protection of nurseries of forage for managed species. The availability of adequate prey is necessary to protect the “feeding” and “growth to maturity” aspects of EFH under the MSA.
15. Evaluate fishing impacts on EFH of species managed by the MAFMC that are caused by fisheries not managed by the MAFMC.
16. Implement cautious management in the face of uncertainty. In a shifting climate it is difficult to determine biological, ecological, and economic value of habitat. Creating climate buffers and other precautionary management measures is necessary where unpredictable systemic ecosystem changes can cause unknown adverse impacts to species and habitat.
17. Restore EFH that has already been impacted by fishing and other anthropogenic causes.
18. Develop a habitat protection and restoration plan for managed species with quantitative and measurable goals.
19. A **historically fished area** is a marine ecosystem area where there is a history of fishing; this may include ongoing fishing activity.
  - a. The Council will identify through the Habitat Area of Particular Concern identification process benthic areas and high productivity areas that may be more at risk than others within historically fished areas, and prioritize the work and fisheries management actions that may be required to mitigate or avoid harm. This will include consideration of the cumulative impacts of all fisheries and fisheries gears on Mid-Atlantic fish benthic habitat through fishing gear impact analyses.
  - b. Evaluate the effectiveness of existing fisheries management measures for minimizing fish habitat impacts, and determine whether changes are required.

- c. Implement management measures across fishery management plans that may reduce impacts on benthic habitat.

20. An ***unfished area*** is an area of the marine ecosystem where there is limited or no history of fishing. In the Mid-Atlantic this includes deep areas of the Outer Continental Shelf. There is a higher level of scientific uncertainty about benthic habitat and its associated communities in unfished areas than within historically fished areas.

- a. Within the Council's "deep sea coral zones", areas where corals have been observed or where they are likely to occur, fishermen will be prohibited from using bottom-tending fishing gear such as trawls, dredges, bottom longlines, and traps. Large swaths of the area in these coral zones are areas that have experienced little or no previous fishing impacts.
- b. The Council will prohibit the expansion of existing or new fisheries or new fishing gears into unfished areas for potential impacts to benthic habitats, until it has determined the sensitivity of these areas to the proposed fishing activity and adopted management measures to minimize those impacts.

Habitat Areas of Particular Concern:

21. Designate and protect Habitat Areas of Particular Concern (HAPCs) for all managed species. HAPCs are discrete areas within EFH that have importance for ecological function, particular sensitivity, stress from human activity, and rarity.

22. Create HAPCs that:

- a. Protect habitats that are difficult to restore. Many habitats (like corals) take a long time to recover from damage. The council should proactively protect sensitive benthic habitat and not rely on potential restoration after negative impacts.
- b. Minimize adverse impacts of fishing in sensitive benthic habitats in fisheries management decision making. Regarding the MSA requirement to minimize adverse effects on EFH to the extent practicable, the phrase "to the extent practicable" does not mean that *any* economic impact makes minimization impracticable. In considering the economic impact, the value of habitat protection (e.g., spawning habitat, nursery habitat, and forage habitat) must also be considered in the analysis.
- c. Ensure heightened protections for areas of particular sensitivity. Different habitats have different ecological and biological significance and vulnerability to particular stressors. Manage to ensure heightened protections for all sensitive benthic habitats.
- d. Ensure heightened protections for areas of ecological significance to managed species including spawning, and nursery habitat areas that, because of their importance to species survival and healthy ecosystems need increased safeguards from degradation.

Fishing Gear:

23. Implement measures which avoid or reduce the potential for lost gear, or “ghost gear” in fishery management plans.
24. Implement fishing gear modifications or substitutions which reduce the impacts on benthic habitats in fishery management plans. Gear should have the lowest impact possible.
25. Incentivize less damaging gear and techniques to reduce the ecological footprint of fisheries analogous to the living shorelines policy.

Research and EFH Updates:

26. Enhance habitat research by establishing a network of Dedicated Habitat Research Areas (DHRAs), including reference areas protected from all fishing and other local human disturbance. These areas are essential elements of adaptive and Ecosystem-Based Fishery Management (EBFM).
27. Use the Best Scientific Information Available, consistent with NS2 and the EFH Guidelines when describing, identifying, enhancing, and conserving EFH.
28. Implement a 5-year review of all EFH, as required in the EFH regulations.
29. Carefully review any and all scientific information on EFH that had become available since the last review and ensure that description and identification of EFH is consistent with the any new scientific information. Update and augment EFH conservation measures as necessary to ensure compliance with the Best Available Science.

Public input:

30. Fully inform the public of all EFH 5-year review processes, and allow for public comment and input.
31. Ensure open informed decisions with public input where gear or habitat priorities conflict, like when fisheries overlap in space and time.
32. Fully inform the public of gear and fishing adverse impacts to sensitive benthic habitat including corals, and allow for the opportunity for public comment and input.
33. Fully inform the public of all consultations with the federal government for all anthropogenic adverse impacts to EFH and allow the opportunity for public comment and input.



## Action Plan (as of 5/02/16) to develop an EFH Review Technical Report

**Council:** Mid-Atlantic

### **Additional Expertise Sought:**

<b>Fishery Management Action Team (FMAT)</b>		
<b>Agency</b>	<b>Role</b>	<b>Person</b>
MAFMC staff	FMAT Chair	Jessica Coakley
NMFS GARFO	Habitat	David Stevenson
NMFS HCD	Habitat	Terra Lederhouse
NMFS HCD	Habitat	Howard Townsend
NMFS NEFSC	Habitat	Dave Packer
NEFMC staff	Habitat	Michelle Bachman

**Title of Action:** Development of an “EFH Review” Technical Report.

**Objective of Action:** A report will be developed to address the 10 components of the Habitat Review for the Council. In this report, the Council will be presented with information to support revising habitat designations and descriptions and/or other aspects of the FMPs. The Council can then initiate FMP action(s), to consider revising EFH components or management measures within their individual FMPs or as an Omnibus action to amend all FMPs simultaneously.

#### *1. Description and Identification of EFH*

Evaluate new scientific literature and information from other relevant sources to see whether species-specific EFH description and identification, as written in the FMP as text and provided as maps, is appropriate and reflects best available information and methods. Suggest changes to EFH text or map designations as appropriate.

#### *2. Fishing activities that may adversely affect EFH*

Review whether there have been changes in or newly available information on fishing activities that may adversely affect EFH. Evaluate the impact of fishing activities on EFH.

#### *3. Non-Magnuson-Stevens Act fishing activities that may adversely affect EFH*

Review whether there have been changes in current Non-Magnuson-Stevens Act fishing (e.g., state water fisheries). Evaluate the impact of non-MSA fishing activities on EFH.

#### *4. Non-fishing related activities that may adversely affect EFH*

Review whether there have been changes to or newly available information on non-fishing activities affecting habitat. Evaluate the impact of non-fishing activities on EFH.

#### *5. Cumulative impacts analysis*

Review cumulative impacts discussions across all FMPs, and update if appropriate.

#### *6. Conservation/Fishing Impact Recommendations*

Review fishing and non-fishing activities and determine whether actions to minimize impacts on EFH or other conservation actions are appropriate.

*7. Prey species*

Review prey species information and determine if updates are appropriate.

*8. Identification of HAPC*

Review current HAPC designations and approach, and consider new approaches and/or new candidate HAPC designation and approaches.

*9. Research Needs*

Review existing habitat research needs and determine whether updates are appropriate.

*10. Develop approaches to better integrate goals and objectives into habitat actions.*

Consider how habitat goals and objectives can be used to make the Council’s use of its habitat authorities more effective.

**Fisheries that Apply:** All Council managed FMPs, excluding Monkfish (as MAFMC is not the lead Council).

**Type of NEPA Analysis Expected:** To be addressed by another FMAT if Council decides to develop an FMP action.

**Applicable Laws/Issues:** To be determined if Council decides to develop an FMP action.

**Other Issues:** At this time, no additional issues have been identified.

**Timing Issues:** At this time, no timing issues have been identified.

**Timeline for Development:**

<b>2016-2018 Development Track</b>	
First FMAT Meeting	May 2016
Develop report (may include additional meetings of the FMAT or other technical meetings as needed)	June 2016 – May 2017
Update Ecosystem and Ocean Planning (EOP) Committee on progress to date on 10 components of EFH Review	June 2017
Continued report development by FMAT	July 2017 – May 2018
Present EOP Committee and Council with final technical report	June 2018
Council can consider FMP action and form another FMAT to develop, as needed	?

## **MAFMC MEETING – GARFO HCD Updates.**

### **Offshore G&G Activities**

NMFS HCD SERO and GARFO issued combined comments on BOEM’s PDEIS for G&G survey work in the Mid and South Atlantic in 2012 (letter attached). At that time, it was determined that a programmatic EFH assessment provided by BOEM did not assess adequately the potential impacts of the G&G activities on EFH. We also disagreed that the impacts to EFH from the seafloor disturbance would be negligible. We determined that a programmatic consultation was inappropriate based upon the information available and issued an EFH conservation recommendation (cr) that BOEM consult with is on each individual application for G&G activities that would affect EFH adversely. BOEM concurred with the EFH cr in their 2014 response (attached).

BOEM agreed to review each application and request from the applicant additional information deemed necessary to analyze impacts of the specific activity within specified locations or areas on marine protected species, archaeological resources, biological features, and EFH. During that review, BOEM would draft a site-specific environmental assessment (SEA) with the EFH Assessment as an appendix. On the basis of the SEA and the EFH Assessment, BOEM would then make the determination whether or not proposed specific activities would adversely affect EFH, which would warrant an EFH consultation. As a matter of process, permit applications for all proposed G&G activities in the Atlantic will be posted to BOEM's webpage:

**<http://www.boem.gov/Currently-submitted-Atlantic-OCS-Region-Permits/>**

There are currently eight applications posted on the webpage.

[TGS](#) - Permit Number E14-001

[GX Technology Corporation](#) - Permit Number E14-003

[WesternGeco LLC](#) - Permit Number E14-004

[CGG Services \(US\) Inc.](#) - Permit Number E14-005

[Spectrum Geo Inc.](#) - Permit Number E14-006

[PGS](#) - Permit Number E14-007

[TDI-Brooks International, Inc.](#) - Permit Number E14-010

[NEOS GeoSolutions Inc.](#) - Permit Number E15-002

BOEM has not yet initiated consultation with us or with the SERO on any of these.

### **Wind Energy**

#### **New York BOEM Task Force Meeting**

A New York BOEM Intergovernmental Task Force meeting was held in Garden City, NY on April 28, 2016. The meeting objectives included an update on the progress of the NY wind energy area (WEA) which was officially identified on March 15, 2016, a discussion of the draft proposed sale notice (PSN), a review major leasing milestones, and a discussion of next

steps. Three major issues arose with regards to the NY WEA including, commercial fishing, navigation, and visual impacts. These issues are identified in the draft PSN, but the WEA was not specifically modified as result of these issues. Preparation of an Environmental Assessment for issuing a lease within the NY WEA is underway and will likely be published by late spring, at the same time as the final PSN. Representatives from the squid fishery and scallop fishery were present and provided comments during the public comment period, including concerns regarding impacts to industry in states outside New York, including Rhode Island and Massachusetts ports. BOEM environmental studies program will be partnering with New York State University at Stony Brook on a tagging study to look at fish movement. The state of New York is planning to prepare an Offshore Wind Master Plan, led by NYSERDA.

### NJ Task Force Meeting

New Jersey BOEM Task Force Meeting was held on May 19, 2016. HCD staff was unable to attend. The agenda included a presentation of the New Jersey auction results, an overview of the commercial leases and next steps, an overview of the environmental stipulations and the next steps for the environmental review of the site assessment plans, and an overview of the relevant studies in the NJ lease areas. There also was an introduction of the commercial lessees –

Lease OCS-A 0498 (RES America Developments, Inc.)

Lease OCS-A 0499 (U.S. Wind Inc.)

### US Wind

US Wind is planning to construct and operate a 500-600 MW wind farm offshore Maryland in 2017. The cable for the project will run through Indian River Bay, Delaware. NOAA received the Site Assessment Plan (SAP) from BOEM on March 22, 2016 for the installation and operation of a MET tower located in the Maryland Wind Energy Area. We provided comments on EFH and ESA species potentially impacted by that part of the project in a letter on April 20, 2016. This project was also recently discussed at May 19, 2016, Delaware joint state/federal interagency permit processing meeting.

### Block Island Wind Farm – Rhode Island

The five jacket foundations are now installed and construction to install the turbines will begin this summer. Horizontal Directional Drilling (HDD) for the cable has been completed at Scarborough Beach in Narragansett and at Block Island. On Block Island, the export submarine cable to the wind farm has been complete and the cable laying barge will work on the remainder of the cable within the wind farm. The submarine cable from Narragansett to Block Island will be laid in May and June.

### Ocean Outfall - Delaware

The city of Rehoboth Beach has applied for an Army Corps permit to install a wastewater outfall pipeline and diffuser via directional drilling and mechanical dredging in the Atlantic Ocean east of Deauville Beach, Rehoboth Beach, Sussex County, Delaware. The purpose of installing this

force main and ocean outfall is to comply with the consent order by discharging treated wastewater effluent from the Rehoboth Beach Waste Water Treatment Plant to the diffuser, eliminating the discharge into the Lewes and Rehoboth Canal. Construction of the ocean outfall is expected to begin in October 2017 and continue until April 2018, avoiding the timeframe from May 1 through October 1 to reduce the risk of impacts to local marine species. A copy of this PN was sent to the council.

### **Aquaculture - Maryland**

Man O' War Shoals – Council was copied on our comment letter. The Maryland Department of Natural Resources has applied for a permit from the Army Corps of Engineers to hydraulically dredge two to five millions bushels (120,000 to 300,000 cubic yards) of oyster (*Crassostrea virginica*) shell from Man O' War Shoal in the Chesapeake Bay near the mouth of the Patapsco River, Baltimore County, Maryland over a five year period. The shell would be used for oyster reef restoration and for private aquaculture leases. Our letter recommended that the processing of the permit be held in abeyance until additional information was provided to describe the project and its potential affects more fully and a complete EFH assessment was provided. The Army Corps has requested additional information from the Maryland Department of Natural Resources (the applicant). This information is due to the Corps by August 1. We expect an interagency meeting will follow.

### **Port Development**

The Baltimore District of the Army Corps is contemplating the deepening and widening of the Baltimore Harbor and approach channels. The SEIS is anticipated to be out for public comment soon.

### **Beach Nourishment Projects.**

There are a number of beach nourishment projects on going or proposed along the Mid-Atlantic coast including almost all of NJ and the south Shore of Long Island. HCD recently commented on the following:

1. Fire Island to Montauk Point Reformulation Study. The project area extends from Fire Island Inlet east to Montauk Point in Long Island, New York. The proposed action includes beach and dune restoration, inlet modifications, groin modifications, a breach response plan, and other non-structural measures, as well as, the continuation of the authorized dredging in Fire Island, Moriches and Shinnecock Inlets and the ebb shoals outside of the inlets with the placement of the dredged material in down drift areas.
2. Asharoken Storm Damage Reduction Project. The proposed project is on the north shore of Long Island in the Town of Huntington, Suffolk County, New York. The proposed plan includes dredging 600,000 cubic yards (cy) of sand from a new 55 acre offshore borrow area with placement along the shoreline for beach nourishment and rebuilding the berm.
3. Little Egg Inlet Sand Resource Borrow Area Investigation. The project involves use of a new 3,288-acre sand borrow area within the Little Egg Inlet as a source of sand for beach

nourishment along the 17-mile stretch of Long Beach Island's (LBI) Atlantic coastline between the Barnegat Inlet and Little Egg Inlet, NJ. The borrow area is an HAPC for sandbar shark.

A number of projects are on-going including Long Beach Island, NJ using existing borrow areas. The number occurring at any given time is limited by the number of suitable dredges available. SERO reports that there are a few beach nourishment projects in the Kitty Hawk, NC area mining several hundred acres of offshore bottom for sand. These bottoms, while not featureless, have much less topography than the shoal areas off the other part of the Mid-Atlantic that GARFO has focused on.

### **Transportation Projects:**

The US Department of Transportation has initiated the NEC FUTURE study to determine a program of investments to improve passenger rail service on the Amtrak Northeast Corridor between Washington, D.C., and Boston. No specific actions have been proposed. However an offshoot of this is the Gateway project, a new passenger rail tunnel under the Hudson River. It was formerly known as the Access to the Region's Core project.

Tappan Zee Bridge construction of the new bridge is underway. Coordination has just begun on the removal of the old bridge.

In NC, the replacement of Bonner Bridge over Oregon Inlet and relocation of NC Highway 12 leading to the bridge from Rodanthe (the south) is a continuing controversy due to impacts within Pamlico Sound.

### **Miscellaneous:**

On June 1, the Army Corps issued a Federal Register Notice announcing the reissuance of the existing Nationwide Permit and two new permits (removal of low head dams and the construction of living shorelines). Nationwide permits are supposed to allow the authorization of activities that will have no more than a minimal adverse effect, individually and cumulatively on the environment. HCD will be working with the individual Corps Districts (NY, Philadelphia, Baltimore and Norfolk) to develop regional conditions to minimize impacts to EFH and other species such as river herring and shad. A copy of the FRN is attached.



## Mid-Atlantic Fishery Management Council

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

# MEMORANDUM

**Date:** 6/1/2016  
**To:** Council  
**From:** Jason Didden  
**Subject:** Atlantic Mackerel, Squid, and Butterfish (MSB) Specifications

Mackerel is in multi-year specifications for 2016-2018 and the squids and butterfish are in multi-year specifications for 2015-2017. The Council's Scientific and Statistical Committee (SSC) reviewed the previously-set 2017 MSB Acceptable Biological Catches (ABCs) during its May 2016 meeting and recommended no changes. The Council is scheduled to:

- Review fishery performance and 2017 specifications
- Review butterfish cap operation
- Review butterfish/longfin squid mesh information

To support these agenda items, the following materials have been posted to <http://www.mafmc.org/briefing/june-2016>:

- Staff Memo to SSC
- Staff Fishery Information Documents
- Advisory Panel Fishery Performance Reports
- NMFS Science Center (NEFSC) data updates
- NMFS MSB Regulation Summary Sheet

The Scientific and Statistical Committee's (SSC) report follows this memorandum.

The MSB Monitoring Committee met May 31, 2016 via webinar. Monitoring Committee attendees included Jason Didden, Carly Bari, Chuck Adams, Lisa Hendrickson, and Kiersten Curti. Douglas Christel and Greg DiDomenico also attended. Given the SSC's positive review of the previously-set 2017 MSB ABCs, and that the Monitoring Committee is not aware of any other pending operational issues with the MSB fisheries (including the butterfish cap), the Monitoring Committee did not recommend any changes for the previously-set 2017 specifications.

The Monitoring Committee also discussed butterfish and longfin mesh issues. Regarding the allowed strengthener for butterfish (5 inches), it was noted that Cornell is currently wrapping up research on several butterfish mesh liners that also used 6.5 inch (between the knots) strengtheners (diamond and square). The Monitoring Committee would still like to review the appropriateness of the current strengthener provisions, but it seems most appropriate to wait for the results of the Cornell work before considering any changes to butterfish mesh requirements.

Regarding longfin mesh issues, Amendment 10 included language that the longfin mesh increase implemented in that Amendment (2 1/8" mesh in Trimesters 1 and 3) would be reviewed. Staff examined 2005-2009 vs 2011-2015 observer-recorded mesh sizes on observed hauls from trips that had at least 50% longfin squid as their retained catch. 2010 was not included given that was the transition year when 2 1/8" mesh became required in Trimesters 1 and 3 (Sept 1 – April 30). Preliminary results indicate that while a substantially greater percentage of hauls used mesh over 2 1/8" in the 2011-2015 period, a substantial number of hauls (slightly over half) also appear to be using mesh less than 2 1/8" in the 2011-2015 period. Possible multi-fishery fishing (especially for *IIIex*) make discerning the meaning of these findings challenging and will require additional examination of haul by haul observer data that was beyond the scope of analysis that could be done as part of this specifications process. The monitoring committee recommended that additional investigation of the mesh data be continued as part of the fishery descriptive information for the in-progress Squid Amendment.

The Monitoring Committee also reviewed the performance of the river herring and shad (RH/S) cap on the mackerel fishery, and is not aware of any operational issues outside of the low observer coverage in the mackerel fishery, which could lead to imprecise estimates. There is further discussion of this issue in the RH/S agenda item.





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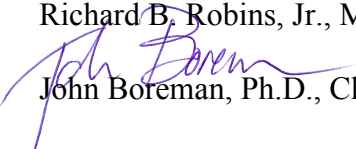
Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman

Christopher M. Moore, Ph.D., Executive Director

# MEMORANDUM

**DATE:** 1 June 2016

**TO:** Richard B. Robins, Jr., MAFMC Chairman

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

**SUBJECT:** Report of the May 2016 SSC Meeting

The SSC met in Baltimore, MD, on 25-26 May 2016 for the main purpose of developing multi-year ABC recommendations for Surfclams and Ocean Quahogs, and reviewing data updates to determine if the SSC's ABC recommendations for the squids, mackerel, and butterfish should be changed. The SSC also continued discussion of criteria for assigning coefficients of variation for OFLs, and providing input during the Council's re-examination of its risk policy for setting ABCs. The final meeting agenda is attached (Attachment 1).

A total of 12 SSC members were in attendance on May 25<sup>th</sup> and 10 on May 26<sup>th</sup>, which constituted a quorum for both days (Attachment 2). Also in attendance were scientists from the NEFSC (NMFS Northeast Fisheries Science Center) by phone, staff from the Council, and representatives from the fishing industry and the general public. Documents cited in this report can be accessed via the MAFMC SSC website (<http://www.mafmc.org/ssc-meetings/2016/may-25-26>).

## Surfclams

Jessica Coakley (MAFMC staff) reviewed the most recent survey and catch data provided by the NEFSC and the fishery performance report prepared by the Advisory Panel, with assistance from Dan Hennen (NEFSC staff). The current ABC specifications for Surfclams expire at the end of the 2016 fishing year, so the SSC is being requested to develop new specifications for the 2017 and 2018 fishing years. A new benchmark assessment is expected later this year.

The SSC's responses to the Council's terms of reference (ToRs, *in italics*) for Surfclams are as follows:

*For Surfclam, the SSC will provide a written report that identifies the following for fishing years 2017-2018:*

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

The SSC considered this stock to be characterized by an “SSC-modified OFL probability distribution” in line with its designation in 2013 (old Level 3).

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

Owing to the lack of a new stock assessment, the SSC used the same method that was used in 2013 to estimate the catch in weight for the 2017 and 2018 fishing years. The relevant levels are:

2017	<b>69,925 mt</b>	P(overfishing) = 50%
2018	<b>70,102 mt</b>	P(overfishing) = 50%

3) *The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock.*

The SSC determined the ABC by using the Council’s risk policy:

2017	<b>44,469 mt</b>	P(overfishing) = 29%
2018	<b>45,524 mt</b>	P(overfishing) = 30%

The SSC noted that it is continuing to use an OFL CV = 100% for its projections based on estimates derived from an assessment that employed data only up to and including 2011. Some additional caution that may be necessary because of this extended projection period. However, this is offset by survey evidence of average or above average recruitment in the southern regions, the fact that the quota has not been fully harvested in each year, and generally low exploitation rates.

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

The data for the most recent assessment included data up to and including 2011; therefore, the lack of an assessment that uses the most recent data is an important source of uncertainty. The SSC notes that a new assessment is expected to undergo peer review in July 2016 and, if accepted, should provide the basis for specifications when the SSC next reviews this species in May 2017. Additionally, the principal sources of uncertainty from the 2013 determination still apply:

- a. The  $F = M$  foundation for establishing OFL;
- b. Estimates of  $M$  used in the assessment;
- c. The scales at which regional replenishment occurs and the potential impact of localized depletion;
- d. Absolute biomass is not known, and biomasses are currently scaled to presumed abundance in 1999 to develop reference points (because the 1999 biomass is assumed to serve as a proxy for carrying capacity ( $K$ ) of the stock); and
- e. Uncertainty in the fishing mortality rates ( $F$ ), as identified by the SARC external review panel (Houde, et al. 2013). In particular, the comparison of catch to the scaled abundance (see point c above) introduces unquantified uncertainty in estimates of  $F$ . Also, incidental mortality estimates, which are used, in part, to generate fishing mortality rates are poorly described and are not current.

5) *Ecosystem considerations accounted for in the stock assessment, and any additional ecosystem*

*considerations that the SSC took into account in selecting the ABC, including the basis for those additional considerations.*

No specific, additional ecosystem considerations were provided to the SSC to include in developing the recommended ABC. The SSC notes that increasing regional temperatures are likely to impact the distribution and abundance of this species. The SSC also notes that ecosystem considerations are included in the terms of reference for the new benchmark assessment: ToR 3 addresses changes in Surfclam habitat quality related to climate change and other factors, and ToR 4 addresses a possible change in depth of Surfclams over time and its impact on vital rates.

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

The SSC notes that the ToRs for the upcoming benchmark assessment encapsulate the committee's concerns relative to research and monitoring recommendations.

*7) The materials considered in reaching its recommendations.*

- 2016 Surfclam and Ocean Quahog AP Fishery Performance Report
- A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf by Hare JA, Morrison WE, Nelson MW, Stachura MM, Teeters EJ, Griffis RB, et al. (2016)
- MAFMC Staff Memo from Jessica Coakley to Chris Moore, dated 6 May 2016
- 2016 Surfclam AP Information Document
- 2016 Surfclam Data Update
- Estimated Proportion of Undersized Surfclam Landings for 2015
- SAW 56 Summary Report
- SAW 56 Assessment Report
- SAW 56 Panelist Report

These documents can be accessed via the SSC's website (<http://www.mafmc.org/ssc-meetings/2016/may-25-26>).

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

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

## **Ocean Quahogs**

As with Surfclams, Jessica Coakley (MAFMC staff) reviewed the most recent survey and catch data provided by the NEFSC and the fishery performance report prepared by the Advisory Panel, with assistance from Dan Hennen (NEFSC staff). The current ABC specifications for Ocean Quahog also expire at the end of the 2016 fishing year, so the SSC is being requested to develop new specifications for the 2017 and 2018 fishing years. A new benchmark assessment is expected in 2017.

The SSC's responses to the Council's terms of reference (ToRs, *in italics*) for Ocean Quahogs are as follows:

*For Ocean Quahog, the SSC will provide a written report that identifies the following for fishing years*

2017-2018:

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

Owing to the lack of a more recent assessment, the SSC followed precedent and confirmed its previous evaluation of this stock as one for which “OFL cannot be specified with current state of knowledge.”

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

The SSC deemed that it lacked credible information on which to calculate an OFL.

3) *The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock.*

The SSC recommends setting an ABC for the 2017 and 2018 fishing years that maintains *status quo*. The recommended ABC in each year is **26,100 mt** – a direct extension of the level of ABC that has been in operation since 2014.

The SSC notes its expectations expressed in 2013 – that catches would remain relatively constant. The SSC also notes that a new assessment is expected in February 2017, the results of which, if accepted, should be available for SSC’s May 2017 meeting at which it can reconsider specification of ABC for the 2018 fishing year.

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

The SSC reiterates its concerns noted in its 2013 report. The SSC also encourages that information from the SCeMFis program on levels of recruitment be brought forward for consideration by the SAW/SARC working group and SSC.

Principal concerns in 2013 were:

- The fishing mortality rate reference point was deemed non-credible because species to which Ocean Quahog was compared were not appropriate;
- 40-year forecasts were provided in the previous assessment report and should be continued;
- Mechanisms for low recent recruitments are not known – could be either a result of underlying stock productivity or a consequence of life history of a long lived-species; and
- The nature of historical recruitments is poorly known.

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

No specific, additional considerations are included in the SSC’s recommended ABC. The SSC recommends that the upcoming assessment should follow the ecosystem considerations included in the Surfclam assessment and other habitat-related factors that may be relevant.

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

The SSC noted these areas in its 2013 report – and they are reiterated here with added notes in brackets:

- Development of credible management reference points remains a high priority. [The recent publication of a management strategy evaluation by Hennen (NAJFM – 2015) is step in this direction.]
- Reliability of estimates of stock biomass should be evaluated.
- Progress on developing age-length keys would be helpful for the assessment and for understanding recruitment patterns. [The SSC notes that the results from the SCeMFiS program may help in this regard.]
- Improved understanding of age-specific reproductive values would be of help in understanding the stock’s resilience. For example, are the older and much larger females as important contributors to the spawning potential as they are for some long-lived fishes?
- Quantification of habitat-specific productivity would be important – both in terms providing robust vital rate estimates and also ensuring sustainable patterns of exploitation.
- Impacts of climate variability on long-term productivity and spatial distribution of the stock and of the fishery.

7) The materials considered in reaching its recommendations.

- 2016 Surfclam and Ocean Quahog AP Fishery Performance Report
- A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf by Hare JA, Morrison WE, Nelson MW, Stachura MM, Teeters EJ, Griffis RB, et al. (2016)
- MAFMC Staff Memo from Jessica Coakley to Chris Moore, dated 9 May 2016
- 2016 Ocean Quahog AP Information Document
- 2016 Ocean Quahog Data Update
- Stock Assessment Update for Ocean Quahogs through 2011

These documents can be accessed via the SSC’s website (<http://www.mafmc.org/ssc-meetings/2016/may-25-26>). The SSC also referenced the following journal article:

Hennen, D. R. 2015. How should we harvest an animal that can live for centuries? *North American Journal of Fisheries Management* 35:512–527, 2015

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

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

## **Mackerel, Squids, and Butterfish**

For Atlantic Mackerel, Longfin Squid, *Illex* squid, and Butterfish, the SSC was asked to review their ABC recommendations for the 2017 fishing year to determine if they needed to be changed based on new evidence. Atlantic Mackerel are in year three of three-year specifications, and the squids and Butterfish are in year two of three-year specs. Jason Didden (MAFMC staff) and staff from the Northeast Fisheries Science Center (Kiersten Curti for Atlantic Mackerel, Lisa Hendrickson for the squids, and Chuck Adams for Butterfish) walked the SSC through the latest survey and catch data, as

well as the fishery performance reports developed by the MSB Advisory Panel. Documents considered during the SSC deliberations are accessible via the SSC website (<http://www.mafmc.org/ssc-meetings/2016/may-25-26>) and include the MAFMC staff memo containing ABC recommendations, MAFMC staff's fishery information updates, catch and survey updates from the NEFSC, the combined fishery performance report, the most recent Canadian assessment and TRAC assessments for Atlantic Mackerel, and other informational materials. **For all four species, the SSC determined that the available information did not support changing the ABC recommendations for fishing year 2017.** However, the SSC did note some concerns about the status of Atlantic Mackerel and the squids.

For Atlantic Mackerel, the SSC continues to be concerned about the absence of large fish in the survey area of US and Canadian waters. The SSC appreciated inclusion of the catch-by-area charts in the information provided by the NEFSC, and encouraged development of analogous charts for all species managed by the MAFMC. Since the implementation of annual catch limits in 2011, total catch of Atlantic Mackerel has been less than 40% of the annual ABCs, with the exception of 2015 where catch was approximately 51% of the ABC. Indices-at-age derived from the most recent (spring 2015) bottom trawl survey are predominately fish aged 1 to 3, similar to the age distribution observed in 2009 and 2011; no fish aged six or older were captured in the survey. In the past, these pulses of recruitment did not result in capture of older fish in later years. The SSC was informed that the Canadians are planning to do an assessment of mackerel in the coming year; the SSC encouraged development of a combined US/Canada joint assessment for Atlantic mackerel as part of the TRAC (Trans-Boundary Assessment Committee) process. However, Kiersten Curti informed the committee that recent talks with Canada indicated reluctance by the Canadians to conduct a joint TRAC-type assessment.

The SSC noted that the mean body weight of both squid species captured in the NEFSC bottom trawl survey is still declining. This continues to be a cause for concern that has been attributed to environmental factors, primarily water temperature.<sup>1</sup> The SSC asked if the smaller size of the squids was a limiting factor in the squid fishery; Jeff Kaelin will check and respond.

## CV Subgroup Report

Sarah Gaichas walked the SSC through her summary notes of her discussions with NEFSC stock assessment scientists regarding approaches to estimating the coefficient of variation (CV) for the overfishing limit (OFL), a key step in the development of ABC recommendations that invokes the Council's risk policy. The SSC then had a broader discussion of how to proceed regarding OFL CV estimation for both the short term and in the longer term.

The SSC made three general recommendations:

1. Historical forecast error is worth exploring as a short-term solution to establish an OFL CV based on assessments. This information could be requested within the assessment process, and would be available ideally whenever SSC is making recommendations.
  - a. The most useful OFL CVs would be developed from separate distributions for forecasts one, two, and three or more years out.

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<sup>1</sup> Dawe, E. G., L. C. Hendrickson, E. B. Colburne, K. F. Drinkwater, and M. A. Showell. 2007. Ocean climate effects on the relative abundance of short-finned (*Illex illecebrosus*) and long-finned (*Loligo pealeii*) squid in the Northwest Atlantic Ocean. *Fish. Oceanogr.* 16 (4): 303–316.

- b. Estimation would be done by looking across previous actual assessment documents, and not just using retrospective patterns within the current assessment. The number of assessments included would generally require going back as far as possible without getting to models and/or data sets that differ radically from the current situation.
    - c. Discussion of basic protocols within the subcommittee and with assessment scientists will be necessary; e.g., when are assessments too different to include in the analyses?
  2. Move ahead with more formal dialogue with the NEFSC to address the larger issue of estimating uncertainty in the OFL: how to develop criteria for “bins” of OFL CV by life history, data quality, assessment characteristics, and what an assessment able to estimate a satisfactory OFL CV directly actually looks like.
    - a. This dialogue could take the form of a 1-2 day workshop, possibly associated with an SSC winter meeting, and possibly convened in Woods Hole.
    - b. The Subgroup needs to develop clear objectives and a work plan before scheduling any workshop.
  3. Investigate coordination with the NEFMC SSC on risk policy, and how to ensure that requests made of NEFSC assessment scientists were efficiently coordinated between Councils.

The SSC had a related discussion of the MAFMC Risk Policy. The OFL CV Subgroup (Sarah Gaichas, Olaf Jensen, Tom Miller, Brian Rothschild, and Mike Wilberg, with the addition of Paul Rago and David Tomberlin) will assist the Council with analyses of the current risk policy and potential alternative components. Performance of the current risk policy (including selected OFL CV levels) could be addressed alongside alternative configurations of the risk policy that might include changes to P\* (probability of overfishing) values, species-specific control rules, or other measures to control interannual variability of ABCs. A management strategy evaluation could address this, but it would be a long-term project and best coordinated with the longer-term collaborative approach to address OFL CV (see point 2 above).

A broader approach to risk policy looking beyond single species approaches to stewardship and management was suggested. This may need the SSC and Monitoring Committee working together, and addressing it would require adding economic and social sciences expertise to the OFL CV Subgroup. Questions to investigate could include:

- When setting ABC for one species, what are ecological and economic outcomes for other species?
- What have been the consequences of our decisions, beyond impacts on the stock? Evaluating this requires better performance measures for economic and social objectives.
- What is being given up throughout the fishery? What other choices will be available given a specific ABC for one species? What are impacts to other fisheries?
- What is the consequence overall of choosing an ABC?
- How might new National Standard 1 and 2 Guidelines influence with the risk policy?

## **Council’s ACL/AM Omnibus Framework**

Rich Seagraves updated the SSC on an action recently taken by the Council to initiate a review of its risk policy and ABC control rule framework, which were implemented as a result of the 2007 MSA Reauthorization. MAFMC staff is currently developing a set of alternatives to the risk policy for consideration by the Council, including different control rules based on different life histories or species groups, a potential increase to a maximum P\* of 45%, and the shape of the risk tolerance response

curve. The Council is also considering building in inertia to ABC recommendations to minimize inter-annual variability in catch (i.e., restrict inter-annual changes in to ABC to some percentage). In addition, the Council would like to see a more formalized treatment for species with assessments in the data poor category; staff recommends working with the SSC's CV Subgroup and the Council's Executive Committee to accomplish this task. The Council is also considering convening an external panel to provide an independent peer review of the current system. Finally, the Council is interested in determining how the risk policy has performed over the past five years (which could be determined via a management strategy evaluation) and is seeking ways to improve that performance.

During the ensuing discussion, the SSC noted that recent reductions in ABCs were not the result of decisions made about the CV of OFL by the SSC (i.e., they were not due to the selection of CVs input into ABC control rule framework). For example, recent changes in the ABC for summer flounder were the result of changes in stock biomass from the recent assessment update. [The MAFMC SSC is one of the few SSCs actually facing the probability question instead of using *ad hoc* methods.] This is a difficult scientific question and it is probably impossible to get a direct analytical estimate from stock assessments. While the Council welcomed the reduction in the OFL CV from 100% to 60% for some of the species, their concerns relate to the lack of objective criteria to establish the CV about OFL for a given stock assessment. The SSC shares these concerns, which is the basis for establishment of the CV Subgroup.

In terms of maintaining stability of annual catch limits, there is a tension between maximizing yield and maintaining stable catch streams. The Council's desire to place limits on the maximum change in ABC from year to year is largely driven by social and economic considerations. Establishing boundary conditions for acceptable volatility in catch vs risk to populations is not a scientific matter but rather a policy one driven by social and economic considerations. The main objective should be to reduce the volatility in ABCs and avoid chasing assessment noise, while following the rules during standard assessment updates.

In terms of outcomes, the Council and SSC need to consider the consequences of decisions based on the current risk policy and ABC control rule framework. This evaluation should extend beyond the biological impacts on the stock and should include critically important social and economic performance measures as well. On a related issue, the SSC noted that there is an artificial separation between ABC and ACL/TAC considerations - the SSC has never looked at the latter part. The Council should consider ways to address this separation and re-evaluate the SSC's role relative to the role of the Monitoring Committees.

The SSC also noted that the CV Subgroup is currently establishing criteria to bin the CVs for MAFMC stock assessments. The uncertainty associated with the different sources of data that drive the overall OFL CV needs to be more fully explored (see the preceding section of this report). The current risk policy implies a different temporal trajectory of the population in response to the control rule, which does not vary by species. It is critical that an empirical basis is established for specification of the CV for each Mid-Atlantic stock assessment (the stock's life history could be a basis).

Staff will report back to the Council on this discussion and proceed with the plan to engage the SSC through the CV Subgroup in an evaluation of the current system, and consider modifications to the risk policy and ABC framework (with external peer review of any proposed changes).

cc: SSC Members, Lee Anderson, Chris Moore, Rich Seagraves, José Montañez, Jason Didden, Jessica Coakley, Dan Hennen, Kiersten Curti, Lisa Hendrickson, Chuck Adams



Mid-Atlantic Fishery Management Council  
Scientific and Statistical Committee Meeting  
25-26 May 2016

Final Agenda

Wednesday May 25, 2016

- 1:00 pm Recommend surfclam and ocean quahog ABC specifications (2017-2018)
- 3:30 pm CV Subgroup Report
- 5:00 pm Adjourn

Thursday May 26, 2016

- 8:30 am Review 2017 Atlantic mackerel, long-finned squid, Illex, and butterfish ABC specifications
- 10:00 am Other business - Council's ACL/AM Omnibus Framework
- 11:00 am Adjourn

MAFMC Scientific and Statistical Committee  
25-26 May 2016 Meeting  
Baltimore, MD

<u>Name</u>	<u>Affiliation</u>
<i>SSC Members in Attendance:</i>	
John Boreman (SSC Chairman)	NC State University
Tom Miller (SSC Vice-Chair, 5/25 only)	University of Maryland - CBL
David Tomberlin	NMFS Office of Science and Technology
Doug Lipton	NMFS
Mark Holliday	NMFS (Retired)
Mike Frisk (5/25 only)	Stony Brook University
Sarah Gaichas	NMFS Northeast Fisheries Science Center
Ed Houde	University of Maryland – CBL
Wendy Gabriel	NMFS Northeast Fisheries Science Center
Olaf Jensen	Rutgers University
Paul Rago	NMFS (retired)
Rob Latour	VIMS
 <i>Others in attendance:</i>	
Rich Seagraves	MAFMC staff
Jessica Coakley (5/25 only)	MAFMC staff
José Montañez (5/25 only)	MAFMC staff
Jason Didden (5/26 only)	MAFMC staff
Dan Hennen (by phone, 5/25 only)	NMFS Northeast Fisheries Science Center
Lisa Hendrickson (by phone, 5/26 only)	NMFS Northeast Fisheries Science Center
Chuck Adams (by phone, 5/26 only)	NMFS Northeast Fisheries Science Center
Kiersten Curti (by phone, 5/26 only)	NMFS Northeast Fisheries Science Center
Dave Wallace (5/25 only)	Wallace and Associates
Jeff Kaelin	Lund's Seafood and MAFMC member
Tom Alspach	SCOQ Advisory Panel member
Purcie Bennett-Nickerson (5/26 only)	Pew Charitable Trust
Greg DiDomenico (5/26 only)	GSSA



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 Christopher M. Moore, Ph.D., Executive Director

**MEMORANDUM**

**Date:** June 2, 2016  
**To:** River Herring and Shad (RH/S) Committee/Council  
**From:** Jason Didden *JDD*  
**Subject:** Annual RH/S Progress Review

In October 2014, the Council approved a list of questions to form the basis of an annual RH/S Progress Review. This memo addresses those questions. In addition, a proposed outline for the updated Stock in the Fishery White Paper (August completion) follows the Progress Review.

*1. How has the Atl. mackerel RH/S cap performed?*

A review of cap performance ([http://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/Mackerel\\_RHS/Mackerel\\_RHS.htm](http://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/Mackerel_RHS/Mackerel_RHS.htm)) indicates that a relatively small percentage of the RH/S cap was caught in 2014, 2015, or 2016 to date. There have been no closures related to the RH/S cap so far. Low mackerel landings have contributed to the low RH/S estimates. Due to the overlap in the Atl. Herring and mackerel fisheries, their RH/S cap catches cannot be added together to produce a total catch across caps - RH/S on a trip with both Atl. herring and mackerel can count against both the Atl. herring and mackerel RH/S caps. Because the cap amounts were set considering this circumstance, double counting is not a problem for monitoring. The Monitoring Committee has not found any operational issues with the cap, other than noting that the recent low observer coverage and high RH/S catch variability means precision may be low. The Industry-Funded Monitoring Amendment has analyzed precision in the 2014/2015 mackerel RH/S caps:

Catch Cap	Fishing Year <sup>1</sup> : CV (Observer Coverage)	
	2014	2015 <sup>2</sup>
RHS-Mackerel	48.9% (37.8%)	22.7% (7.3%) <sup>2</sup>

Source: GARFO Quota Monitoring Database as of 5/22/2016

<sup>1</sup>Catch cap fishing year: river herring/shad = calendar year; haddock = May-April

<sup>2</sup>Fishing Year 2015 data are PRELIMINARY

Somewhat counterintuitively, the Coefficient of Variation (CV – a measure of relative precision) for 2015 was better than 2014 despite substantially lower observer coverage in 2015. CV is dependent on both coverage and the underlying data - the RH/S catches in 2015 were more similar to each other on the few 2015 observed mackerel trips compared to 2014, resulting in better CVs despite the lower coverage.

2. What has recent coastal RH/S catch been?

The ASMFC annual fishery management plan reviews are available at <http://www.asafc.org/species/shad-river-herring>. Catch figures for 2012-2014 from those reports (all “Table 2”) are provided below:

**Table 2. American shad and river herring in-river commercial and ocean bycatch landings (in pounds) provided by states, jurisdictions and the NOAA Fisheries for 2012.**

	American Shad	River Herring	Hickory Shad
Maine <sup>4</sup>		1,606,535	
New Hampshire		2,681	
Massachusetts			
Rhode Island			
Connecticut	61,623		
New York <sup>1</sup>	1,485	16,965	
New Jersey <sup>2</sup>	28,120	84	924
Pennsylvania			
Delaware			
Maryland		290	
D.C.			
PRFC	4,742		446
Virginia	4,601		999
North Carolina	235,861	678	65,645
South Carolina <sup>3</sup>	299,528	163,076	
Georgia <sup>4</sup>			
Florida			
<b>Total</b>	<b>635,960</b>	<b>1,790,309</b>	<b>68,014</b>

<sup>1</sup>New York American shad landings are from ocean bycatch

<sup>2</sup>Includes in-river and coastal harvest

<sup>3</sup>American shad landings include hickory shad

<sup>4</sup>Georgia & Maine (shad) landings are confidential

**Table 2. American shad and river herring in-river commercial and ocean bycatch landings (in pounds) provided by states, jurisdictions and NOAA Fisheries for 2013.**

	American Shad	River Herring	Hickory Shad
Maine <sup>3</sup>		1,423,878	
New Hampshire		4,420	
Massachusetts			
Rhode Island			
Connecticut	65,679		
New York <sup>1</sup>	932	10,349	
New Jersey <sup>2</sup>			3,483
Pennsylvania	2,854		
Delaware			
Maryland		305	
D.C.			
PRFC	3,799		
Virginia	4,825		755
North Carolina	257,869	743	71,326
South Carolina	205,368	192,454	652
Georgia	62,017		2,162
Florida			
<b>Total</b>	<b>608,428</b>	<b>1,632,149</b>	<b>78,378</b>

<sup>1</sup>New York American shad landings are from ocean bycatch

<sup>2</sup>Includes in-river and coastal harvest

<sup>3</sup>Maine (shad) landings are confidential

**Table 2. American shad and river herring in-river commercial and ocean bycatch landings (in pounds) provided by states, jurisdictions and NOAA Fisheries for 2014.**

	American Shad	River Herring	Hickory Shad
Maine <sup>3</sup>		1,720,285	
New Hampshire			
Massachusetts		192	
Rhode Island			
Connecticut	61,544		
New York <sup>1, 3</sup>		8,450	
New Jersey <sup>2</sup>	42,599		456
Pennsylvania			
Delaware	85,794		
Maryland			
D.C.			
PRFC	4,013		1,300
Virginia	1,325		1,025
North Carolina	193,130	989	109,407
South Carolina <sup>4</sup>	333,602	114,905	1,311
Georgia <sup>3</sup>			
Florida			
<b>Total</b>	<b>776,586</b>	<b>1,844,821</b>	<b>119,118</b>

<sup>1</sup>New York American shad landings are from ocean bycatch

<sup>2</sup>New Jersey shad landings includes in-river and Delaware Bay harvest

<sup>3</sup>Georgia, Maine, and New York shad landings are confidential

<sup>4</sup>South Carolina American shad landings include hickory shad

The Omnibus Industry Funded Monitoring Amendment has analyzed observer data to obtain RH/S incidental catch estimates for purposes of determining which fleets have accounted for RH/S catch. The table below is excerpted from draft Omnibus Industry Funded Monitoring Amendment text:

**FLEETS RESPONSIBLE FOR RH/S CATCH (TOTAL CATCH FROM 2005-2013)**

<b>Fishing Fleet</b>	<b>Percent of RH/S Catch</b>
Midwater Trawl (Single and Paired)	57%
Small Mesh Bottom Trawl	33%
Large Mesh Gillnet	7%
Purse Seine	0.3%

While the 2014 RH/S caps in the Atlantic herring fishery approximately matched this pattern, catch was higher for small mesh bottom trawl in the 2015 herring caps, and that would have only accounted for a portion of total small mesh bottom trawl RH/S catch. See [http://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/Mackerel\\_RHS/Mackerel\\_RHS.htm](http://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/Mackerel_RHS/Mackerel_RHS.htm) for historical performance of the Atl. herring and mackerel RH/S caps. Staff recommends that the Council request that the Science Center update general RH/S catch estimates (as estimated via the Standardized Bycatch Reporting Methodology (SBRM)), so that Amendment 14 RH/S catch analyses are updated through 2015.

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### 3. What levels of observer coverage have been achieved in relevant fisheries?

The revised SBRM prioritization procedures determine year to year observer coverage generally based on where discards of federally-managed species most occur, and available funding. In recent years this process has led to fewer midwater trips being observed (but more small mesh bottom trawl trips). The Omnibus Industry-Funded Monitoring Amendment is seeking to supplement SBRM coverage through a variety of options. The following tables were developed for the Industry-Funded Monitoring Amendment and describe planned and realized coverage levels for the relevant fleets as pertaining to RH/S caps. As described in #1 above, coverages of trips that qualified for the mackerel fishery's RH/S cap were 38% (CV=49%) in 2014 and 7% (CV=23%) in 2015.

Fleet	Region	Sea Days allocated for April 2014 to March 2015	Observed sea days, July 2012 to June 2013	VTR sea days, July 2012 to June 2013	Observed trips, July 2012 to June 2013	VTR trips, July 2012 to June 2013
Small Mesh Bottom Trawl	MA	1,289	631	7,003	263	3,569
Small Mesh Bottom Trawl	NE	1,604	463	7,315	171	3,315
Purse seine	MA	12	0	447	0	441
Purse seine	NE	20	71	699	31	319
Midwater Trawl (Pair and Single)	MA	0	7	72	1	10
Midwater Trawl (Pair and Single)	NE	45	638	1,389	146	394

Source: NEFOP/GARFO Proposed Seaday Allocation for 2014 (Appendix C); Wigley et al., 2014 (Appendix D).

Fleet	Region	Proposed sea days for April 2016 to March 2017	Observed sea days, July 2014 to June 2015	VTR sea days, July 2014 to June 2015	Observed trips, July 2014 to June 2015	VTR trips, July 2014 to June 2015
Small Mesh Bottom Trawl	MA	1,171	997	6,761	360	3,088
Small Mesh Bottom Trawl	NE	798	933	8,847	319	3,381
Purse seine	MA	6	0	174	0	172
Purse seine	NE	19	29	661	13	315
Midwater Trawl (Pair and Single)	MA	30	8	134	1	26
Midwater Trawl (Pair and Single)	NE	440	160	1,189	43	363

Source: 2016 Discard Estimation, Precision, and Sample Size Analyses for 14 Federally Managed Species Groups in the Waters off the Northeastern United States; Wigley et al., 2016 (included in Appendix 4).

4. *Was a cap set for RH/S for the following year?*

Caps were previously set for 2014 and 2015, and in 2015 the Council set a cap of 82 mt (180,779 pounds) for 2016-2018. If the Atlantic mackerel fishery catches 95 percent of the RH/S cap (77.9 mt), the directed mackerel fishery will be closed and vessels will be limited to a 20,000-lb incidental catch trip limit for the remainder of the fishing year.

5. *Was the cap based on recent catch or more directly tied to RH/S population dynamics?*

The cap was originally based on catch ratios expanded up to the mackerel quota. Given the low RH/S cap catches and low mackerel quota, the Council has reduced the RH/S cap in recent years. With the current 82 mt mackerel cap, in order to catch the mackerel quota the fishery must maintain a RH/S catch rate around the median value for 2005-2012.

6. *What progress has been made on aligning cap operation with the Atlantic herring fishery's cap?*

Given the degree of alignment created by the current estimation procedures and the potential for the Councils to disagree on year to year cap amounts even if a joint framework was established, it is not clear to staff that there likely would be substantial gains from moving from the status quo cap setting procedures. If a cap was based on a biologically-derived amount, then more explicitly aligning the caps *may* be more important. See previous memo on this topic at [http://www.mafmc.org/s/Tab16\\_ED-Report.pdf](http://www.mafmc.org/s/Tab16_ED-Report.pdf) for additional background.

7. *What other RH/S coordination with other management partners has occurred (NMFS, NEFMC, ASMFC, states, NGOs, academia, TEWG, etc.)?*

The TEWG continues to actively keep a variety of parties engaged in RH conservation issues. Staff will provide a high-level overview at the Council meeting, but the following products provide a medium-level summary of recent TEWG outcomes:

\*River Herring Conservation Plan Executive Summary and 2015 Year in Review  
[http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/conserv/rh\\_plan\\_2015\\_executive\\_summary\\_042916.pdf](http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/conserv/rh_plan_2015_executive_summary_042916.pdf)

\*Fisheries Subgroup 2015 Update  
[http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/tewg/fisheries/tewg\\_fisheries\\_-\\_data\\_gaps\\_and\\_cons\\_ideas\\_update\\_nov\\_2015.pdf](http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/tewg/fisheries/tewg_fisheries_-_data_gaps_and_cons_ideas_update_nov_2015.pdf)

\*Genetics Subgroup 2015 Update  
[http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/tewg/genetics/genetic\\_subgroup\\_white\\_paper\\_final\\_updated\\_march\\_9\\_2016.pdf](http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/tewg/genetics/genetic_subgroup_white_paper_final_updated_march_9_2016.pdf)

The Omnibus Industry-Funded Monitoring Amendment (another topic at the June 2016 meeting) has also served to maintain a high level of collaboration among NMFS, the MAFMC, and the NEFMC on RH/S issues even though the goals of that Amendment are broader than just RH/S issues.



*8. How has the Scientific and Statistical Committee (SSC) been involved?*

There have been preliminary discussions with the SSC regarding a working group to evaluate the feasibility of developing a biologically-based cap. The ASMFC currently has assessment updates scheduled for shad in 2017 and river herring in 2018. Embedding an SSC member in those updates may be one way to assist the SSC in becoming more familiar with RH/S data, which could assist in any SSC efforts to develop a biologically-based cap.

*9. What other actions have been taken by the Council that could affect RH/S?*

The primary work from staff over the last year that could affect RH/S involves the TEWG and the Omnibus Industry-Funded Monitoring Amendment. Council staff has also promoted the existing RH/S voluntary bycatch programs (SMASST/Cornell) through communication with industry. Another issue that has come up repeatedly in TEWG discussions is that members of the public with diverse perspectives believe that a one-stop database of RH/S run strength trends would be very helpful to contextualize news reporting of runs in particular areas. Council staff has been engaging with NMFS and ASMFC staff to determine if such a project is feasible, and how it could be accomplished. The State of Maine took preliminary steps to accomplish a portal for this kind of information, [www.riverherring.com](http://www.riverherring.com), and discussions are continuing on a way to create a resource that would allow quick access to regional run count information. Council staff has also provided support to NOAA General Counsel regarding legal actions pertaining to RH/S and the stock in the fishery issue, which will culminate in a revised stock in the fishery white paper and subsequent Council reconsideration of the stock in the fishery issue in October.

*10. What information is available on RH/S abundance trends?*

RH/S are scheduled to undergo assessment updates in 2018/2017 respectively. Benchmarks are scheduled for five years after the updates, though if new data or modeling improvements suggest a benchmark would be appropriate sooner, then sooner is also a possibility for benchmarks. Waiting until after 2020 for benchmarks should allow some of the improvements in data collection being worked on through the TEWG to be useful for an assessment. Also, if state moratoria and/or RH/S catch caps have had positive impacts there would be more time to observe those impacts. While collecting state by state river run data is beyond the resources of Council staff (that is an assessment update type activity), the ASMFC does provide selected run counts in its FMP reviews, provided below for 2012-2014:

**Table 3. American shad and river herring passage counts at select rivers along the Atlantic Coast in 2012.**

State/River	Shad	River Herring
<b>Maine</b>		
Androscoggin	11	170,191
Saco	6404	27,858
Kennebec	5	179,357
Sebasticook	163	1,703,520
St. Croix		36,168
<b>New Hampshire</b>		
Cocheco		27,608
Oyster		2,573
Lamprey		86,862
Exeter		378
Taylor		92
Winnicut		5
<b>Massachusetts</b>		
Merrimack	21,396	
<b>Rhode Island</b>		
Gilbert Stuart		107,901
Nonquit		60,132
Buckeye Brook		90,625
<b>Pennsylvania/Maryland/Delaware</b>		
Susquehanna (Conowingo)	23,629	52
Susquehanna (Holtwood)	4,238	
<b>South Carolina</b>		
St. Stephen Dam	150,082	
<b>Total 2012</b>	<b>205,928</b>	
<b>Total 2011</b>	<b>307,793</b>	

**Table 3. American shad and river herring passage counts at select rivers along the Atlantic Coast in 2013.**

State/River	Shad	River Herring
<b>Maine</b>		
Androscoggin	14	69,297
Saco	6171	43,414
Kennebec	0	94,456
Sebeccook	114	2,272,492
St. Croix		16,677
<b>New Hampshire</b>		
Cocheco		18,337
Oyster		7,149
Lamprey		79,408
Exeter		378
Taylor		128
Winnicut		0
<b>Massachusetts</b>		
Merrimack	37,149	17,359
<b>Connecticut</b>		
Holyoke Dam	392,967	976
<b>Rhode Island</b>		
Gilbert Stuart		91,240
Nonquit		52,563
Buckeye Brook		45,244
<b>Pennsylvania/Maryland/Delaware</b>		
Susquehanna (Conowingo)	12,733	7
Susquehanna (Holtwood)	2,503	
Susquehanna (Safe Harbor)	1,927	
Susquehanna (York Haven)	202	
<b>South Carolina</b>		
St. Stephen Dam	324,984	
<b>Total 2013</b>	<b>774,132</b>	<b>2,808,149</b>
<b>Total 2012</b>	<b>205,928</b>	<b>2,493,322</b>

Note: Passage numbers on Susquehanna River are cumulative. For example, any shad counted at the York Haven dam has also passed the previous three dams (Safe Harbor, Holtwood and Conowingo). The dams are listed in ascending order of passage mile.

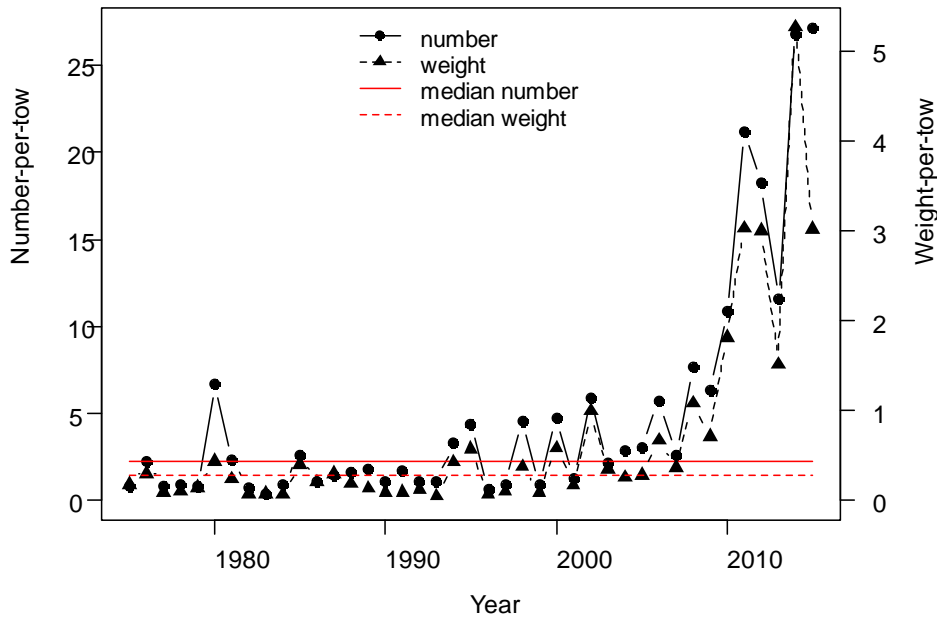
**Table 3. American shad and river herring passage counts at select rivers along the Atlantic coast in 2014.**

State/River	Shad	River Herring
<b>Maine</b>		
Androscoggin	0	55,953
Saco	2,580	11,576
Kennebec	1	108,432
Sebasticook	26	2,282,454
St. Croix		26,893
<b>New Hampshire</b>		
Cocheco		29,968
Oyster		4,227
Lamprey		84,868
Exeter		789
Taylor		57
Winnicut		0
<b>Massachusetts</b>		
Merrimack	34,789	33,515
<b>Rhode Island</b>		
Gilbert Stuart		102,408
Nonquit		71,501
Buckeye Brook		47,263
<b>Connecticut</b>		
Holyoke Dam	370,506	647
<b>Pennsylvania/Maryland</b>		
Susquehanna (Conowingo)	10,425	382
Susquehanna (Holtwood)	2,625	2
Susquehanna (Safe Harbor)	1,336	0
Susquehanna (York Haven)	8	0
<b>South Carolina</b>		
St. Stephen Dam	42,535	171,200
<b>Total 2014</b>	<b>426,073</b>	<b>3,031,753</b>
<b>Total 2013</b>	<b>776,162</b>	<b>2,922,985</b>
<b>Total 2012</b>	<b>205,928</b>	<b>2,493,322</b>

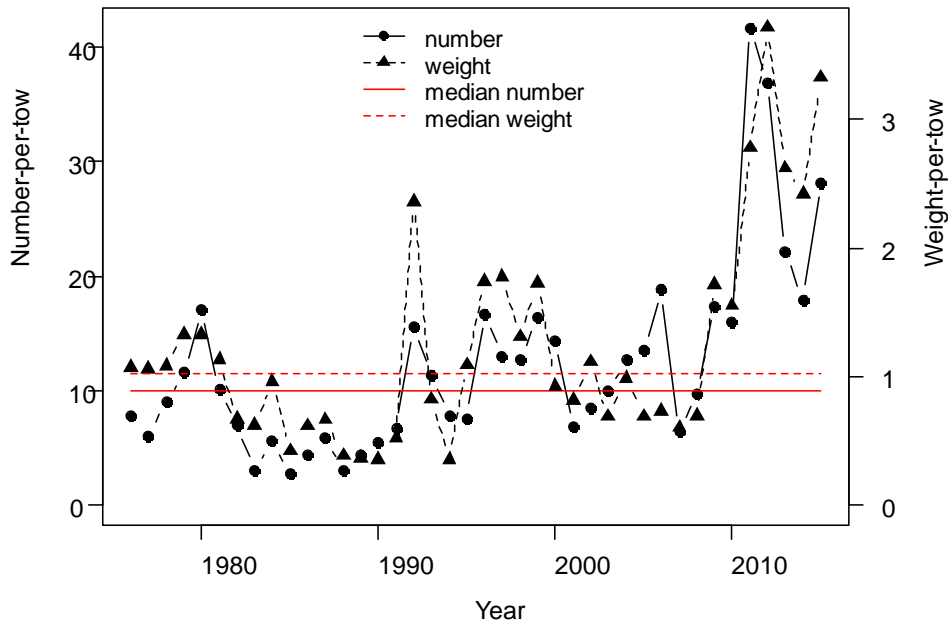
Note: Passage numbers on Susquehanna River are cumulative. For example, any shad counted at the York Haven dam has also passed the previous three dams (Safe Harbor, Holtwood and Conowingo). The dams are listed in ascending order of passage mile.

Updated NMFS and NEAMAP trawl survey indices through 2015 for river herrings are provided below. All values are above long term medians. Staff will provide shad indices at the Council meeting. Spring 2016 data should be available prior to October 2016 (and possibly by August 2016), but the spring 2016 NMFS data will have to be interpreted cautiously given the issues with the timing of that survey in 2016.

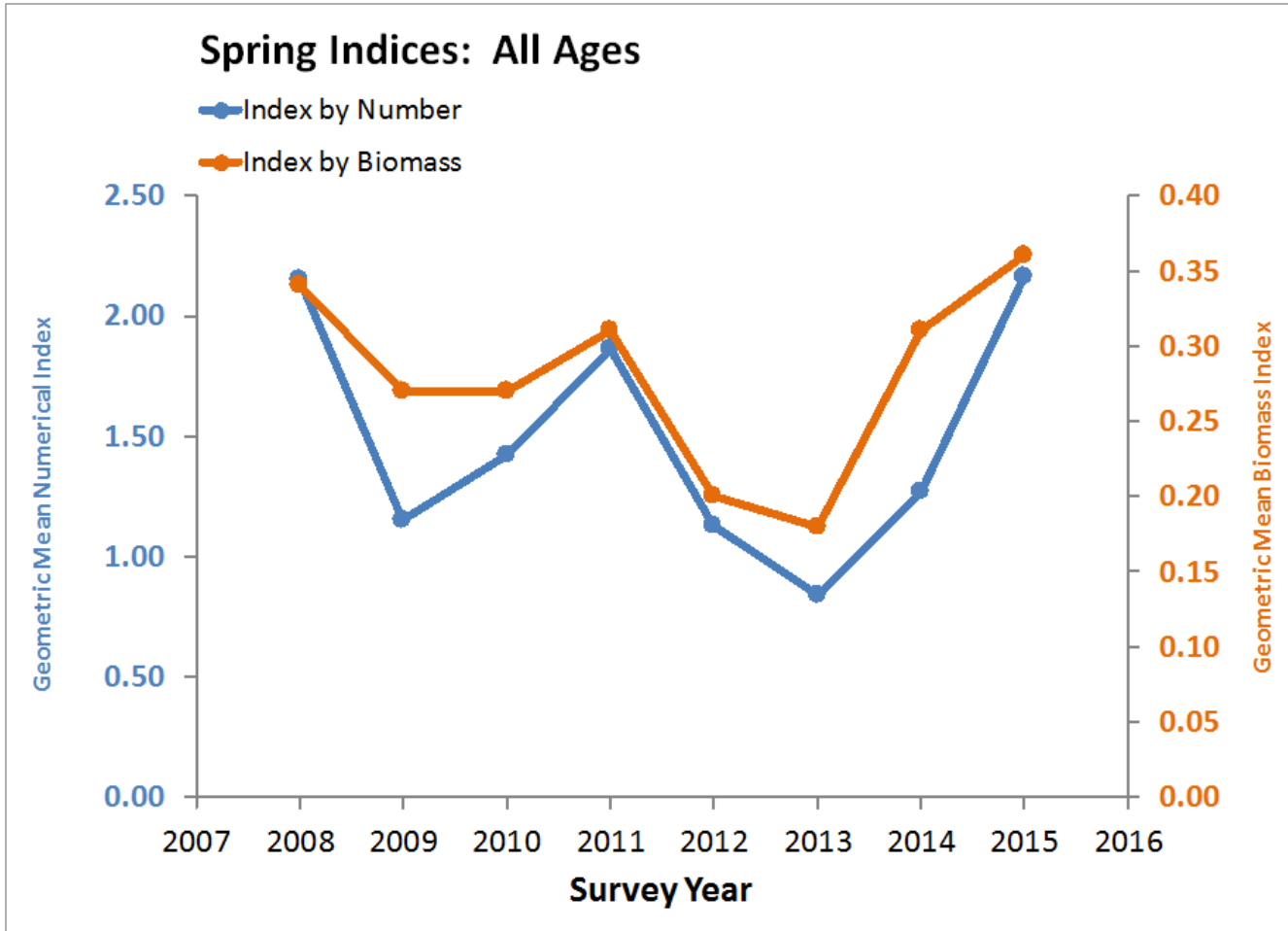
**NMFS Alewife - FALL**



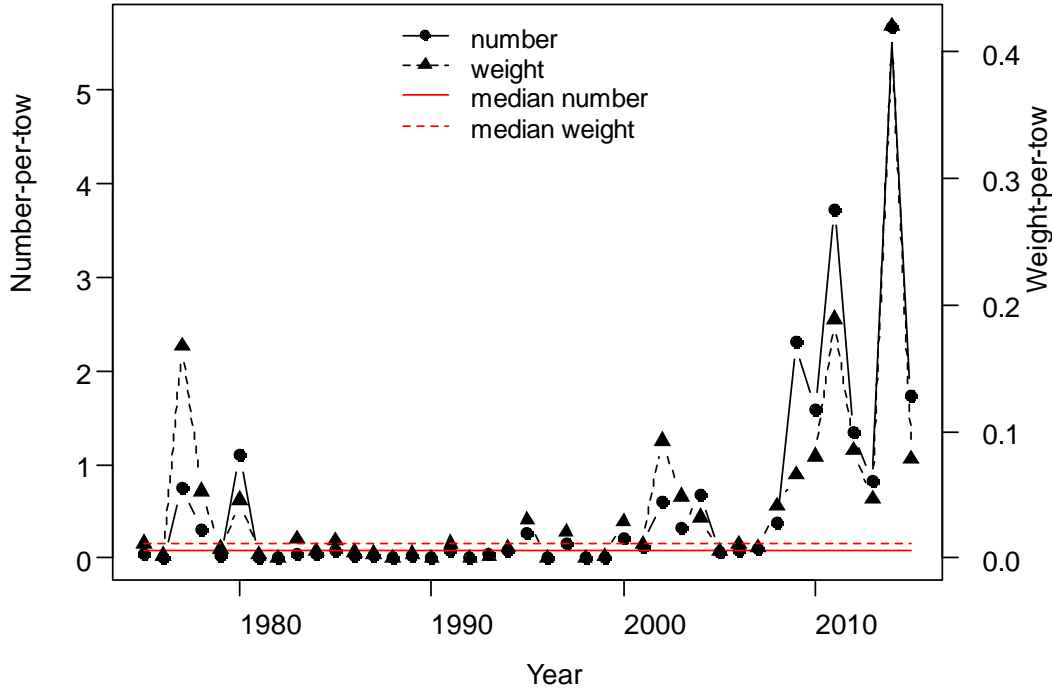
NMFS Alewife – SPRING (Abbreviated strata set due to 2014 survey issues, but previous analyses demonstrated no substantial change in trends using the abbreviated survey strata)



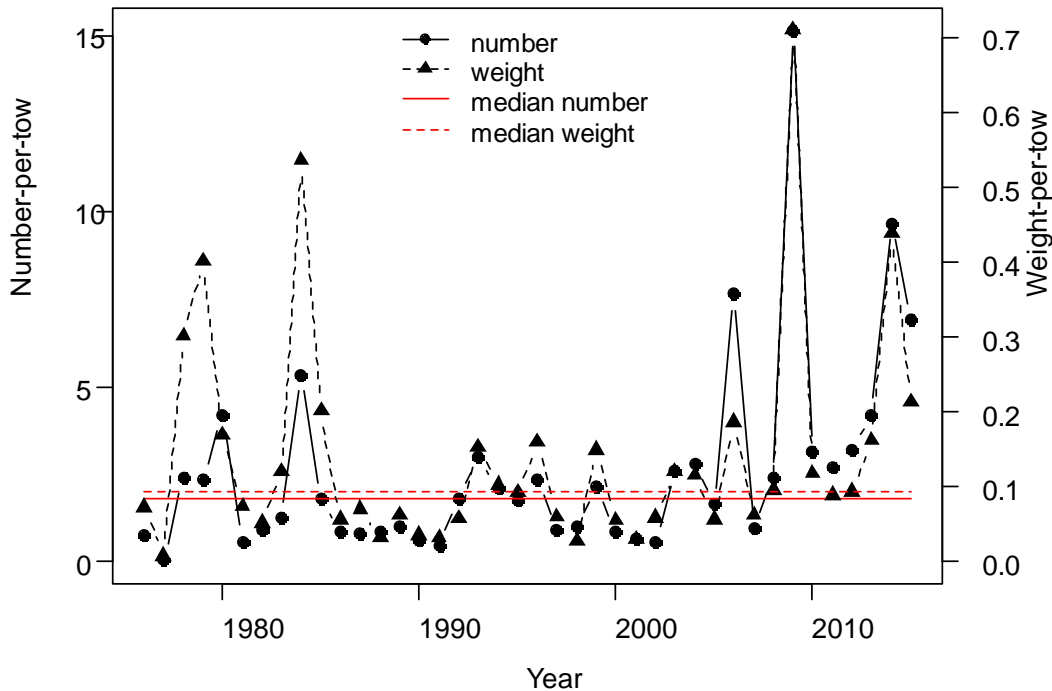
NEAMAP Alewife SPRING



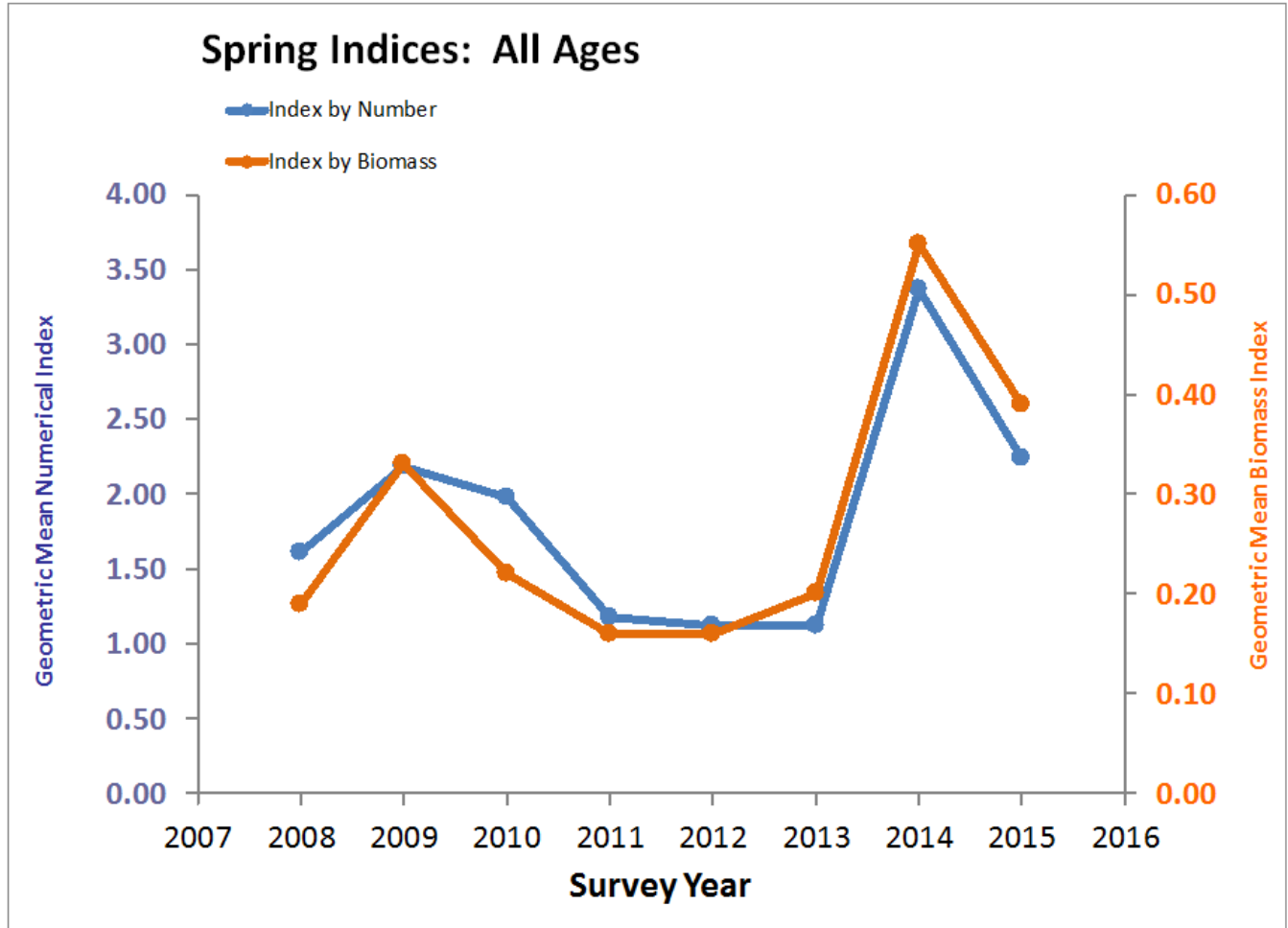
NMFS Blueback - FALL



NMFS Blueback – SPRING (Abbreviated strata set due to 2014 survey issues, but previous analyses demonstrated no substantial change in trends using the abbreviated survey strata)



NEAMAP Blueback SPRING





Proposed Outline – Stock In Fishery RH/S White Paper  
with Expanded Environmental Analysis

1. Intro
2. Magnuson-Stevens Act (MSA) Requirements
  - a. Definition & Need for Conservation and Management
  - b. National Standards (NS)
    - i. National Standard 7 details & applicability
    - ii. Proposed NS1 guideline revision details relative to stock in fishery decision
  - c. Required & Discretionary contents of fishery management plans (FMPs)
3. RH/S Background
  - a. Description of RH/S Biology/Life History/Abundance (current and historical)
    - i. Review current/new science, especially genetic information, indices (MA vs NE), available run information, etc.
    - ii. Review recent assessments (note current NMFS participation)
    - iii. Consider upcoming assessment updates/benchmarks
  - b. Description of RH/S Role in the Ecosystem
  - c. Description of RH/S Directed & Incidental Fisheries (current and historical)
    - i. Historical use and value of RH/S directed fisheries
    - ii. Consideration of recent/current/future observer coverage levels
  - d. Description of recent/current RH/S Management
    - i. General jurisdictional issues
    - ii. States
    - iii. ASMFC
    - iv. ESA/NMFS
    - v. TEWG
    - vi. Councils (caps, coordination issues, etc.)
    - vii. Voluntary – shore-side monitoring/bycatch avoidance program(s) results; study fleet + environmental modeling work
    - viii. Dam removals & passage improvements
  - e. Consider role of climate change
4. Describe the kinds of alternatives (with examples) that result from the required and discretionary MSA FMP contents, e.g. proxy status determination criteria, catch limits, accountability measures, EFH, time area closures, etc.
5. Environmental analysis (direct, indirect, and cumulative) of immediately adding vs not adding River Herring and Shad to a fishery and managing it by use of proxies.
  - a. Describe no-action impacts, including:
    - i. full consideration of the impacts of the earlier decision by the full Council to not add River Herring and Shad into an FMP in Amendment 14

- ii. Review success criteria and progress updates to determine course of RH/S situation over last 3 years
  - 1. Are RHS stocks improving?
  - 2. Any evidence that incidental catch in federal fisheries has been limited and/or reduced?
  - 3. Has scientific information about RH/S improved (life history, abundance, etc.)?
  - 4. Has coordination between the entities that are involved in RHS management improved?
- iii. full consideration of the future impacts of failing now to include River Herring and Shad in the fishery
- b. Fully describe the likely impacts of immediately adding RH/S as typically-managed Council stocks through the use of proxy reference points
  - i. Describe likely impacts from required FMP provisions
  - ii. Describe potential impacts from discretionary FMP provisions
  - iii. Impacts include standard VECs (RH/S, other non-targets, EFH, protected resources, socio-economic), as well as ecosystem considerations
  - iv. Evaluate how FMP requirements, such as additional support for management, stock assessments, observer coverage, EFH designation, etc. may help:
    - 1. increase RH/S populations
    - 2. fill data/information gaps that could have indirect future benefits
  - v. Impact considerations to include impacts from higher RH/S populations on all VECs
- 6. Other applicable legal requirements



## Mid-Atlantic Fishery Management Council

800 North State Street, Suite 201, Dover, DE 19901-3910  
Phone: 302-674-2331 | Toll Free: 877-446-2362 | FAX: 302-674-5399 | www.mafmc.org  
Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman  
Christopher M. Moore, Ph.D., Executive Director

# MEMORANDUM

**Date:** 6/1/2016  
**To:** Council  
**From:** Jason Didden  
**Subject:** Squid Amendment Update

For review and discussion at the June Council meeting, please find the following documents in this tab:

- Draft Action Plan
- May 19, 2016 FMAT meeting summary
- Squid Amendment – Permit Requalification Examples

**DRAFT Squid Amendment Action Plan (as of 5/31/16)**

**Council:** Mid-Atlantic

**Additional Expertise Sought:**

<b>Fishery Management Action Team (FMAT)</b>		
<b>Agency</b>	<b>Role</b>	<b>Person</b>
MAFMC	FMAT Chair	Jason Didden
NMFS GARFO	Sustainable Fisheries – GARFO liaison	Carly Bari
NMFS GA RFO	Fisheries Statistics	Jay Hermsen
NMFS GARFO	Permitting	Don Paskowski
NMFS NEFSC	Stock Assessment/Technical	Lisa Hendrickson
NMFS NEFSC	Socioeconomics	John Walden
NMFS NEFSC	Anthropologist	Julia Olson

**Title of Action:** Squid Amendment – Mackerel, Squid, and Butterfish (MSB) Fishery Management Plan (FMP).

**Objectives of Action/Purpose and Need:**

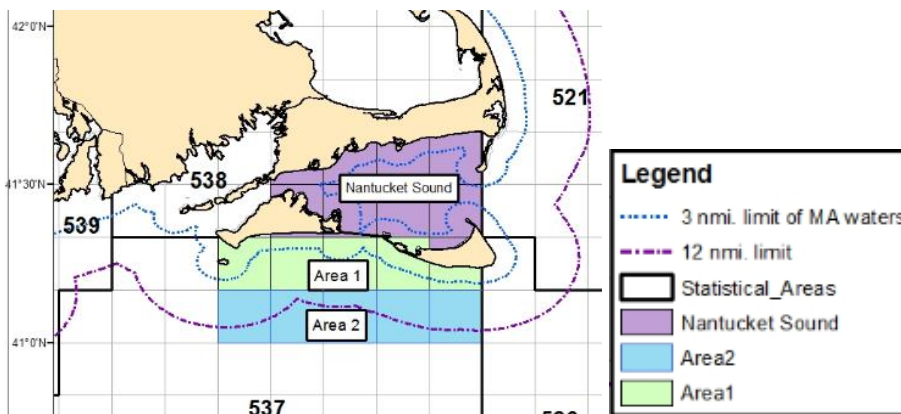
- A. Consider reducing the number of vessels in the directed longfin squid / *Illex* fisheries. The Council is considering this action because there is considerable latent effort in both fisheries - a relatively small portion of vessels with limited access (“moratorium”) squid permits account for the majority of landings in most years, and the Council is concerned that activation of latent permits in the squid fisheries could lead to excessive fishing effort (shortening seasons), and increased catch of non-target species.
- B. Consider provisions for new permits for Maine/northern states. The Council is considering this action because of reports of increased longfin squid abundance off Maine, and the State of Maine requested consideration of provisions for additional access by fishermen in northern states.
- C. Re-evaluate the longfin squid trimester allocations. The Council is considering this action because some constituents have requested that more longfin squid be available during the summer trimester (Trimester 2), while other constituents have concerns that increased summer trimester effort may be negatively impacting spawning success.

- D. Consider a longfin squid buffer zone (i.e. time-area closure) in the area south of Martha's Vineyard/Nantucket. The Council is considering this action because scoping comments indicated public concern that longfin squid fishing effort concentrated in this area may be negatively impacting other fishing in Nantucket Sound, due to localized depletion of prey and/or bycatch of recreationally-targeted species.

**Fisheries that Apply:** Longfin and *Illex* Squid, Butterfish indirectly (longfin/butterfish joint moratorium permit).

**Types of Measures to be considered:**

- *A – Squid permits* – Consider options based on vessel landings in relatively recent years and possible use of 2013 control date.
- *B – Northern states permits* – Providing new permits for vessels in only a few states may violate the Magnuson Act's provisions to not discriminate between residents of different States. However, it may be possible to create a lottery for temporary (3-year?) permits that could only be used to land squid in Maine and/or New Hampshire (anyone could apply and be included in the lottery). The FMAT is investigating this issue. Currently vessels can apply for an Exempted Fishing Permit (EFP) if they want to explore new aspects of a fishery.
- *C – Squid Trimesters* – The FMAT is conducting an analysis to explore if there is a correlation between higher/lower catch/effort in the summer trimester and lower/higher catches in the following offshore fishery, and vice-versa. Depending on the results of that analysis, consider modifications to trimester allocations/rollover provisions. The FMAT will also conduct analysis of bycatch and protected resource impacts by trimester.
- *D – Buffer Zone* – Consider prohibiting vessels from possessing more than **X pounds** longfin squid while in an area of Federal waters immediately south of Martha's Vineyard and Nantucket for all or some part of Trimester 2 (summer). The FMAT is analyzing effort trends in the three areas colored purple, green, and blue, as well as trends in several species' catch and abundance in/around Nantucket Sound. Possible Federal waters closure areas could align with the FMAT analyses – 3 and 12 nautical mile lines are provided for reference.



**Type of NEPA Analysis Expected:** Document expected to be EA.

Acronym	NEPA Analysis	Requirements
EA	Environmental Assessment	NEPA applies, no scoping required, public hearings required under MSA

**Applicable Laws/Issues:**

Magnuson-Stevens Act	Yes
Administrative Procedures Act	Yes
Regulatory Flexibility Act	Yes
Paperwork Reduction Act	Possibly; depends on data collection needs
Coastal Zone Management Act	Possibly; depends upon effects of the action on the resources of coastal states in the management unit
Endangered Species Act	Possibly; level of consultation, if necessary, depends upon the actions taken
Marine Mammal Protection Act	Possibly; level of consultation, if necessary, depends upon the actions taken
E.O. 12866 (Regulatory Planning and Review)	Yes
E.O. 12630 (Takings)	Possibly; legal review will confirm
E.O. 13132 (Federalism)	Possibly; legal review will confirm
Essential Fish Habitat	Possibly; level of consultation, if necessary, depends upon the actions taken
Information Quality Act	Yes

**Other Issues:** At this time, no additional Amendment development issues have been identified.

**Timing Issues:** No unusual timing issues expected.

**Timeline for Development/Review/Implementation:**

<b>2015-2017 Development Track</b>	
<b>Action</b>	<b>Timeline, based on current Council meeting schedule</b>
Scoping	April 2015
First FMAT meetings, consideration of relevant data sources	Early 2016
Council reviews action plan	June 2016
FMAT continues analyses	June-August 2016
AP and then Committee meet to provide input on options for all alternatives	Late August 2016
Additional development of alternatives & analysis	fall 2016
MAFMC Meeting to adopt public hearing document and identify any preliminary preferred alternatives	December 2016
Public hearings	January/February 2017
MAFMC Meeting to: review comments; select final preferred measures; approve/adopt amendment)	April 2017
Final Rule Effective	January 1, 2018



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# MEMORANDUM

**Date:** 6/1/2016  
**To:** Council  
**From:** Jason Didden  
**Subject:** FMAT Meeting Summary – Squid Amendment

The Fishery Management Action Team (FMAT) met on 5/19/2016. FMAT members in attendance included Jason Didden, Lisa Hendrickson, Carly Bari, Don Paskowski, John Walden, and Julia Olson. Other attendees included Jeff Kaelin, Greg DiDomenico, Katie Almeida, and Douglas Christel.

The FMAT understands that there are currently 4 objectives of the Amendment (A-D below), and each were addressed during the meeting.

- A. Consider reducing the number of vessels in the directed longfin squid and *Illex* fisheries - The Council is concerned that activation of latent permits in the squid fisheries could lead to excessive fishing effort (possibly shortening seasons into derbies), and increased catch of non-target species and/or protected resources.

The FMAT endorsed the staff suggestion to bring a preliminary range of alternatives to an Advisory Panel (AP) meeting to get input on permit re-qualification criteria (non-re-qualifiers would presumably be eligible to get an open access incidental permit). Based on FMAT member schedules and analyses to be completed, that meeting would likely take place in late August. Staff reviewed an initial set of possible criteria (5 or 10 years, 25,000 or 50,000 pounds in best year) that would be brought to the AP meeting.

Staff will include: the distributions of qualifying years so that any natural break points can be identified; what portions of total/federal landings the current holders of moratorium permits have been landing in recent years versus incidental and non-permit holders; and recent landings by vessels that would not re-qualify.

The FMAT also discussed if there was a way to illustrate the ability of any resulting re-qualified limited access fleet to catch the current squid quotas. Technical measures of capacity do not appear to be a useful analytical tool in this case given there is a hard quota and the Council's goal is to protect vessels that have been dependent on recent squid catches rather than



optimizing the use of capital resources in this fishery. Council staff suggested that identifying the sum of all the vessels' best-year catches over some time period might serve as an approximate upper bound (but not technical maximum) on what any group of re-qualifying vessels might be likely to catch in a given year. Any such analysis would have to acknowledge that annual trends in the abundances of various species and changes in fishery management measures impact year-to-year fishery performance. Another consideration is that such an analysis would not be informative about the possible catches of latent vessels that might seek to enter or expand participation in the future. Staff will draft an initial iteration of this kind of analysis for additional FMAT feedback before bringing requalification options to the AP for input.

- B. Consider provisions for new permits for Maine/northern states. The Council is considering this action because of reports of increased longfin squid abundance off Maine, and the State of Maine requested consideration of provisions for additional access by fishermen in northern states.

The FMAT discussed several aspects of this issue. Granting new permits for only some states may violate Magnuson-Stevens Act provisions not to discriminate between residents of different states. However, it may be possible to create a lottery for temporary (e.g., 3-year) permits that could only be used to land squid in Maine and/or New Hampshire (anyone could apply and be included in the lottery). C. Bari will discuss with NOAA GC. Also, currently vessels can apply for an Exempted Fishing Permit (EFP) if they want to explore new aspects of a fishery, so a vessel might obtain an incidental permit and then request exemption from the trip limit as part of an Exempted Fishing Permit. The FMAT will explore longfin squid abundance trends in the Gulf of Maine to determine whether consistent production is feasible in the region. A research-set-aside could also be used to grant some vessels additional access to demonstrate the feasibility of an expanded fishery in northern areas. In general, the FMAT was concerned that granting new permits seemed to run contrary to the general goals of the amendment to reduce the number of permits in the squid fisheries. Adding additional northern squid fishing effort could also raise additional bycatch issues (which may support using an EFP to explore this issue). Squid are allowed to be fished within the existing small-mesh exemption areas in the GOM with certain season and gear restrictions.

- C. Re-evaluate the longfin squid trimester allocations. The Council is considering this action because some constituents have requested that more longfin squid be available during the summer trimester (Trimester 2), while other constituents have concerns that increased summer trimester effort may be negatively impacting spawning success.

L. Hendrickson will update previous analyses examining connectivity between the inshore and offshore fisheries. Specifically, the analysis will examine standardized CPUE in the summer inshore fishery relative to performance in the following offshore fishery and vice-versa. L. Hendrickson noted that it would be useful to collect vessel processing type (e.g. freezer, ice and/or RSW), on annual permit applications for effort standardization in CPUE analyses. L.

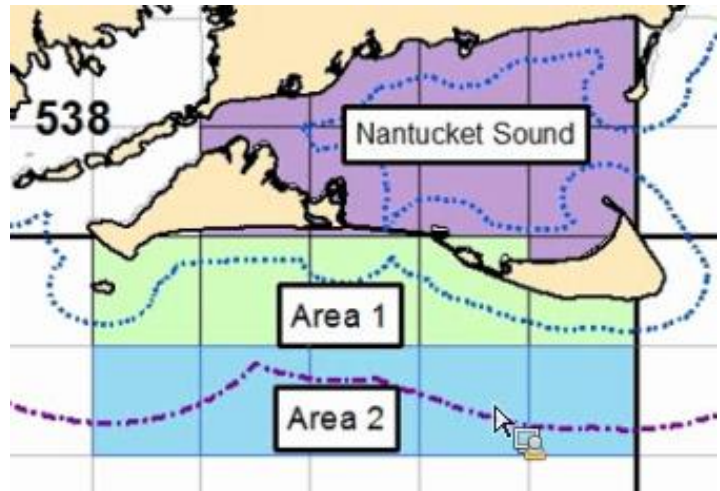
Hendrickson is also working on improving the documentation of squid spawning bed locations. The FMAT will also examine bycatch and protected resource impact differences by Trimester.

- D. Consider a longfin squid buffer zone (i.e. time-area closure) in the area south of Martha's Vineyard/Nantucket. The Council is considering this action because scoping comments indicated public concern that longfin squid fishing effort concentrated in this area may be negatively impacting the fishing in Nantucket Sound, due to localized depletion of prey and/or bycatch of recreationally-targeted species.

The FMAT discussed several initial analyses. A detailed written narrative will be produced for later consideration, but a preliminary summary is provided below as an update:

1. Have relevant recreational landings declined in recent years? The FMAT is examining MRIP harvest trends during 2004-2015 at ports from New Bedford, MA to Chatham, MA, where fishing likely occurred in Nantucket Sound, for striped bass, bluefish, black sea bass, and/or summer flounder. These species are some of the major predators of longfin squid, river herring, and butterfish. While the analysis involved a partitioning of the data that MRIP is not intended for (MRIP landings and effort data are available by state), landings per unit effort for these species were not indicative of an extreme drop in recent years (e.g. trends since either 2004 or 2010) given the variability generally seen in the data. Precision estimates are not available but would likely be low for such a small area.
2. Has the relative abundance of striped bass, bluefish, black sea bass, and/or summer flounder in Nantucket Sound declined in recent years based on the Massachusetts (MA) bottom trawl survey for strata that include Nantucket Sound? Striped bass and bluefish occurrences were too low/inconsistent to be useful. Recent years (since 2012) have shown a marked increase in black sea bass in the relevant spring and fall MA strata due to a large 2011 year class. Recent years (since 2010) have shown a decline for summer flounder in the spring and variability in the fall, though fall of 2015 was the highest value in the time series for summer flounder in the relevant strata.
3. Has the relative abundance of longfin squid, alewife, blueback herring, and/or butterfish in Nantucket Sound declined in recent years? Longfin squid and butterfish indices exhibited high variability and recent values appear to be within the typical variation of the time series. Alewife showed high variation as well, though recent years (since 2010) showed a decline in the spring survey and an increase in the fall survey in the relevant strata. Blueback herring indices were too low/inconsistent to be useful.

In the future, the FMAT will evaluate longfin squid catch/effort trends in Areas 1, 2, and Nantucket Sound as illustrated (right). If feasible, correlations will be examined between effort trends and the availability (for the MA survey) of longfin squid, butterfish, and alewife in Nantucket Sound. The FMAT will likely not be able to deduce any cause and effect associations given the myriad of factors that impact local fish abundances. This will make any quantitative evaluation of trade-offs between possible lost commercial squid fishing opportunities versus possible benefits to fishing and/or the ecosystem in Nantucket Sound impossible, though the FMAT will attempt to generally describe the relative importance of these areas to longfin squid fishing and recreational fishing.



## Squid Amendment – Permit Requalification Examples

Staff proposes that permit requalification options be considered at an Advisory Panel (AP) meeting and that the AP provide recommendations for the Committee/Council. Staff can examine the outcomes of permit requalification options in real time at the meeting to help the AP evaluate what kind of fleet would result from different requalification criteria.

The structure of any qualifying criteria will impact the number of qualifiers. Based on staff's understanding that the Council's goal is to account for the dependency on squid of recently active vessels, staff proposes to take four initial qualifying criteria to the AP for both squids: requalify vessels that had at least 25,000 or 50,000 pounds in their best year over either 2006-2015 (10 years) or 2011-2015 (5 years). Given the quotas have not been taken in recent years and there has not been a dramatic increase in active vessels since 2013, staff has not used the 2013 control dates, but would seek input from the AP on this issue as well.

Approximate and preliminary re-qualifiers for each squid fishery under the above example criteria are provided below. These would be provided to the AP as background/illustrations for discussion at an in-person AP meeting.

### Longfin

There were about 422 longfin/butterfish moratorium permits in the NMFS permit files in at least one year 2011-2015.

-If a 5-year/25,000 pound threshold was used the number of re-qualifying permits would be about 154.

-If a 5-year/50,000 pound threshold was used the number of re-qualifying permits would be about 133.

-If a 10-year/25,000 pound threshold was used the number of re-qualifying permits would be about 181.

-If a 10-year/50,000 pound threshold was used the number of re-qualifying permits would be about 151.

### Illex

There were about 90 *Illex* moratorium permits in the NMFS permit files in at least one year 2011-2015.

-If a 5-year/25,000 (or 50,000) pound threshold was used the number of re-qualifying permits would be about 27.

-If a 10-year/25,000 (or 50,000) pound threshold was used the number of re-qualifying permits would be about 31.

1 Northeast Regional Action Plan - NOAA Fisheries Climate Science  
2 Strategy

3  
4  
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22 PUBLIC COMMENT PERIOD

23 9 May – 29 July 2016  
24  
25  
26  
27  
28

29 DISCLAIMER:

30 This draft regional action plan once finalized will be a guidance document only. None of the  
31 recommendations contained in this guidance will be binding or enforceable against any public  
32 or private party, and no part of the guidance or the guidance as a whole will constitute final  
33 agency action that could injure any person or represent the consummation of agency decision  
34 making. This guidance will not change or substitute for any law, regulation, or other legally  
35 binding requirement and is not legally enforceable.

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62

63 **1. EXECUTIVE SUMMARY**

64 The Northeast U.S. Shelf Ecosystem supports a wide array of living marine resources from  
65 Atlantic sea scallops, one of the most valuable, to the North Atlantic Right whale, one of the  
66 most endangered. All of these resources - fish, invertebrates, marine mammals, sea turtles,  
67 habitats, and other ecosystem components - are being impacted by climate change and multi-  
68 decadal climate variability. In fact, the pace of observed climate change in the Northeast U.S. is  
69 faster than in many of the other U.S. Large Marine Ecosystems, and future change in the  
70 Northeast U.S. Shelf ecosystem is projected to be greater than other portions of the world's  
71 oceans. These changes in climate are already creating significant challenges for the region.  
72 Species distributions are becoming out-of-sync with the spatial allocations of management. The  
73 productivity of some iconic species is decreasing making rebuilding and recovery difficult. Some  
74 ports rely on one or two fisheries; changes in these fisheries could have dramatic consequences  
75 for the human communities connected to these ports. Changes in management and regulation  
76 are slow, while changes in the physics, chemistry, and biology of the ecosystem are occurring  
77 rapidly. Despite these challenges, there are opportunities. Some species in the region are  
78 responding positively to the changes: moving into the region and increasing in productivity.  
79 Technology offers new tools for observing, understanding, and adapting to change. The region  
80 has an excellent marine science infrastructure. On the national scale, NOAA Fisheries released  
81 the Climate Science Strategy in August 2015. This Strategy develops a national framework to  
82 meet the growing demand for information to better prepare for and respond to climate-related  
83 impacts on the nation's living marine resources and resource-dependent communities. This  
84 document represents the Northeast U.S. Regional Action Plan for implementing the NOAA  
85 Fisheries Climate Science Strategy. The Northeast U.S. Shelf Ecosystem extends from North  
86 Carolina to Maine, and includes watersheds, estuaries, the continental shelf and the open  
87 ocean. Fourteen actions are identified, and the activities to be undertaken over the next three-  
88 to-five years are described.

89  
90 A critical element of this Action Plan is partnerships. The challenges are great, the issues are  
91 complex, and resources are limited. By working together, we can reduce the impacts of change  
92 on living marine resources, and increase the resilience of the ecosystem to change, including  
93 people, businesses and communities.

94 **2. INTRODUCTION**

95 The NOAA Fisheries Climate Science Strategy seeks to increase the production, delivery, and  
96 use of the climate-related information required to fulfill NOAA Fisheries mandates (Link et al.  
97 2015). These mandates are derived from numerous statutes: primarily the Magnuson-Stevens  
98 Fishery Conservation and Management Act (MSA); Fish and Wildlife Coordination Act (FWCA);

99 Atlantic Coastal Fisheries Cooperative Management Act (ACFCM); Endangered Species Act  
100 (ESA); Marine Mammal Protection Act (MMPA); National Aquaculture Act (NAA); Coral Reef  
101 Conservation Act (CRCA); and the National Environmental Policy Act (NEPA). There are also a  
102 number of other statutes and Executive Orders that have bearing on the mission of NOAA  
103 Fisheries: Federal Power Act; Clean Water Act; Coastal Zone Management Act; Comprehensive  
104 Environmental Response, Compensation, and Liability Act; Oil Pollution Act; Fish and Wildlife  
105 Coordination Act; Coastal Wetlands Planning, Protection, and Restoration Act; American  
106 Recovery and Reinvestment Act; Executive Order 13547 Stewardship of the Ocean, Our Coasts,  
107 and the Great Lakes; and Executive Order 13653 Preparing the United States for the Impacts of  
108 Climate Change.

109

110 In general, these mandates are intended to instruct and support the National Marine  
111 Fisheries Service (NOAA Fisheries) to work in five thematic areas: fisheries, protected species<sup>1</sup>,  
112 aquaculture, habitats, and ecosystems. NOAA Fisheries primarily focuses on fisheries in federal  
113 waters, that being generally three miles from the coast to the 200 mile extent of the Economic  
114 Exclusive Zone. However, many marine species also use coastal, estuarine, and fresh waters  
115 during some portion of their life cycle, which can broaden the spatial scope of NOAA Fisheries  
116 activities in the region. Further complicating the mission, many species migrate outside the U.S.  
117 Exclusive Economic Exclusion Zone (EEZ) into other national jurisdictions or international  
118 waters. Moreover, the MSA requires taking into account consideration of human communities  
119 and fishing industries (Clay and Olson 2008), food production (Olson et al. 2014), and the  
120 sustainability of marine species and their habitats (Fluharty 2000). Clearly, the NOAA Fisheries  
121 mission of science and management activities extends from the headwaters of watersheds to  
122 the deep ocean and includes interactions among physical, chemical, biological, and human  
123 components and NOAA is in the position to integrate science and management across this  
124 Large Marine Ecosystem.

125

126 One requirement of the NOAA Fisheries Climate Science Strategy is for each region to  
127 develop a Regional Action Plan. The NOAA Fisheries Climate Science Strategy defines seven  
128 interdependent objectives with the goal to inform and fulfill NOAA Fisheries mandates in a  
129 changing climate (Figure 1). The Strategy also identifies four near-term actions, one of which is  
130 the development of Regional Action Plans, to customize and execute the Strategy over the next  
131 3-5 years in a given region. This document, the Northeast Regional Action Plan, addresses this  
132 near-term action. The Region covered is the Northeast U.S. Shelf Ecosystem, which extends  
133 from Cape Hatteras, North Carolina to the western end of the Scotian Shelf and includes the

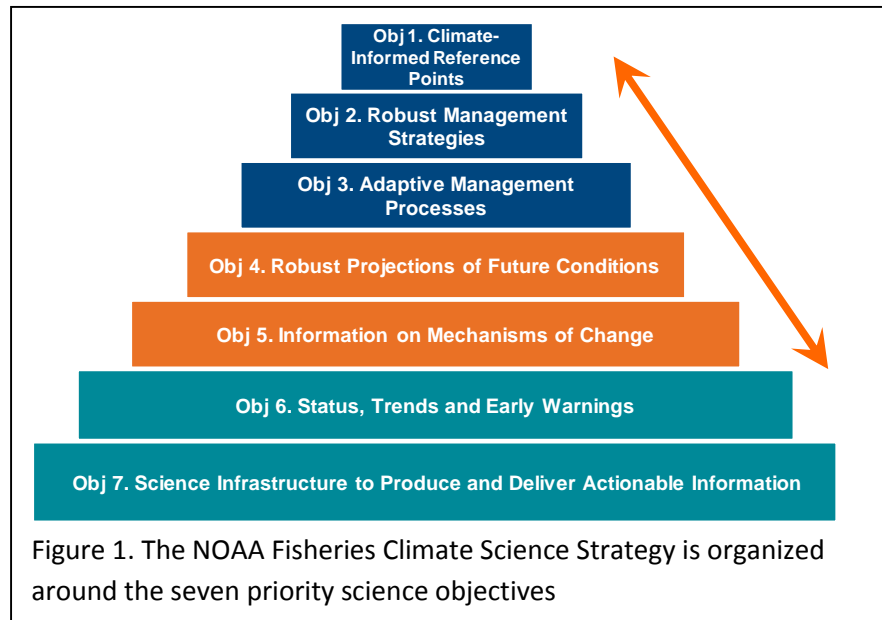
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<sup>1</sup> For the purposes of this document only, “protected species” refers to ESA listed species, MMPA protected marine mammals, ESA Candidate Species and Species of Concern.



134 Mid-Atlantic Bight, Southern New England, Georges Bank, and the Gulf of Maine. Regional  
135 Action Plans are intended to: 1) identify strengths, weaknesses, priority needs and actions to  
136 implement the seven NCSS Objectives in each region over the next five years; and 2) increase  
137 awareness, partnerships and support for these efforts internally and externally at regional to  
138 national scales. This document provides information related to both of these goals.

139  
140 The Northeast  
141 Regional Action Plan has  
142 three sections. The first  
143 section - [Regional](#)  
144 [Assessment](#) - describes  
145 the process used to  
146 develop the Regional  
147 Action Plan. This section  
148 starts with a summary of  
149 the effect of climate  
150 change on living marine  
151 resources in the  
152 Northeast U.S. The  
153 strengths, weaknesses,  
154 opportunities, and



155 challenges to implementing the Strategy in the Northeast U.S. are then identified. A range of  
156 needs are described and prioritized for the region based on the assessment of strengths and  
157 weaknesses and relative to the seven objectives of the NOAA Fisheries Climate Science  
158 Strategy. The second section - [Action Plan](#) - provides more detailed information for the High  
159 Priority needs. Specific actions under a budget neutral (*No New Resources*) and budget increase  
160 (*New Resources*) scenario are described. The third section - [Timeline and Metrics](#) - presents a  
161 plan for managing actions under the Regional Action Plan and for evaluating success.

### 163 3. REGIONAL ASSESSMENT

#### 164 DEVELOPMENT OF THE NORTHEAST REGIONAL ACTION PLAN

165 The Northeast Fisheries Science Center (NEFSC) and Greater Atlantic Regional Fisheries  
166 Office (GARFO) established a Working Group to develop the Northeast Regional Action Plan  
167 (NERAPWG). NERAPWG is representative of the different components of NEFSC and GARFO, as  
168 well as other NOAA Fisheries Offices in the Northeast Region (see Appendix 1). Two NEFSC and  
169 two GARFO staff members formed a smaller leadership group from the NERAPWG (see

170 Appendix 1). The Action Plan covers the Northeast U.S. Shelf, which extends from Cape  
171 Hatteras, North Carolina to the western end of the Scotian Shelf and includes the Mid-Atlantic  
172 Bight, Southern New England, Georges Bank, and the Gulf of Maine.

173  
174 Each member of the working group was asked to identify regional strengths and  
175 weaknesses, opportunities and challenges, and needs related to each objective of the NOAA  
176 Fisheries Climate Science Strategy. This was done by each individual NERAPWG member; the  
177 idea was to capture a broad perspective across the related, but varied, GARFO and NEFSC  
178 perspectives. Because of their involvement in fisheries management – a priority for NOAA  
179 Fisheries – staff from the New England Fishery Management Council (NEFMC), Mid-Atlantic  
180 Fishery Management Council (MAFMC), and Atlantic States Marine Fisheries Commission  
181 (ASMFC) were also asked to provide input on regional strengths and weaknesses, opportunities  
182 and challenges, and needs related to each objective based on their involvement in fisheries  
183 management (see Appendix 2). The Priority (over a < 6 month planning horizon), Near-Term (6-  
184 24 months) and Mid-Term (2-5 years) actions identified in the NOAA Fisheries Climate Science  
185 Strategy were also considered. Finally, representatives of different line offices of NOAA (NOS,  
186 OAR, NCEI, other NMFS offices) that work in the Northeast U.S. (see Appendix 2) were asked to  
187 provide input on regional strengths and weakness, opportunities and challenges, and needs  
188 related to each objective. This input was solicited at the individual level and not meant to  
189 represent the official comments of NOAA Line Offices. Finally, a list of relevant documents was  
190 compiled and reviewed to ensure that existing information was used in the development of the  
191 Regional Action Plan (see Appendix 5).

192  
193 This input was used to complete the assessment of regional strengths and weaknesses and  
194 challenges and opportunities ([Regional Assessment Section](#)) and to draft a list of actions to  
195 implement the NOAA Fisheries Climate Science Strategy in the Northeast region. These draft  
196 lists of strength, weaknesses, and actions were reviewed by the Working Group to ensure  
197 completeness and to formulate the draft actions at approximately the same level of detail. The  
198 Working group then prioritized the final list of 63 actions. Working Group members were asked  
199 to rank actions as High, Medium, or Low priority. There were no restrictions on the number of  
200 actions in each category, but NERAPWG members were asked to strive for an even distribution  
201 to provide a range in individual ranking. NERAPWG members were given the following  
202 guidance/questions to help frame their rankings.

- 203  
204
- Respondents should consider NOAA Fisheries mission as a whole
    - “Fisheries” refers to harvested species: managed, unmanaged, highly migratory, etc.
    - “Protected species” refers to ESA listed species, MMPA protected marine mammals, ESA Candidate Species and Species of Concern unless otherwise specified
- 205  
206  
207

- 208           ▪ “Habitat” components include pelagic, benthic, marine, estuarine, and freshwater  
209           areas of the Northeast U.S. Shelf ecosystem.
- 210           ▪ “Ecosystem” components range from physical oceanography to the economic and  
211           social aspects of human communities
- 212           ▪ “Aquaculture” refers to the development and sustainability of cultured invertebrates  
213           and vertebrates
- 214           ▪ “National Environmental Policy Act (NEPA) issues” related the environmental review  
215           of potential impacts of planned projects or permits.
- 216
- 217           ● Does the action address a high priority need in the Northeast U.S. Region?
- 218
- 219           ● Does the action advance climate science related to NOAA Fisheries Mission in the  
220           Northeast U.S. Region (NOAA Fisheries Mission and NEFSC and GARFO Strategic Plans)?
- 221
- 222           ● Will the action reduce uncertainty of management advice related to NOAA Fisheries  
223           Mission in the Northeast U.S. Region (NOAA Fisheries Mission and NEFSC and GARFO  
224           Strategic Plans)?
- 225
- 226           ● Does the action lead to tangible improvements or increased knowledge within the five  
227           year time frame?
- 228

229           NERAPWG members were asked to identify their top 10 actions if no new resources are  
230           available and their top 10 actions if new resources are available. In pre-ranking discussions,  
231           NERAPWG members expressed that their prioritization may differ depending on the resources  
232           available, so top 10 actions were identified separately for the no new resources and the new  
233           resources scenarios. For each of the top 10 actions, NERAPWG members were asked to identify,  
234           to the best of their ability, the specific steps that should be taken in the next five years.  
235           NERAPWG members were also asked to identify important partners. Members could state why  
236           the action is important and provide additional comments if desired, but these later two  
237           responses were optional.

238

239           Following NERAPWG ranking, the Leadership Group compiled the ranks and the action  
240           statements. The numbers of High, Medium, and Low ranks were then tabulated for each Draft  
241           Action. The numbers of Top 10 ranks were also tabulated for each Action. The leadership group  
242           then used these rankings and considered the NOAA Fisheries Climate Science Strategy to  
243           combine some actions and to identify Priority Actions for the region; these Priority Actions are  
244           itemized in Section 4 below. The full list of the 63 actions developed and considered by the  
245           NERAPWG is presented in Appendix 3.

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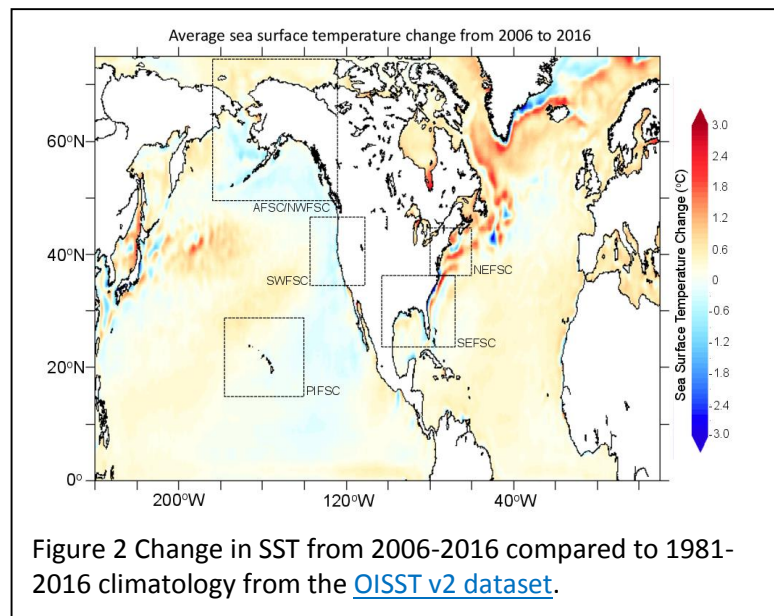
Priority Actions were aligned with the most applicable objective from the NOAA Fisheries Climate Science Strategy and to NOAA Fisheries mission elements. This latter step will help users of the Regional Action Plan to view the actions identified for a particular mission area as well as the actions identified as overall priorities.

252 ASSESSMENT OF REGIONAL STRENGTHS AND WEAKNESSES

253 **Climate Change and Variability in the Northeast U.S. Shelf Ecosystem**

254 The Northeast U.S. Continental Shelf extends from Cape Hatteras, North Carolina to the  
255 western end of the Scotian Shelf and includes the Mid-Atlantic Bight, Southern New  
256 England, Georges Bank, and the Gulf of Maine. The climate of this ecosystem is changing,  
257 both as a result of anthropogenic climate change and natural climate variability.  
258 Anthropogenic climate change is a long-term change in the climate system that is attributed  
259 to greenhouse gas emissions. The evidence for anthropogenic climate change is widely  
260 accepted (IPCC 2014, NCA 2015). The Northeast U.S. Shelf has experienced some of the  
261 greatest warming over the past decade (Figure 2) and some of the greatest rates of sea-  
262 level rise of any area around the world. The anthropogenic climate change signal is  
263 occurring simultaneously with natural climate variability - the two signals can amplify or  
264 cancel each other out.

265  
266 Within the North Atlantic Ocean, there are two basin-scale indices of natural climate  
267 variability that impact climate  
268 in the Northeast U.S.: the  
269 North Atlantic Oscillation  
270 (NAO) and the Atlantic  
271 Multidecadal Oscillation  
272 (AMO). The NAO is measured  
273 as the difference in  
274 atmospheric pressure  
275 between the Icelandic Low  
276 and the Azores High, and is  
277 linked to the strength and  
278 direction of the westerlies  
279 across the North Atlantic  
280 (Hurrell et al. 2003). A  
281 negative NAO is associated



282 with cold, dry air over the Northeast U.S. Shelf and a positive NAO is associated with warm,  
283 wet air over the region. The NAO went through a predominantly negative phase in the  
284 1960s and early 1970s and then a predominantly positive phase from the mid-1970s to  
285 early-1990s. In recent years, the NAO has been more variable, fluctuating between negative  
286 and positive phases on a one to three year scale (EcoAP 2015). The AMO represents a  
287 pattern of sea surface temperatures across the North Atlantic (Schlesinger and Ramankutty  
288 1994). A negative AMO is related to cooler temperatures across the North Atlantic (early  
289 1960s to late-1990s). A positive AMO is related to warmer temperatures across the North  
290 Atlantic (late-1990s to the present) (EcoAP 2015). The AMO has a period of approximately  
291 70 years in the observational record, but the regularity of the oscillation is uncertain (Chylek  
292 et al. 2012). The recent positive phase of the AMO co-occurs with the anthropogenic  
293 climate signal (i.e., warming over the past 30 years) making it difficult to separate climate  
294 change and decadal-scale climate variability on the Northeast U.S. Shelf (Figure 3).  
295

296 More recently, climate variability in the Pacific Ocean has been linked to changes in both  
297 ocean temperature (Pershing et al. 2015) and air temperature (Chen et al. 2014, 2015) in  
298 the Northeast U.S. Shelf  
299 ecosystem. The Pacific Decadal Oscillation (PDO) is inversely  
300 related to spring and summer  
301 sea surface temperature in the  
302 Gulf of Maine (Pershing et al.  
303 2015). This long-distance  
304 connection between the  
305 Atlantic and Pacific Ocean  
306 suggests that atmospheric  
307 forcing is an important  
308 mechanism driving the climate  
309 variability of the Northeast U.S.  
310 Shelf. For example, the  
311 extreme warming observed in  
312 2012 on the Northeast U.S.  
313 Shelf (warmest on record) was  
314 primarily driven by air-sea heat  
315 flux (Chen et al. 2014, 2015).  
316 The anomalous position of the  
317 atmospheric jet stream in the  
318

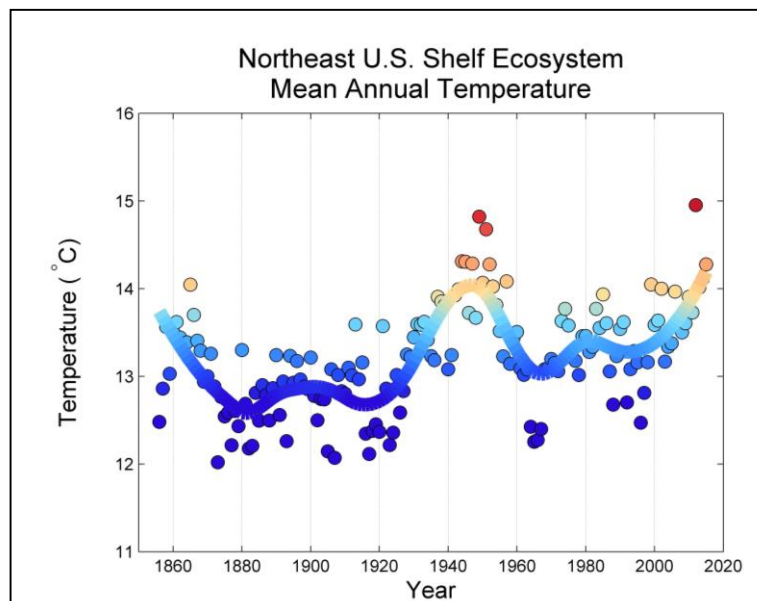


Figure 3. Annual sea-surface temperature on the Northeast U.S. Shelf from the [ERSSTv3b dataset](#). Colors represent annual temperatures. The line is a lowess smoother of annual temperature. The multi-decadal variability (peaks in the 1850's, 1950's, and 2010') is closely related to the Atlantic Multidecadal Oscillation.

319 fall-winter of 2011-2012 reduced the heat-loss from the Northeast U.S. Shelf waters and  
320 resulted in a less cooling in the fall and winter of 2011-2012 (Chen et al. 2014).

321

322 While it appears that the 2012 warming event was primarily driven by the atmosphere,  
323 ocean advection also plays an important role in the ocean temperature on the Northeast  
324 U.S. Shelf (Rossby and Benway, 2010; Mountain and Kane, 2010; Shearman and Lentz 2010;  
325 Gawarkiewicz et al. 2012). Although the Gulf Stream does not flow directly over the  
326 Northeast U.S. Shelf, a more northern position of the warmer Gulf Stream is associated with  
327 reduced transport of colder Labrador water that enters the Shelf from the north (Pershing  
328 et al. 2001; Rossby and Benway, 2010). New research has pointed to a robust relationship  
329 between the Atlantic Meridional Overturning Circulation (AMOC) and ocean conditions on  
330 the Northeast U.S. Shelf (Goddard et al., 2015; Saba et al. 2016). Observations of the  
331 interannual variability of AMOC at 26.5°N and Slope Water intrusions into the Gulf of  
332 Maine’s Northeast Channel (42.25°N) are significantly correlated when the AMOC is lagged  
333 1–2 years (Saba et al. 2016). A similar correlation is reported between observations of sea  
334 surface height (lagged 2 years) and ocean temperature in the Middle- Atlantic Bight (Forsyth  
335 et al., 2015) with a potential link to AMOC such that increased sea level height on the Shelf  
336 may be related to a reduction of AMOC (Goddard et al., 2015). However, this link has been  
337 questioned in other studies indicating no reduction in Gulf Stream transport, which is a  
338 surface component of AMOC (Rossby et al., 2014).

339

340 As a result of climate change and natural variability, there have been changes in a  
341 number of physical parameters in the Northeast U.S. Shelf over the past 30-40 years (EcoAp  
342 2015) and climate models project that these changes will continue. Air and ocean  
343 temperatures are increasing in the Northeast U.S., which can impact marine organisms,  
344 their habitats, and ultimately the human communities that depend on these organisms and  
345 habitats. Air temperature is an important indicator of trends in freshwater and coastal  
346 water temperature owing to efficient heat exchange occurring in the shallow waters (Hare  
347 and Able 2007). The Northeast U.S. Shelf is one of the fastest warming regions of the  
348 world’s oceans (Figure 1), but the relative effect of the climate change signal and the AMO  
349 signal is unclear (Solomon et al. 2011). The warming signal has a seasonal component, with  
350 summers warming faster than winters (Friedland and Hare 2007). The Northeast U.S. is also  
351 a “hotspot” for sea-level rise, with rates in the past five decades approximately 3–4 times  
352 higher than the global average (Sallenger et al. 2012). Land subsidence along portions of the  
353 Mid-Atlantic coast contributes to apparent sea-level rise (Eggleston and Pope, 2013).  
354 Annual precipitation and river flows have increased and the timing of snowmelt is earlier,  
355 while the magnitude of extreme precipitation events has also increased (Karl and Knight;  
356 1998, McCabe and Wolock, 2002; Walsh et al., 2014). As examples, the timing of high river

357 flows in New England has shifted 1-2 weeks earlier over the past 30 years (Hodgkins et al.  
358 2003) and the magnitude and frequency of floods in the Northeast U.S. have increased over  
359 the past 75 years (Collins 2009; Armstrong et al., 2014). Dissolved CO<sub>2</sub> is increasing, which is  
360 resulting in the “acidification” of shelf waters at rates comparable to global averages.  
361 Salinities were decreasing from the 1970s into the 1990s likely due to the transport of low  
362 salinity ice melt from the Arctic (Greene and Pershing 2007), but are now increasing ,  
363 potentially due to increased influence of Atlantic Warm Temperate water (EcoAp 2015,  
364 Gawarkiewicz et al. 2012). Climate projections from global climate models suggest that both  
365 temperature and precipitation will increase over time in the Northeast US. However, there  
366 is higher confidence in the temperature projections (IPCC, 2013; NCA 2014). Increases in  
367 dissolved CO<sub>2</sub> will continue, but there is a substantial amount of seasonal and regional scale  
368 variability. Projected trends in salinity are more complex, with increased freshwater input  
369 from the Labrador Coastal Current and increased addition of saltier water as the Gulf  
370 Stream is expected to shift northwards; it is not clear how the salinity regime will change in  
371 response. Changes in the Labrador Coastal Current and the Gulf Stream will impact  
372 temperature and salinity conditions. For example, a high-resolution global climate model,  
373 which resolves regional oceanography, projects an increased in Atlantic Warm Temperate  
374 water entering the Gulf of Maine leading to both an enhanced warming and increases in  
375 salinity (Saba et al. 2016).

376  
377 These changes in climate are causing numerous changes in fish, shellfish, marine  
378 mammal, and sea turtle populations, as well as in the habitats that these species use. In  
379 turn, the changes with individual species are impacting predator-prey relationships and  
380 competition in the ecosystem, as well as impacting the human communities that interact  
381 with the species and habitat. When the Northeast U.S. Shelf is analyzed as a single region,  
382 the distribution of a large number of species is dominated by a shift of populations to the  
383 northeast and into deeper water (Nye et al. 2009, Pinsky et al. 2013); however, at the  
384 species specific-level there is variability (e.g. Spiny Dogfish is shifting southward). When the  
385 Northeast U.S. Shelf is analyzed as two distinct regions, in the Mid-Atlantic Bight, the  
386 northeastern distribution shift is primarily evident, whereas in the Gulf of Maine a  
387 southwestern shift into deeper water is more evident (Kleisner et al. 2016). This difference  
388 is explained by regional-scale oceanography and bathymetry. The phenology of spawning  
389 time of a large number of species has also changed (Walsh et al. 2015), with some species  
390 spawning earlier in the year and some later. In addition to changes in distribution and  
391 phenology, there is evidence of a change in productivity for some species. For example,  
392 Winter Flounder and Atlantic Cod productivity has decreased in recent decades, whereas  
393 Atlantic Croaker productivity has been increasing (Fogarty et al. 2008, Hare et al. 2010, Bell  
394 et al. 2014, Pershing et al. 2015). These changes are not restricted to fish species. Sea turtle

395 nesting habitats also are being affected by changing climate conditions (Saba et al. 2012).  
396 Coastal shellfish productivity will likely be impacted by ocean acidification (Talmage and  
397 Gobler 2010), affecting both coastal fisheries on wild resources and aquaculture sites. Sea-  
398 level rise is expected to impact coastal habitats used by freshwater, estuarine, and marine  
399 species (Morris et al. 2002, Craft et al. 2008; Kirwan et al., 2010; Carey et al., 2015; Kirwan  
400 et al., 2016) and have dramatic effects on coastal communities (Ford and Smit 2004;  
401 Howard et al. 2013). Fishing remains an important factor in the management of marine  
402 species, but recognition of the relative importance of climate, ecosystem, and habitat  
403 interactions has increased. In addition, other human pressures including shipping, dams,  
404 and energy development are impacting NOAA Fisheries trust resources. Coupled with the  
405 rapid rate of climate change in the Northeast U.S. Shelf, multiple stressors are creating  
406 numerous and serious challenges to the management of living marine resources in the  
407 Northeast U.S. However, there are some opportunities created by climate change in the  
408 region. Adaptive strategies need to be develop to meet both short-term and long-term  
409 management objectives.

410

### 411 **Regional Strengths**

412 The Northeast U.S. region is in a good position to implement the NOAA Fisheries Climate  
413 Science Strategy and to increase the production, delivery, and use of the climate-related  
414 information required to fulfill NOAA Fisheries mandates. Below follow examples of various  
415 efforts underway related to the intersection of climate science and living marine resource  
416 management. This review is not meant to be comprehensive, but seeks to identify regional  
417 strengths and provide some examples.

418

419 There is a long history of ecosystem and climate research in the Northeast U.S. region.  
420 In 1871, Spencer Baird was appointed the first Commissioner of Fish and Fisheries for the  
421 United States Fish Commission and advocated that fisheries needed to be studied,  
422 understood, and managed in the context of the ecosystem including humans. This concept  
423 was supported by preeminent scientists working for the precursors of the NEFSC (e.g.,  
424 Henry Bigelow, Victor Loosanoff, Oscar Sette, Lionel Walford, George Clarke, and Charles  
425 and Marie Fish). Studies through the first half of the 20th century emphasized the  
426 importance of the ecosystem in affecting fishery yields (e.g., Sette 1943) and changes in  
427 species distribution were linked to changes in climatic conditions during this period (Taylor  
428 et al. 1957). Through the latter half of the 20th century, attention turned more toward  
429 single-species approaches, but the importance of the environment in affecting fishery  
430 productivity was still recognized (e.g., Sissenwine 1974). In 1999, the NOAA Fisheries  
431 Ecosystem Advisory Panel reaffirmed the importance of considering ecosystem interactions



432 in fishery management, specifically including human dimensions (NOAA Fisheries, 1999).  
433 This long history of an ecosystem and climate focus sets the stage for the development of  
434 Ecosystem Based Management that includes the effect of climate change in marine  
435 resources and on the human communities that utilize them.

436  
437 A number of preeminent research institutions and research universities are located in  
438 the Northeast U.S. region. There are formal relationships that exist between NOAA and  
439 many of these organizations including the [Cooperative Institute for the North Atlantic  
440 Region \(CINAR\)](#), [Cooperative Institute for Climate Science \(CICS\)](#), and the [Cooperative  
441 Institute for Climate and Satellites \(CICS-NC\)](#). There are also collaborative relationships  
442 between regional universities and other federal agencies: [North Atlantic Coast Cooperative  
443 Ecosystem Studies Unit](#) (NACCESU) and USGS [Cooperative Research Units](#). There are [NOAA  
444 Sea Grant programs](#) throughout the Northeast U.S. and there have been a number of large-  
445 scale projects between academics and research institutions and NOAA investigators  
446 including [Global Ocean Ecosystem Dynamics](#) (1989-2002) and [Comparative Analysis of  
447 Marine Ecosystem Organization](#) (2009-2012). Research done with and by these institutions  
448 will continue to contribute to our understanding of the effect of climate change on marine  
449 species and ecosystems.

450  
451 With this science capacity in the region, there have been a number of recent significant  
452 studies that advance the objectives of the NOAA Fisheries Climate Science Strategy and lay  
453 the foundation for moving forward. Many of these studies are cited above and in Appendix  
454 5. There are also a number of new programs and opportunities in the region, including a  
455 collaboration between NOAA Fisheries and NOAA Research, [Sustainable management and  
456 resilience of U.S. fisheries in a changing climate](#), and a NOAA Sea Grant effort, [Northeast  
457 Sea Grant Consortium Regional Ocean Acidification RFP](#). The NOAA Ocean Acidification  
458 Program provides sustained funding to the NEFSC for monitoring and experimental work  
459 and funds a number of science projects in the region. There are National Science  
460 Foundation opportunities including the [Coastal SEES program](#) and the [Long-Term Ecological  
461 Research \(LTER\) New Site Competition](#). There are NOAA Fisheries internal funding programs  
462 that have supported research applicable to the NOAA Fisheries Climate Science Strategy  
463 including the Fisheries and the Environment, Improve Stock Assessment, Habitat  
464 Information for Stock Assessment, Stock Assessment Analytical Methods, Sea Turtle  
465 Assessment, and Advanced Sampling Technology Working Group. As interest in  
466 understanding the effect of climate change on fisheries, protected species, habitat,  
467 ecosystems and aquaculture grows, the opportunities to conduct science in these areas will  
468 grow as well.

470 The NOAA Chesapeake Bay Office (NCBO) has been engaged in a number of climate  
471 related activities – Chesapeake Bay is the largest estuary in the Northeast U.S. Shelf  
472 ecosystem. NCBO has been developing a climate resiliency [work plan](#) in support of the 2014  
473 Chesapeake Bay Program Agreement outcomes. This work plan consists of two  
474 components. The Monitoring and Assessment component calls for continually monitoring  
475 and assessing the trends and likely impacts of changing climatic and sea level conditions on  
476 the Chesapeake Bay ecosystem. The effectiveness of restoration and protection policies,  
477 programs and projects will also be evaluated. The Adaptation component calls for  
478 restoration and protection projects to enhance the resiliency of the Chesapeake Bay  
479 ecosystem from the impacts of coastal erosion, coastal flooding, more intense and more  
480 frequent storms and sea-level rise.

481  
482 In addition to having a strong research base and funding, the region has exceptional  
483 experimental and observational capabilities. NOAA Fisheries supports experimental facilities  
484 at the [Sandy Hook Laboratory](#) and the [Milford Laboratory](#). A number of other institutions  
485 and universities in the region have experimental facilities (e.g., [Environmental Systems](#)  
486 [Laboratory](#), [Darling Marine Center](#), [Smith Laboratory](#), [Marine Ecosystems Research](#)  
487 [Laboratory](#), [University of Connecticut](#)) and this experimental approach is used in the field  
488 (e.g., effect of trawling on benthic habitat, Sullivan et al. 2003; caging studies to examine  
489 fish ecology, Meng et al. 2008). Since fisheries science in the region developed with the  
490 understanding of the importance of the ecosystem, fisheries observations and marine  
491 ecosystem observations have been combined since the early 20th century. Portions of the  
492 legacy continue today with the [NEFSC Ecosystem Monitoring Surveys](#), [Bottom Trawl Survey](#),  
493 and protected species surveys (e.g., [Atlantic Marine Assessment Program for Protected](#)  
494 [Species](#)) ; many of the NEFSC surveys started in the 1960's and 70's and represent time  
495 series in excess of forty years. These surveys collect a range of information on targeted  
496 species information, as well as a broader suite of ecosystem and climate information,  
497 providing the ability to analyses the interactions between targeted species and their  
498 environment. These programs include traditional and new technologies such as acoustic  
499 (e.g., [Northeast Acoustic Network](#)) and optical (e.g., [HabCam](#)). There are also two  
500 Integrated Ocean Observing System Regional Associations: [Northeastern Regional](#)  
501 [Association of Coastal and Ocean Observing Systems](#) and [Mid-Atlantic Coastal Ocean](#)  
502 [Observing System](#); and the [Chesapeake Bay Interpretive Buoy System](#) operates in the  
503 region. The [Pioneer Array](#) on the outer Southern New England Shelf is now operational with  
504 support from the [Ocean Observatories Initiative Program](#) (National Science Foundation  
505 funded). Collaboration between NOAA Fisheries and these other large-scale experimental  
506 and observational activities continues to grow and can be used to meet the goals of the  
507 Climate Science Strategy.

508  
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Modeling capabilities in the region are also quite advanced. Single-species fisheries assessments use a range of models from simple data-limited and index models to age-structured models (NEFSC 2014). Multispecies models are used in some fish assessments (NEFSC 2006) and environmental variables are beginning to be included in some single species models (NEFSC 2014, Miller et al. 2016). Similarly, protected species assessments utilize a range of models formulations (Moore and Merrick, 2011) and there are models under development that are explicitly climate-driven (Meyer-Gutbrod et al. 2015). Ecosystem modeling capability in the region is well developed with network-type models for Northeast U.S. Shelf ecoregions (Link et al. 2008) and complete system models like Atlantis (Link et al. 2014, Townsend 2014, Ihde 2015); these models are being developed to provide strategic advice. There is also an evaluation of a range of models underway at the NEFSC to provide tactical fisheries advice ([NEFSC Ecosystem Considerations: Modeling Approaches](#)). The region has a diversity of ocean models. Data assimilative hindcast models are available providing dynamical reanalysis of past conditions (Chen and He 2010, Chen et al. 2011, Kang and Curchitser 2013). In addition, oceanographic forecast models have been developed (Beardsley and Chen, 2014, Wilkin et al. 2014) and are starting to be used in living marine resource management applications (NEFSC 2014, Turner et al. 2015). Century-scale projections from global climate models have been used in the region and evaluations of high-resolution global models (Saba et al. 2016) and decadal prediction skill are underway (Stock et al. 2015). The region is poised to begin integrating across biological, oceanographic, and climate models in support of assessment and the provision of management advice.

The region has strong social science capacity. The NEFSC has a [Social Sciences Branch](#) , with fisheries anthropologists, resource economists and other social scientists who work on a range of issues including the impact of climate change on communities (Colburn et al. in review) and fishing businesses (Gaichas et al., in review). Both GARFO and NEFSC recognize the importance of linking natural science, social science, regulation, and management. GARFO has identified Community Resiliency as one of its seven strategic goals ([GARFO Strategic Plan FY2015-2019](#)), with the purpose of developing an integrated approach among programs to enhance fishery community resiliency. NEFSC has identified social sciences in one of its seven strategic foci ([NEFSC Strategic Science Plan, 2016-2021](#)): to improve understanding of economic and socio-cultural factors in marine resource management. Many universities in the region also have social scientists who are working with NOAA Fisheries. There are even examples of linking climate change to economic effects through climate effects on marine populations (e.g., sea scallop, Cooley et al., 2015). The NEFMC and MAFMC are integrating social sciences into their development of Ecosystem-Based

546 Fisheries Management approaches (e.g., [East Coast Climate Change and Fisheries](#)  
547 [Governance Workshop](#)) to develop more meaningful linkages between natural sciences,  
548 social sciences, management objectives, and regulation in the future.

549  
550 Importantly, there are strong research interactions forming with the fishing industry.  
551 The [Research-Set-Aside](#) program funds research through the sale of set-aside allocations for  
552 quota or days-at-sea (DAS) managed fisheries. These projects focus on research to improve  
553 assessments, but could be used for research related to the NOAA Fisheries Climate Science  
554 Strategy. Cooperative environmental monitoring with lobstermen has been ongoing at the  
555 NEFSC since 2001 ([eMOLT](#)) and similar programs have started recently (e.g., [Lobster](#)  
556 [Research Fleet](#)). Work with butterfish and Atlantic mackerel fishermen also aims to support  
557 stock assessment (NEFSC 2014), as well as examines the importance of the environment in  
558 the distribution and productivity of the stocks. The Northeast Cooperative Research  
559 Program has existed since the late 1990's; within it, the [Study Fleet](#) is deploying  
560 environmental sensors on fishing vessels and work is underway to transmit the data in near-  
561 real time and make it available to ocean forecasting models. The Social Sciences Branch has  
562 conducted over 100 oral histories with fishermen and fishing community members and the  
563 NMFS Voices from the Fisheries program has hundreds more. These can be mined for Local  
564 Ecological Knowledge, including signals of climate change. Further collaboration and  
565 cooperation with industry will be critical for the success of the NOAA Fisheries Climate  
566 Science Strategy.

567  
568 There is an improved understanding of the habitat requirements of fisheries and some  
569 protected species in the region. [Essential Fish Habitat](#) (EFH) for all managed fish and  
570 invertebrate species has been defined and habitat needs for some ESA listed species have  
571 been identified (see critical habitat designations for [North Atlantic Right Whales](#), the [Gulf of](#)  
572 [Maine distinct population segment \(DPS\) of Atlantic Salmon](#) and the [Northwest Atlantic DPS](#)  
573 [of loggerhead sea turtle](#) at [Greater Atlantic Regional Office Protected Resources](#)). This  
574 information is used in a variety of management decisions and recommendations made by  
575 NOAA Fisheries. The [GARFO Habitat Conservation Division](#) and [Protected Resources Division](#)  
576 routinely work together to identify and conserve both EFH and ESA listed species through  
577 either the fishery management process or through consultations with Federal agencies on  
578 actions that may adversely affect those resources. The EFH and ESA consultation processes  
579 are required under Federal regulations and are designed so that Federal agencies and their  
580 partners account for and attempt to minimize adverse effects of their activities on NOAA  
581 trust resources. The [NOAA Chesapeake Bay Office](#) works to protect and restore a variety of  
582 habitats in the Chesapeake Bay watershed. The Chesapeake Bay Interpretive Buoy System  
583 (CBIBS) is one of the most comprehensive coastal monitoring systems in the United States.

584 This, combined with other Chesapeake Bay field programs, makes NCBO a key component  
585 of efforts to couple physical impacts of a changing climate. There are also numerous place-  
586 based management structures that are designed in part to protect habitat. For example,  
587 [Stellwagen Bank National Marine Sanctuary \(SBNMS\)](#) is a region containing a shallow,  
588 primarily sandy bank surrounded by deeper water in the western Gulf of Maine. SBNMS is  
589 heavily utilized by humans and by marine species, including the North Atlantic Right Whale  
590 and Atlantic Cod. The [National Estuarine Research Reserve System](#) has nine sites  
591 throughout the Northeast U.S. Shelf ecosystem stretching from Chesapeake Bay-Virginia  
592 NERRs to Wells NERRs (in Maine). NERRs sites are designated to protect and study estuarine  
593 systems. In addition, the two regional fishery management councils have designated a  
594 number of protected areas specifically for the purpose of habitat protection including  
595 seasonal closures, gear restricted areas, and Habitat Areas of Particular Concern. (HAPC). Of  
596 particular note is the MAFMC [Deep Sea Corals Amendment](#) to the Mackerel, Squid, and  
597 Butterfish Fishery Management Plan (FMP), which protects areas that are known or highly  
598 likely to contain deep sea corals; and, the NEFMC [Habitat Omnibus Amendment 2](#), which  
599 designated EFH and HAPC in New England waters.

600  
601 There are numerous habitat restoration projects underway in the Northeast U.S., which  
602 reduce the stress of human development on marine resources in the region ([NOAA](#)  
603 [Restoration Center Northeast Region](#)). Most rivers and streams in the Northeast U.S.  
604 contain fish passage barriers, which contribute to decreased productivity of many of the  
605 region’s diadromous species. Coastal hardening with concrete seawalls and bulkheads has  
606 increased coastal erosion and negatively impacted coastal habitats. In addition, dredging,  
607 filling, and development have reduced natural coastal habitats. Restoration efforts are  
608 underway throughout the region removing passage barriers, replacing seawalls with “living  
609 shorelines”, repairing salt marsh beds, and widening bridges and culverts to improve tidal  
610 flow in coastal wetlands. Increased gentrification of coastlines also contributes to  
611 destruction of coastal habitat and increased point source pollution. The Social Sciences  
612 Branch has developed community gentrification indicators (Colburn and Jepson 2012) to  
613 track this process.

614  
615 Management and science structures and procedures are well developed and  
616 coordinated. The [New England Fishery Management Council](#), [Mid-Atlantic Fishery](#)  
617 [Management Council](#) and [Atlantic State Marine Fisheries Commission](#) manage fishery  
618 resources and have formal cooperative arrangements. Management of [Atlantic Highly](#)  
619 [Migratory Species \(HMS\)](#) is under authority of the Secretary of Commerce, who has  
620 delegated that authority to NMFS. ). NOAA supports Federally-Recognized Tribes in the  
621 region (see [NOAA Tribal Relations](#)). A [U.S. Tribal Climate Resilience Toolkit](#) has been

622 developed and NOAA is committed to developing policies and procedures that improve  
623 relations and cooperative activities with Federally-Recognized Tribes on a government-to-  
624 government basis. The [Atlantic Scientific Review Group](#) advises NOAA Fisheries on the  
625 status of marine mammal stocks. There is a region-wide stranding and disentanglement  
626 [program](#) for marine mammals and sea turtles. Permitting processes exist for aquaculture in  
627 state waters and there are venues for communicating across the region (see [Aquaculture in](#)  
628 [the Greater Atlantic Region](#)). The [Northeast Regional Ocean Council](#) and the [Mid-Atlantic](#)  
629 [Regional Council on the Ocean](#) are active and developing the concept of Ecosystem-Based  
630 Management in the region as part of the [National Ocean Policy](#). There are numerous federal  
631 (e.g., [Environmental Protection Agency](#), [Fish and Wildlife Service](#), [United States Geological](#)  
632 [Survey](#)), state ([North Carolina Division of Marine Fisheries](#), [Virginia Marine Resources](#)  
633 [Commission](#), [Maryland Department of Natural Resources](#), [Delaware Department of Natural](#)  
634 [Resources and Environmental Control](#), [Pennsylvania Fish and Boat Commission](#), [State of](#)  
635 [New Jersey Department of Environmental Protection](#), [New York State Department of](#)  
636 [Environmental Conservation](#), [Vermont Fish and Wildlife](#), [Connecticut Department of Energy](#)  
637 [and Environmental Protection](#), [Rhode Island Department of Environmental Management](#),  
638 [Massachusetts Division of Ecological Restoration](#), [Massachusetts Division of Marine](#)  
639 [Fisheries](#), [New Hampshire Fish and Game Department](#), [Maine Department of Marine](#)  
640 [Resources](#)), and local agencies and organizations with living marine resource responsibilities  
641 and interest. This list is not complete, but serves to illustrate the management and  
642 organizational infrastructure that is in place in the region.

643  
644 Protected species management has incorporated climate and environmental variables in  
645 standard abundance, distribution, and bycatch analyses. The Atlantic Marine Assessment  
646 Program for Protected Species ([AMAPPS](#)) has been collecting oceanographic and climate  
647 data associated with marine mammal, sea turtle, and sea bird visual and acoustic  
648 observations. These data have been used to model distribution and abundance included in  
649 stock assessments, and as such could be used to predict distribution changes due to climate  
650 change. Mid-Atlantic sea turtle temperature preferences have also been demonstrated via  
651 analysis of both fishery-dependent and -independent data (Murray and Orphanides 2013)  
652 and studies have been completed on the projected response of sea turtle populations to  
653 climate change (Saba et al. 2012). Similarly, sea surface temperature has been used as an  
654 indicator of potential sea turtle-fishery interactions in the southern Mid-Atlantic Bight  
655 (Braun-McNeill et al. 2008). Climate change information is used in ESA decisions in the  
656 region. A [Climate Change Workshop](#) was held as part of the ESA listing determination  
657 process for River Herring and a [Climate Change Subgroup](#) has been established as part of  
658 the Technical Expert Working Group for River Herring. Several studies have been published  
659 on river herring and climate change during this period (e.g., Lynch et al. 2014, Tommasi et

660 al. 2015). Analyses were completed on climate change effects on habitat and distribution of  
661 cusk, which is an ESA Candidate Species (Hare et al. 2012) and there has been substantial  
662 work completed on the effects of climate change and decadal-scale variability on Atlantic  
663 Salmon populations and habitats (e.g., Walsh and Kilsby 2007, Todd et al. 2012, Friedland et  
664 al. 2014, Perry et al. 2015).

665  
666 There is increased recognition of the interaction among climate change, marine  
667 resources, and human communities, which has influenced the thinking about assessment  
668 and management in an ecosystem impacted by climate change. The Fishery Management  
669 Councils are developing Ecosystem-Based Fisheries Management in the region that includes  
670 consideration of climate, species interactions, and habitat. The NEFSC Climate, Ecosystem,  
671 Habitat, and Assessment Steering Group has developed a process for including climate,  
672 ecosystem, and habitat factors into benchmark and update assessments and there are  
673 discussions underway with the Fishery Management Councils to include climate, ecosystem,  
674 and habitat Terms of Reference in update and benchmark assessments. NOAA Fisheries has  
675 developed Guidance for Treatment of Climate Change in NOAA Fisheries ESA Decisions.  
676 Other institutions are also focusing on climate change and contributing to the advancement  
677 of ideas and potential approaches (e.g., [Island Institute](#), [Rhode Island Saltwater Anglers  
678 Association](#), [Cooperative Institute of the North Atlantic Region](#)). There are also numerous  
679 environmental non-governmental organizations (ENGO) active in the region. These range  
680 from organizations working around the world (e.g., [The Nature Conservancy](#), the  
681 [Environmental Defense Fund](#)) to local organizations (e.g., [Save the Bay](#), [Barneget Bay  
682 Partnership](#)). Many of these organizations are actively involved in living marine resource  
683 science and management and contributing to climate change adaptation activities. There  
684 are numerous interactions with GARFO and NEFSC on research projects, Fishery  
685 Management Council committees, and protected species committees and panels.

686  
687 Aquaculture organizations in the region are thinking about the effects of climate  
688 change, primarily ocean acidification, on their businesses ([NROC Aquaculture White Paper](#)).  
689 Studying the effects of climate change on aquaculture organisms and industry is a  
690 component of the [NEFSC Strategic Plan](#). There are regional climate and health related  
691 initiatives working with the aquaculture industry (e.g., [Interstate Shellfish Sanitation  
692 Conference](#), [NCCOS Cooperative Oxford Laboratory](#), [NEFSC Milford Division](#)). Numerous  
693 research activities and educational programs are also underway at regional universities and  
694 research institutions (e.g., [Marine Biological Laboratory](#), [University of North Carolina  
695 Wilmington](#), [University of Rhode Island](#), [Roger Williams University](#), [University of Maine](#)).  
696 Aquaculture is related to other NOAA Fisheries mission areas. For example increasing  
697 physical habitat complexity in the nearshore environment through aquaculture operations

698 can have beneficial impacts affecting the abundance, growth and diversity of juvenile  
699 marine finfish (Clynick et al. 2008). Shellfish aquaculture may also provide important long-  
700 term data sets to inform our understanding of ocean acidification (e.g., [Tracking Ocean](#)  
701 [Alkalinity using New Carbon Measurement Technologies](#)) and how this may affect primary  
702 production within the nearshore coastal and freshwater ecosystems (Gledhill et al. 2015).

703  
704 Finally, the region has made substantial progress on immediate-term actions defined in  
705 the NOAA Fisheries Climate Science Strategy (see Appendix 6):

- 706  
707 1. Conduct climate vulnerability analyses in each region for all Living Marine Resources  
708 to better understand what is at risk and why.

709  
710 The NOAA Fisheries Climate Science Strategy calls for climate vulnerability  
711 analyses in each region for all Living Marine Resources as an immediate action. The  
712 Northeast Fisheries Climate Vulnerability Assessment has been completed and evaluated  
713 the vulnerability to a change in productivity, the potential for a shift in distribution and the  
714 directional effect of climate change on 82 fish and invertebrate species in the region  
715 (Morrison et al. 2016, Hare et al. 2016). This fisheries vulnerability assessment has been  
716 linked to a social vulnerability assessment providing information on the vulnerability of  
717 communities along the east coast to climate change (Colburn et al., in press). Additional  
718 indicators of climate impact to communities are available and in development as part of a  
719 nationwide NOAA Fisheries social indicators project (Jessop and Colburn 2013). Further,  
720 NOAA Fisheries staff from the Northeast U.S. are involved in the development of marine  
721 mammal and sea turtle vulnerability assessments.

- 722  
723 2. Establish and strengthen ecosystem indicators and status reports in all regions to  
724 better track, prepare for and respond to climate-driven changes.

725  
726 The Ecosystem Assessment Program at the NEFSC produces an Ecosystem Status  
727 Report that tracks a number of indicators related to fisheries, protected species, habitat,  
728 aquaculture, and the broader ecosystem, including both social and natural science  
729 indicators. The first Ecosystem Status Report was produced in 2009 ([EcoAp 2009](#)), and  
730 two have been completed subsequently ([EcoAp 2012](#), [EcoAp 2015](#)). The Ecosystem  
731 Assessment Program, working with other groups in the NEFSC, is also developing Annual  
732 Ecosystem Reports for the Fishery Management Councils, and has developed a [Climate](#)  
733 [Change](#) webpage to provide regionally specific information on the changes observed in  
734 the Northeast U.S. Shelf ecosystem and the impacts on Living Marine Resources.



736 3. Develop capacity to conduct management strategy evaluations regarding climate  
737 change impacts on management targets, priorities, and goals.

738  
739 The region is starting to develop Management Strategy Evaluation (MSE)  
740 capabilities. The MAFMC has used an MSE approach to evaluate control-rules for the  
741 Atlantic mackerel fishery ([Wiedenmann 2015](#)). The issue of setting harvest control rules  
742 for data-poor species using an MSE framework has also been dealt with more generally  
743 (Wiedenmann et al. 2013). An MSE framework is being developed to evaluate harvest  
744 control rules in Atlantic herring ([Deroba 2015](#)). Further, the NEFMC is looking to  
745 incorporate MSE-like frameworks into their [Risk Policy](#). The NEFSC has established an  
746 MSE Working Group to continue to develop this approach within NOAA Fisheries. It  
747 includes both social and natural scientists. Although this work is in its infancy, the value  
748 of MSE is recognized in the region and the application of the approach will increase.

### 749 750 **Regional Weaknesses**

751 Despite the number and magnitude of strengths related to incorporating climate change  
752 into the NOAA Fisheries mission in Northeast U.S., there remain substantial weaknesses  
753 that will inhibit the region’s ability to implement the NOAA Fisheries Climate Science  
754 Strategy.

755  
756 Science and management processes have developed around the concept of equilibrium  
757 and the general goal to return a resource or a system to a past equilibrium state. Accepting  
758 that climate change is occurring calls into question one of the basic assumptions of these  
759 models and presents a new challenge to the institutions, infrastructure, and processes that  
760 support living marine resource management. The magnitude of these challenges and  
761 acknowledgement of the additional uncertainties results in well-placed caution in  
762 management advice. Partnerships are critical to obtain the needed information to inform  
763 management. The [NEFSC Strategic Plan](#) recognizes “*the importance of building trust  
764 through full engagement of stakeholders and partners and improved external  
765 communications*”. Similarly, the [GARFO Strategic Plan](#) states “*goals and strategic objectives  
766 rely on close coordination with, and participation of, our partners and stakeholders*”.

767  
768 Although the region has sufficient funding to achieve many of its mandates, living  
769 marine resource assessment and management is still resource limited. There are a number  
770 of data-poor species, assessments where species are of an unknown status, and a number  
771 of questions regarding the effect of climate change, ecosystem interactions, and habitat  
772 effects on living marine resources. Social and economic data to understand the impacts of

773 climate change on people, businesses, and communities that interact with living marine  
774 resources is also limiting. Although progress has been made on integrating climate change  
775 into regional living marine resources management, these efforts are just the beginning.  
776 Addressing these issues more completely will require creative efforts from all stakeholders  
777 including NOAA Fisheries: building collaborations, leveraging resources, identifying common  
778 goals, and other forms of partnering, coordinating, and aligning activities (Nichols et al.  
779 2011).

780

781 Changing species distributions create a number of challenges and opportunities to  
782 resource management. There are two Fishery Management Councils in the Northeast U.S.  
783 region with resources moving across the management boundaries, thus creating added  
784 complication for science and management. There are 12 coastal states in the region and  
785 watersheds extend into 2 other East Coast states. Many of the managed species move  
786 through the Northeast U.S. Shelf Ecosystem during seasonal migrations, occupying other  
787 parts of the Atlantic during other times of the year and coming under an array of different  
788 management authorities (South Atlantic Fisheries Management Council, North Atlantic  
789 Fisheries Organization), states (e.g., South Carolina, Georgia, Florida) and countries (e.g.,  
790 Canada).

791

792 The legal and regulatory framework is complex. Predominant federal laws include the  
793 Magnuson-Stevens Fishery Management and Conservation Act, Atlantic Coastal Fisheries  
794 Cooperative Management Act, the Endangered Species Act, and the Marine Mammal  
795 Protection Act. Numerous other federal laws and agencies interact with the NOAA Fisheries  
796 mission including the National Environmental Policy Act, Deepwater Port Act, and Clean  
797 Water Act to name a few. Regulations include quotas, time and space closures/restrictions,  
798 incidental catch limits, targeted catch limits, limited access-fisheries, gear restrictions and  
799 more. There also are numerous laws and regulations from each of the 14 states and a wide  
800 array of stakeholders that have differing perspectives on and goals for living marine  
801 resource management. Further, the science and management processes are relatively slow;  
802 the time between data collection and management decisions is relatively long. An  
803 important component of climate resilience is developing adaptive management that can  
804 respond to changing conditions. This complexity argues for Ecosystem-Based Management  
805 (EBM) (see Dolan et al. 2015), but getting to a holistic perspective that encompasses  
806 management and regulation and impacts on both marine and human systems is a massive  
807 undertaking. There are institutions and directives that move toward EBM, but integration  
808 with the NOAA Fisheries mission has been slow. However, there is commitment and energy  
809 to support the development of Ecosystem-Based Fisheries Management in the region (see  
810 Dolan et al. 2015), which encompasses integrating climate change into living marine

811 resource management. As EBFM moves forward, there is the need to keep the goals and  
812 approaches of EBM in mind so that in the future, the concepts remain compatible.

813

814 Although the development of EBFM in the Northeast U.S. region is a priority ([NEFSC](#)  
815 [Strategic Plan](#)), there remain major obstacles. NOAA Fisheries and the NEFSC focus most of  
816 the resources on the continental shelf. The Northeast U.S. Shelf ecosystem is highly  
817 connected to coastal and freshwater systems and to offshore systems. Recognition of the  
818 importance of these connections is growing, but there remains work to be done. Similarly,  
819 recognition of the importance of the connections with the Southeast U.S. Shelf and  
820 Canadian waters is growing, but again, there remains work to be done.

821

822 There is a large focus on fisheries issues in the Northeast U.S., and more specifically  
823 finfish. Yet, shellfish, namely Atlantic sea scallop, American lobster, Atlantic surf clam and  
824 ocean quahog are the most valuable fisheries in the region. Northern inshore squid is also  
825 an important resource. Diadromous species, some of which are listed as endangered or  
826 threatened, play an important ecosystem function. Many species in the ecosystem utilize a  
827 wide-range of habitats including freshwater, estuaries, shelf, and in some cases open ocean  
828 systems. Marine mammals, sea turtles, protected fish, aquaculture, habitats, and  
829 ecosystems are part of the NOAA Mission, but financial support and agency focus for these  
830 mission elements is less than that for fisheries management. With less support, the  
831 opportunities to integrate climate change into these areas of the NOAA Fisheries mission is  
832 less. The focus on commercial and recreational fisheries issues contributes in part to the  
833 focus on fishing as the major factor affecting living marine resources in the region. During  
834 the 1970's when foreign fleets were operating in U.S. waters, fishing effort was very high.  
835 As fishing effort has reduced, the relative importance of other processes, including climate  
836 change, in regulating fishery dynamics has increased. Thus factors in addition to fishing  
837 need to be integrated into the assessment and management of living marine resources in  
838 the region. Yet even as fishing (as a factor removing fish from the ocean) has been a strong  
839 focus of concentration, the social, cultural, and economic factors that contribute to how,  
840 when, where, and why people fish have received much less overall attention. Both EBFM  
841 and EBM require ecosystem and human dimensions for effective implementation. This  
842 includes many additional ocean uses besides fishing that impact living marine resources,  
843 such as shipping and energy development.

844

845 Although substantial progress has been made on understanding the potential effects of  
846 climate change on protected species in the region, there remain many more questions.  
847 Many of the protected fish species in the region are relatively data-poor, making basic  
848 assessment of status difficult. There are more than 10 fish species that are a [Candidate](#)

849 [Species under the ESA and/or Species of Concern](#), and [three endangered/threatened fish](#)  
850 [species](#) in the region. A recent emphasis on river herring (the [Technical Expert Working](#)  
851 [Group](#)) has generated new information and there has been research for  
852 endangered/threatened fish species but important gaps remain for these species and  
853 others. Many of these species are diadromous, yet most of the science effort focuses on  
854 Atlantic Salmon ([Northeast Fisheries Science Center Salmon Team](#)) and there is no  
855 coordinated, multidisciplinary effort comparable to the [Northwest Fisheries Science Center](#)  
856 [Watershed Program for developing basic and applied science in support of diadromous](#)  
857 [species in freshwater environments](#). Many of the protected marine mammal and sea turtle  
858 species in the region are also data-poor; approximately half of the marine mammals and all  
859 the sea turtles are classified with low-quality data in the region ([Merrick et al. 2004](#)). Many  
860 of the protected species only use the region for part of the year and climate-related  
861 changes in their use of the Northeast U.S. Shelf ecosystem are largely unexplored.

862  
863 The focus on wild-captured fisheries has de-emphasized aquaculture, but natural  
864 linkages between wild-capture and cultured fisheries are being recognized. The new NEFSC  
865 Strategic Plan includes aquaculture under a Sustainable Fisheries Theme, so integration is  
866 beginning. The demand for domestic marine aquaculture is increasing rapidly ([Fisheries of](#)  
867 [the United States 2013](#)), as is the demand for science to support sustainable aquaculture.  
868 The Northeast U.S. region makes up approximately 30% of the national aquaculture  
869 production. Efforts are also expanding to include offshore areas as well as traditional  
870 nearshore areas. There are a number of intersections between climate change and  
871 aquaculture in the Northeast U.S. region, including the impact of sea-level rise on  
872 aquaculture operations and the effect of ocean acidification and warming on cultured  
873 species. Sustainable aquaculture practices such as [Integrated Multi-Trophic Aquaculture](#)  
874 can provide important ecosystem functions such as habitat enhancement through a  
875 combination of seaweed, finfish, clam, oyster and mussel culture; considering the effect of  
876 climate change on the interactions between these components is an important need. There  
877 is a lot of science needed to support this growing industry and its resilience and adaptation  
878 to climate change.

879  
880 Much of the fishing infrastructure in the Northeast U.S. is vulnerable to sea-level rise as  
881 are many local communities (Colburn et al. in press). The science infrastructure is also  
882 vulnerable to sea-level rise. Many living marine resources will be impacted by sea-level rise,  
883 primarily through loss of coastal and estuarine habitats. There will be additional indirect  
884 effects of sea-level rise, including the release of land-based contaminants into marine  
885 systems and changes in trophic interactions. Many of these impacts and interactions are  
886 poorly understood in the context of living marine resource management.

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In addition to the numerous issues listed above, there are a number of scientific issues in the region that limit furtherance of the NOAA Fisheries Climate Science Strategy. One main issue, and perhaps the critical issue, is the general lack of mechanistic understanding; most of the work completed in the region to date is correlative and/or descriptive. For example, species distribution modeling estimates a correlative function between components of the environment and species occurrence or abundance (see Hare et al. 2012). These past studies have made critical findings, but it is now necessary to increase our understanding of the mechanisms and the incorporation of these mechanisms into modeling. This is true for both social and natural science issues and assessments. Similarly, our understanding of the links between habitat, productivity, and distribution is limited as is our knowledge of the spatial extent of habitats (e.g., mapping of pelagic and benthic habitats).

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The Northeast U.S. shelf ecosystem is highly seasonal and has one of the greatest seasonal ranges in temperatures in the world (Liu et al. 2005). In response, many living marine resources move into and out of the Northeast U.S. shelf ecosystem or move among different regions of the ecosystem. These movements coupled with the governance complexity, exposes resources to a range of different regulations, stressors, and authorities throughout the year. The strong seasonality can also create a bias in surveys and other data collection in the system. Approaches have been developed for correcting the NEFSC Bottom Trawl survey for bias introduced by survey sampling through dynamic habitat. In essence this approach addresses the assumption that the survey is synoptic and calculates the availability of a species to the survey through time and space ([NEFSC 2014](#)).

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Although the region has substantial observing capabilities, decreases in funding and limited coordination present challenges. Further, limited coordination between adjoining regions poises problems for understanding climate impacts on living marine resources that move between and are distributed over different regions (e.g., the Southeast U.S. Shelf Ecosystem, the Scotian Shelf Ecosystem). Support for long-term ecosystem and climate observations has decreased with termination of the 50 year Continuous Plankton Recorder (CPR) survey and decreasing the Ecosystem Monitoring program (EcoMon) from 6 to 4 shelf-wide surveys per year. Data collected during the EcoMon surveys is particularly relevant to the NOAA Fisheries Climate Science Strategy, with approximately 95% of the hydrographic data for the Northeast U.S. Shelf in the World Ocean Database coming from the NEFSC. Efforts are underway to restore this program, and the Ecosystem Monitoring Survey increased to 5 surveys per year in FY2016, but some of the surveys have been limited by ship time allocations and ship maintenance issues resulting in incomplete surveys

925 of the Northeast U.S. Shelf. Additionally, the CPR program has ended and operations have  
926 been transferred to the [Sir Alister Hardy Foundation of Ocean Science](#). There are a number  
927 of other long-term observing programs in the Northeast U.S., but coordination across the  
928 ecosystem is limited. [MARACOOS](#) and [NERACOOS](#) have some interaction, but the platforms  
929 used are very different, resulting in differing coverage across the ecosystem. Similarly, the  
930 [Pioneer Array](#) is coming on line, but this is a 5 year deployment and not well integrated with  
931 other large observing programs in the region. While new technologies are being develop,  
932 operational use remains limited, as does the collaborative use of data across disciplines and  
933 institutions. Social science observing systems, such as regular social and economic surveys,  
934 are also limited and not well integrated with the physical and biological observing systems.  
935 Further, there has been little work on including social and economic variables in climate  
936 models and it is difficult to attach social and economic variables to pre-existing marine-  
937 species based and ecosystem models due largely to fit-of-scale issues. In addition,  
938 ethnographic research that provides context similarly limited in funding and integration  
939 with quantitative models is much less well understood. Qualitative data can, however, be  
940 more easily integrated into conceptual models; that is a starting point currently being  
941 explored and linked to MSEs

942  
943 Another weakness in the region is relative general lack of familiarity with climate data,  
944 ability to work with large, complex datasets, and ability to integrate data across datasets  
945 and disciplines. The lack of familiarity extends across most institutions and stakeholders in  
946 the region. The increased use of new technologies (e.g., acoustics and optics) exacerbates  
947 this problem. The distributed nature of data also presents a problem. Clearly, there are  
948 individuals and work groups that have the capacity and knowledge to integrate climate and  
949 living marine resource data, but these skills are not widespread. In addition, the availability  
950 of consolidated data and indicators is not wide-spread.

951  
952 There are major scientific questions that need to be investigated to advance the NOAA  
953 Fisheries Climate Science Strategy. For one, there is the specific need for information on  
954 ocean acidification effects on living marine resources in the region. Molluscs and  
955 crustaceans represent the majority of commercial landings from a value perspective, but  
956 there is relatively little specific information on the effects of ocean acidification on  
957 federally-managed molluscs and crustacean species. In fact, although there has been  
958 important research on many species in the Northeast U.S., many others remain data poor.  
959 Understanding of species interactions is also limited. Without this basic knowledge,  
960 developing information on how species interactions will change as a result of climate  
961 change is extremely difficult. Questions related to prey switching, functional forms, trophic  
962 transfer, and forage are all important and relevant to climate change. On the social science

963 side, questions related to fishermen decision-making in response to climate change (e.g.,  
964 switch species, take longer trips to follow species no longer common where previously  
965 fished, move entire households to new communities nearer previously fished species) are  
966 poorly understood and funds for research are limited.

967  
968 There are also major needs from the climate modeling perspective. Most climate  
969 models are relatively coarse resolution (approximately 100 km). Higher-resolution climate  
970 models have demonstrated that changes in regional circulation patterns are an important  
971 component of climate change. Thus higher resolution global models and downscaled, higher  
972 resolution regional models are needed. Another modeling issue is the development,  
973 evaluation, and use of models that have skill on the 1-20 year time frame. Most work to  
974 date has focused on the 50+ year time frame highlighting the impact of climate change on  
975 long-term dynamics. However, most living marine resource decisions are made on shorter  
976 time scales. Finally, the issue of model and data continuity is critical. Most if not all of the  
977 physical and climate modeling will be developed outside of NOAA Fisheries. If products are  
978 integrated into management processes, these products need to be operationalized and  
979 their ongoing production assured. As an example, a hindcast climatology product developed  
980 by academic partners was used to support the most recent butterfish assessment. However,  
981 the hindcast has not been updated due to lack of funding. This uncertainty about  
982 continuation of data production, makes its use in the next assessment less valuable and  
983 makes the assessment working groups circumspect about the inclusion of new data,  
984 information, and analyses.

## 985 PRIORITIZATION

986 The definition of strengths and weaknesses in the region lead to the identification of 63  
987 draft actions across the 7 NOAA Climate Science Strategy Objectives (Appendix 3). There was  
988 overlap in some of the draft actions, but all identify important steps in meeting the objectives  
989 of the NOAA Fisheries Climate Science Strategy. The relevant mission area is also identified for  
990 each of the 63 draft actions (Appendix 3).

991  
992 Fifteen Priority Actions were defined from the list of 63 draft actions (discussed below and  
993 listed in Appendix 7). These Priority Actions group similar actions into larger coherent units. For  
994 each Priority Action identified below, specific activities are described under a *No New Resources*  
995 and a *New Resources* scenario. The activities under the *No New Resources* represent potential  
996 activities. The implementation of these activities is dependent on broader, NEFSC and GARFO-  
997 wide prioritization of activities for FY17 and beyond, as well as the annual appropriation of  
998 funds to NEFSC and GARFO and other science demands placed on NEFSC and GARFO. The  
999 activities under the *New Resources* scenario are less dependent on annual appropriations and

1000 other science, regulatory, and management demands, and more dependent on the level of new  
1001 resources available.

## 1002 **4. ACTION PLAN**

### 1003 PRIORITY ACTIONS

1004 Priority Actions are described by NOAA Fisheries Climate Science Strategy objective. Many  
1005 Priority Actions are relevant to multiple objectives, but are aligned with the most relevant  
1006 objective. A list of the Priority Actions is provided first, followed by descriptions of activities  
1007 planned for each Priority Action under the *No New Resources* and *New Resources* scenarios  
1008 (Table 1). The concept is that activities under *No New Resources* would occur as prioritized  
1009 under the Ranking *No New Resources* and these activities would be augmented by additional  
1010 activities as listed under Ranking *New Resources*. These Priority Actions are also mapped  
1011 the immediate, short-term, and intermediate term actions described in the NOAA Fisheries  
1012 Climate Science Strategy.

1013  
1014 [Priority Action 1 - Give greater emphasis to climate-related Terms of Reference and](#)  
1015 [analyses in stock assessments.](#)

1016  
1017 [Priority Action 2 - Continue development of stock assessment models \(e.g., Age Structured](#)  
1018 [Assessment Program, new state-space model, multi-species models\) that include](#)  
1019 [environmental terms \(e.g., temperature, ocean acidification\).](#)

1020  
1021 [Priority Action 3 - Develop climate- related products and decision support tools to support](#)  
1022 [protected species assessments and other management actions.](#)

1023  
1024 [Priority Action 4 - Increase social and economic scientist involvement in climate change](#)  
1025 [research.](#)

1026  
1027 [Priority Action 5 - Develop Management Strategy Evaluation capability to examine the](#)  
1028 [effect of different management strategies under climate change.](#)

1029  
1030 [Priority Action 6 - Improve spatial management of living marine resources through an](#)  
1031 [increased understanding of spatial and temporal distributions, migration, and phenology.](#)

1032  
1033 [Priority Action 7 - Continue to build industry-based fisheries and ocean observing](#)  
1034 [capabilities and use information to develop more adaptive management.](#)

1035



1036 [Priority Action 8 - Work with NOAA Oceanic and Atmospheric Research and academic](#)  
1037 [scientists to develop short-term \(day to year\) and medium-term \(year to decade\) living marine](#)  
1038 [resource forecasting products.](#)

1039  
1040 [Priority Action 9 - Work with NOAA Oceanic and Atmospheric Research and academic](#)  
1041 [scientists to develop and improve regional hindcasts and climatologies.](#)

1042  
1043 [Priority Action 10 - Conduct research on the mechanistic effects of multiple climate factors](#)  
1044 [on living marine resources with a goal of improving assessments and scientific advice provided](#)  
1045 [to managers.](#)

1046  
1047 [Priority Action 11 - Develop and implement vulnerability assessments in the Northeast U.S.](#)  
1048 [Shelf Region.](#)

1049  
1050 [Priority Action 12 - Continue production of the Ecosystem Status Report, and other related](#)  
1051 [products, and improve the distribution of information from the reports through the formation](#)  
1052 [of an Environmental Data Center.](#)

1053  
1054 [Priority Action 13 – Maintain ecosystem survey effort in the Northeast U.S. Shelf ecosystem](#)  
1055 [including the Bottom Trawl Survey, Ecosystem Monitoring Program, Sea Scallop Survey,](#)  
1056 [Northern Shrimp Survey, and Protected Species Surveys and expand where possible \(e.g., data](#)  
1057 [poor species\).](#)

1058  
1059 [Priority Action 14 – Initiate a Northeast Climate Science Strategy Steering Group \(NECSSSG\)](#)  
1060 [to coordinate, communicate, facilitate, and report on issues related to climate change and](#)  
1061 [living marine resource management.](#)

1062  
1063 [Priority Action 15 – Coordinate with other NOAA Programs to link living marine resource](#)  
1064 [science and management to climate science and research activities](#)

1065

1066 Table 1. Summary of Priority Actions and Ranking Under No New and New Resources Scenarios.

1067

NOAA Fisheries Climate Science Strategy Objective	Priority Action Number	Action Statement	Ranking No New Resources	Ranking New Resources	Draft Actions (see Appendix 3)	Requested Resources (\$1,000's)	Cumulative Requested Resources (\$1,000's)	Details of Requests
1	2	Continue development of stock assessment models (e.g., Age Structured Assessment Program, new state-space model, multi-species models) that include environmental terms (e.g., temperature, ocean acidification).	1	1	32	150	150	1 FTE
3	6	Improve spatial management of living marine resources through an increased understanding of spatial and temporal distributions, migration, and phenology.	5	2	13, 14, 19, 34	150	300	1 FTE
1	3	Develop climate related products and decision support tools to support protected species assessments and other management actions.	12	3	31, 35, 40	90	390	1 post-doc
5	10	Conduct research on the mechanistic effects of multiple climate factors on living marine resources with a goal of improving assessments and scientific advice provided to managers	4	4	1, 2, 3, 10	100	490	1 post-doc + 10K supplies
2	5	Develop Management Strategy Evaluation capability to examine the effect of different management strategies under climate change.	9	5	28	90	580	1 post-doc
4	8 & 9	Work with NOAA Oceanic and Atmospheric Research and academic scientists to develop short-term (day to year) and medium-term (year to decade) living marine resource forecasting products. Work NOAA Oceanic and Atmospheric Research and academic scientists to develop and improve regional hindcasts and climatologies.	8	6	36, 37, 38	180	760	2 post-docs
6	12	Continue production Ecosystem Status Report, and other related products, and improve the distribution of information from the reports through the formation of an Environmental Data Center	6	7	26, 51	175	935	1 IT contractor + 25K
7	14	Initiate a Northeast Climate Science Strategy Steering Group (NECSSSG) to coordinate, communicate, facilitate, and report on issues related to climate change and living marine resource management	7	8	23, 25, 33, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62	190	1,125	1 post-doc + 100K workshops
6	11	Develop and implement vulnerability assessments in the Northeast U.S. Shelf Region	10	9	43, 44, 45, 46, 47, 48	150	1,275	1 FTE
3	7	Continue to build industry-based fisheries and ocean observing capabilities and use information to develop more adaptive management.	13	10	20, 27	175	1,450	1 IT contractor + 25K
2	4	Increase social and economic scientist involvement in climate change research.	11	11	8	90	1,540	1 post-doc
1	1	Give greater emphasis to climate-related Terms of Reference and analyses in stock assessments.	3	12	30	0	1,540	No new resources
7	13	Maintain ecosystem survey effort in the Northeast U.S. shelf ecosystem including the Bottom Trawl Survey, Ecosystem Monitoring Program, Sea Scallop Survey, Northern Shrimp Survey, and Protected Species Surveys.	2	13	22	180	1,720	1 FTE +30K
3	6	Improve spatial management of living marine resources through an increased understanding of spatial and temporal distributions, migration, and phenology.	5	14	13, 14, 19, 34	90	1,810	1 post-doc
5	10	Conduct research on the mechanistic effects of multiple climate factors on living marine resources with a goal of improving assessments and scientific advice provided to managers	4	15	1, 2, 3, 10	100	1,910	1 post-doc + 10K supplies
2	5	Develop Management Strategy Evaluation capability to examine the effect of different management strategies under climate change.	9	16	28	90	2,000	1 post-doc
7	15	Watershed Program for the East Coast	17	17	5, 6, 12, 24, 39, 50, 63	0	2,000	
7	15	Links to NOAA Fisheries Habitat Programs	14	19	17, 49	0	2,000	
3	15	Links to NOAA Integrated Ecosystem Assessment Program and Ecosystem-Based Fisheries Management	15	20	29, 52	0	2,000	
5	15	Links to NOAA Ocean Acidification Program	16	21	9, 11	0	2,000	
7	15	Links to NOAA Fisheries Office of Aquaculture	19	22	18, 41, 42	0	2,000	
5	15	Other Actions Identified	18	18	4, 7, 15, 16, 21	0	2,000	

1068

1069

1070 DESCRIPTIONS OF PRIORITY ACTIONS

1071 Objective 1 - Identify appropriate, climate-informed reference points for managing  
1072 LMRs.

1073  
1074 Priority Action 1 - Give greater emphasis to climate-related Terms of Reference and  
1075 analyses in stock assessments.

1076  
1077 In general, two categories of stock assessments are conducted by the NEFSC:  
1078 benchmark assessments and update assessments. Benchmark assessments evaluate new  
1079 models, new data, and new approaches to conducting the assessment. Update assessments  
1080 use a previously defined methodology from the previous benchmark assessments and  
1081 update the data and re-run the models. Since most NEFSC assessments currently do not  
1082 include climate factors, the introduction of these factors would need to take place in  
1083 benchmark assessments. The terms of reference (TORs) for conducting a benchmark  
1084 assessment establish the information requirements of managers and outline the types of  
1085 models and analyses that would be included in the assessment. Prior to each assessment,  
1086 the TORs are agreed to by the NEFSC, GARFO, and the appropriate management body (i.e.,  
1087 NEFMC, MAFMC, ASMFC). The assessment schedule is developed by the Northeast Region  
1088 Coordinating Council (NRCC), which includes high-level representatives from the NEFSC,  
1089 GARFO, MAFMC, NEFMC, and ASMFC. Assessment scheduling is an NRCC consensus  
1090 decision, but the NEFSC Science and Research Director has the ultimate responsibility for  
1091 staff tasking and prioritization (see Description of the process in [Stock Assessment Peer-](#)  
1092 [Review Process](#) for more details).

1093  
1094 In 2009, an Office of Inspector General recommended that NOAA should more  
1095 aggressively pursue ecosystem approaches to fisheries management, which requires  
1096 additional data and new models. As a result, the NEFSC started including ecosystem TORs in  
1097 benchmark stock assessments. However, many of these ecosystem analyses were  
1098 conducted in parallel with assessment modeling and not incorporated into the assessment.  
1099 In 2014, the NEFSC formed the Climate, Ecosystem, Habitat, and Assessment Steering Group  
1100 to provide structure and direction to NEFSC efforts pertaining to climate, ecosystem, and  
1101 habitat research, and the integration and inclusion of this research into the assessments of  
1102 living marine resources. More broadly, the group aims to provide guidance on the  
1103 development and application of Ecosystem-Based Fishery Management (EBFM) in the  
1104 Northeast Region. This group has developed guidance on the incorporation of climate,  
1105 ecosystem, and habitat factors into the TORs for assessments, but NRCC partners have not

1106 reviewed this guidance, nor has it been fully implemented in the development of TORs for  
1107 benchmark assessments.

1108  
1109 *No New Resources* – The NEFSC would continue to work to include climate-related TORs in  
1110 stock assessments. However, this should be done in partnership with the other NRCC  
1111 members. In addition, because of the linkages between climate, ecosystem, and habitat  
1112 issues, new developments in ecosystem understanding (e.g., ecosystem targets, thresholds)  
1113 and habitat understanding (e.g., availability, population productivity) should also be  
1114 included in TORs. In FY17, the NEFSC plans to hold a workshop to review previous efforts to  
1115 incorporate climate, ecosystem, and habitat factors in assessments. The workshop would  
1116 include participants from NEFSC, GARFO, NEFMC, MAFMC, and ASMFC, as well as scientists  
1117 and managers from other institutions. This workshop should focus on assessments  
1118 completed in the Northeast region, but should also examine examples from other regions.  
1119 Barriers to including climate, ecosystem, and habitat factors in assessments should be  
1120 identified and draft guidelines prepared for the inclusion of these factors in assessments.  
1121 Based on this workshop, a plan for climate, ecosystem, and habitat-related TORs should be  
1122 presented at the NRCC for discussion and eventual consensus approval. These guidelines  
1123 should then be used in subsequent assessments. Further, the guidelines should be reviewed  
1124 in a workshop in FY20. The format should be similar to the FY17 workshop, with an added  
1125 topic of progress made over the three years. The guidelines should then be revised and  
1126 presented to the NRCC again for discussion, changes, and eventually consensus approval.

1127  
1128 *New Resources* – No resources are needed for this action. But many of the other actions  
1129 directly relate to improving assessments and these improvements should be incorporated  
1130 into assessment TORs. Thus, the review of climate, ecosystem, and habitat factors in  
1131 assessment TORs in FY20 should be an important measure of the success of the Regional  
1132 Action Plan.

1133  
1134 Priority Action 2 - Continue development of stock assessment models (e.g., Age  
1135 Structured Assessment Program, new state-space model, multi-species models) that include  
1136 environmental terms (e.g., temperature, ocean acidification).

1137  
1138 Over the past several years, a number of stock assessment models have been modified  
1139 to be able to include environmental effects. Previous assessment models in the Northeast  
1140 U.S. could not include environmental terms even if an environmental effect was known.  
1141 Four recent efforts highlight the progress that has been made and provide examples for  
1142 future work from which to build.

- 1143 1. A state-space assessment model has been developed that simultaneously treats  
1144 environmental covariates as stochastic processes and estimates their effects on  
1145 recruitment (Miller et al. 2015). The model was applied to Southern New England  
1146 Yellowtail Flounder using data from the most recent benchmark assessment. Both  
1147 spawning stock biomass and the environment (i.e., Mid-Atlantic Bight cold pool)  
1148 were important predictors of recruitment and led to annual variation in estimated  
1149 biomass reference points and associated yield. This study also emphasized the  
1150 importance to the stock assessment forecast of being able to forecast the  
1151 environmental effect; this need is addressed in Priority Actions 8 & 9.
- 1152 2. The ability to incorporate an environmental covariate was built into the Age-  
1153 Structured Assessment Program (Miller and Legault 2015). This new formulation is  
1154 being used to investigate the effect of warming on the rebuilding of Southern New  
1155 England Winter Flounder (Bell et al., in prep). Stock Synthesis is another model that  
1156 has been applied globally, but rarely used in the Northeast U.S. Most of the  
1157 parameters in Stock Synthesis can change over time in response to environmental or  
1158 ecosystem factors (Methot and Wetzel 2013). This functionality can be used in the  
1159 future to advance the incorporation of climate change in stock assessments.
- 1160 3. The assessment model used for Atlantic sea scallops was recently coupled to a  
1161 biogeochemical model to investigate the effects of ocean acidification and warming  
1162 on scallop dynamics. Three effects were included: ocean acidification effects on  
1163 larval survival, ocean acidification effects on adult growth, and warming effects on  
1164 adult growth (Cooley et al. 2015).
- 1165 4. Species distribution modeling was used to define the thermal habitat of Butterfish  
1166 (NEFSC 2014). The time and space sampling of this dynamic habitat by the NEFSC  
1167 Bottom Trawl was then used to estimate the amount of habitat sampled versus the  
1168 total amount of habitat. These values were used to bound the availability estimates  
1169 in the stock assessment model. A similar procedure was also used in the Scup and  
1170 Bluefish assessment.

1171  
1172 There are other approaches that are under development, in the Northeast region and  
1173 elsewhere and these approaches form the foundation for continued progress incorporating  
1174 climate factors in assessment models.

1175  
1176 *No New Resources* – With no new resources, current efforts would continue. Many of  
1177 these efforts have been supported by internal fund competitions (e.g., NOAA Ocean  
1178 Acidification Program, NOAA Fisheries Improve a Stock Assessment, NOAA Fisheries Stock  
1179 Assessment Analytical Methods, NOAA Fisheries and the Environment, NOAA Fisheries  
1180 Habitat Information Use in Stock Assessments). Priorities should be discussed by the

1181 Climate, Ecosystem, Habitat and Assessment Steering Group and collaborative efforts  
1182 across the NEFSC and with other researchers in the region should be encouraged.

1183

1184 *New Resources* - Hire a federal employee (or postdoctoral associate) to complement  
1185 expertise already at the Center and develop applications of models within the current stock  
1186 assessment process. The position would work closely with the Fisheries and the  
1187 Environment staff and other NEFSC staff involved in linking stock assessment models with  
1188 climate factors. The position would also work with other stock assessments staff in ways to  
1189 incorporate environmental terms in stock assessments. Priorities would be discussed by the  
1190 Climate, Ecosystem, Habitat, and Assessment Steering Group. In addition, in FY18 the NEFSC  
1191 would host a workshop on including environmental variables in stock assessment. The  
1192 workshop would build off a similar effort hosted by the Massachusetts Marine Fisheries  
1193 Institute, Incorporating Change in Assessments and Management, held in 2013. The  
1194 purpose of the workshop would be to review efforts throughout the Northeast U.S. region  
1195 and identify common themes and important limitations of the methods. The results of this  
1196 workshop would then be used to direct the work of the federal employee (or postdoctoral  
1197 associate) in FY19-FY21.

1198

1199 Priority Action 3 - Develop climate- related products and decision support tools to  
1200 support protected species assessments and other management actions.

1201

1202 Climate change is an important consideration for meeting management objectives  
1203 under the ESA and MMPA. The impact of climate change on the current and future status  
1204 of a species is a factor considered when determining whether the species warrant listing  
1205 under the ESA. NMFS also considers the impacts of climate change to ESA listed species'  
1206 habitats and ecosystems. In addition, when considering effects of actions on ESA listed  
1207 species in ESA section 7 consultations, consideration is given to how the effects of activities  
1208 may change due to climate change, as well as the impact of climate change on the future  
1209 survival and recovery of listed species and designated critical habitat. Previous work  
1210 completed in the Northeast U.S. focused on changes in habitat and used species distribution  
1211 models coupled with climate models to project changes in habitat volume and distribution  
1212 (Hare et al. 2012, Lynch et al. 2014). These studies were part of a larger effort to understand  
1213 the interaction between climate change and the Endangered Species Act for NOAA Fisheries  
1214 (Seney et al. 2013).

1215

1216 NOAA Fisheries developed Guidance for the Treatment of Climate Change in NMFS ESA  
1217 Decisions subsequent to the above-mentioned studies. The guidance recognizes that  
1218 climate change makes the evaluation of protected species more difficult by changing the

1219 future extinction risk to a species. The guidance provides specific instructions for  
1220 incorporating climate change in ESA considerations:

- 1221 • Consideration of future climate condition uncertainty
- 1222 • Selecting a climate change projection timeframe
- 1223 • Evaluating the adequacy of existing regulatory mechanism to reduce greenhouse  
1224 gas emissions.
- 1225 • Critical habitat designation in a changing climate
- 1226 • Consideration of future beneficial effects
- 1227 • Responsiveness and effectiveness of management actions in a changing climate
- 1228 • Incorporating climate change into project designs

1229  
1230 Based on this guidance, NOAA Fisheries would need additional scientific support for ESA-  
1231 related decisions and actions. Information is also important to inform proactive  
1232 conservation efforts for Species of Concern.

1233  
1234 The regulatory framework for marine mammals is different than for endangered species  
1235 (MMPA vs ESA)<sup>2</sup>, but climate change creates similar uncertainty in the assessment of status  
1236 and threats. Marine mammal assessments follow National [Guidelines for Assessing Marine  
1237 Mammal Stocks \(GAMMS\)](#). Distribution of marine mammals is likely to be impacted by  
1238 climate change through oceanographic changes and changes in prey distributions (Macleod  
1239 2009). These changes in distribution may impact Take Reduction Plans design to limit the  
1240 take of marine mammals through other human activities. Climate change may also impact  
1241 the productivity of some marine mammals. For example, decreases in prey abundance may  
1242 reduce productivity of North Atlantic Right Whale (Meyer-Gutbrod et al. 2015). Although  
1243 assessment guidelines are national, there is a clear need to incorporate climate change  
1244 consideration in marine mammal assessments and management in the Northeast U.S.  
1245 region, including changes in the physical environment, changes in habitat conditions, and  
1246 changes in species interactions.

1247  
1248 *No New Resources* – Climate-related efforts supporting ESA and MMPA actions would  
1249 continue at a low level. Current efforts include work on North Atlantic Right Whale, Atlantic  
1250 Salmon, sea turtles, and river herring; these efforts should continue. To the extent that  
1251 additional support can be provided (e.g., Fisheries And The Environment, Office of  
1252 Protected Resources, staff re-alignments) these approaches should be applied to other  
1253 species (e.g., thorny skate). Support for the Marine Mammal and Sea Turtle Climate

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<sup>2</sup> Some marine mammals are listed under the ESA.

1254 Vulnerability Assessment should also continue (see [Priority Action 11](#)). Finally, NEFSC and  
1255 GARFO staff should initiate a strategic discussion regarding the support for climate  
1256 information in ESA and MMPA actions and the NEFSC Climate, Ecosystem, Habitat and  
1257 Assessment Steering Group should lead this discussion. The NOAA Fisheries Guidance for  
1258 the Treatment of Climate Change in NMFS ESA Decisions should be reviewed in FY16 and  
1259 ESA-related decisions should be supported in the FY16-FY21 period. In addition, a workshop  
1260 should be convened in early FY17 to review the Guidelines for Assessing Marine Mammal  
1261 Stocks (GAMMS) related to climate change and a regional strategy should be developed.  
1262 The focus should be on defining the approaches for including climate change in MMPA  
1263 assessments and decisions and the type of climate information required. This strategy  
1264 should then be followed to the extent possible during the FY17-FY21 period.

1265  
1266 *New Resources* – Support a postdoctoral associate to work on incorporating climate  
1267 change factors in ESA and MMPA assessments and decisions. The postdoctoral associate  
1268 would work with NEFSC and GARFO staff on a jointly agreed upon topic and provide  
1269 scientific products in support of decisions. Topics may include climate related changes in the  
1270 physical environment, habitat conditions and species interactions. The postdoctoral  
1271 associate would also provide climate expertise to other projects by providing and reviewing  
1272 information used in a variety of decisions. The position would focus on population  
1273 projections with the inclusion of climate factors using species distribution models,  
1274 population models, or ecosystem models.

1275  
1276 Objective 2 - Identify robust strategies for managing LMRs under changing climate  
1277 conditions.

1278  
1279 Priority Action 4 - Increase social and economic scientist involvement in climate change  
1280 research.

1281  
1282 Ecosystems include humans and climate change acts on human communities both  
1283 directly (e.g., sea-level rise) and indirectly (e.g., species range shifts). There is an ongoing  
1284 effort in the NEFSC to integrate social science into ecosystem science in the Northeast U.S.  
1285 region. Recent work in this collaboration includes portfolio analyses in the MAFMC  
1286 Ecosystem Guidance documents (Jin et al. 2016, Gaichas et al. 2016). The Northeast  
1287 Fisheries Climate Vulnerability Assessment has been linked to a set of social indicators to  
1288 evaluate the vulnerability of human communities to climate change (Colburn et al. in  
1289 review; Hare et al. 2016; Morrison et al. 2015). The [ICES WGNARS](#) is also incorporating  
1290 human dimensions into a regional Integrated Ecosystem Assessment, which includes a  
1291 conceptual model linked to an MSE approach.



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*No New Resources* – Continue time series analysis on changes in community resilience and vulnerability including those for climate change, and engage with Coastal and Ocean Climate Applications projects (see [Appendix 4](#)). NEFSC and GARFO are working to discern possible strategies for boosting community resilience within NMFS legal authorities based on results of the [GARFO/West Coast Region Community Resilience Working Group](#). In addition, review Council oversight for cases where species are likely to move to areas under the jurisdiction of a different council or councils and advise the Councils of the need to revise FMPs to include analyses of the impacts of climate change on any proposed regulatory measures. Make use of existing community social and climate vulnerability indicators and of the new such indicators that can be constructed with additional funds. NEFSC and GARFO are also working to communicate results of community vulnerability assessments to states and communities. Social and natural scientists could present talks on research that may be used in Environmental Impact Statement NEPA documents. Continue to provide social scientist support for development of EBFM in Northeast U.S. region. Conduct literature review of local ecological knowledge and climate, as well as conceptual modeling of the relationships involved. Include Community Social Vulnerability indicators (including to climate change) in annual Ecosystem Reports for the Fishery Management Councils and Atlantic States Marine Fisheries Commission, fisheries engagement indicators can be calculated annually, as can community level sea-level rise data. Census-based indicators are available every five years.

*New Resources* – Hire postdoctoral associate or contractor to expand social vulnerability work and Community Social Vulnerability Indicators (e.g., social capital) and to contribute to the development of integrated models (e.g., Atlantis). Efforts would also increase to conduct and analyze new sets of oral histories that record the heritage and local knowledge of fishermen and fishing communities particularly in relation to climate change and resilience strategies (e.g., Folke et al. 2005, Azzurro et al. 2011). Expand cooperative research opportunities and include fishermen in all stages of the research, not just data collection but also planning and evaluation. Fund informational outreach presentations by scientists to be held throughout the region, in order to facilitate access to as many fishermen and fishing community members as possible. Add the community-level indices based on Hare et al. (2016) and Morrison et al. (2015) species vulnerability indicators and community-level indices of marine infrastructure vulnerability to various levels of sea-level rise to Ecosystem Status Reports.

1329 Priority Action 5 - Develop Management Strategy Evaluation capability to examine the  
1330 effect of different management strategies under climate change.

1331  
1332 Management strategy evaluation (MSE) is a simulation technique that allows the  
1333 evaluation of a range of management options and identifies tradeoffs in performance  
1334 across the range of options (A’mar et al. 2008). An operating model is developed to  
1335 represent the “true” dynamics of the system, based on current understanding. An  
1336 estimation model is used to assess the state of the system based on various observing or  
1337 sampling processes. Finally, the effect of different management strategies can be examined  
1338 in the context of the operating and simulating model. Conceptually, MSE is similar to ocean  
1339 observing system simulation experiment (OSSE) framework (Arnold and Dey 1986). Several  
1340 MSEs have been developed in the Northeast U.S. region: 1) to examine harvest controls  
1341 rules for the MAFMC ([Wilberg et al., 2015](#)), 2) to evaluate harvest control rules for Atlantic  
1342 mackerel ([Wiedenmann, 2015](#)) and 3) evaluate management and regulatory options for  
1343 summer flounder ([Wiedenmann and Wilberg, 2014](#)). There are also several MSEs underway  
1344 in the NEFSC including an evaluation of harvest control rules in Atlantic herring and multi-  
1345 species management procedure testing (e.g., [Deroba 2015](#)) . Although MSEs have been  
1346 developed in the region, they have not been used to evaluate the effect of climate change  
1347 on living marine resource management.

1348  
1349 *No New Resources* –There is very little climate-related MSE work that can be conducted  
1350 without new resources. The NEFSC should continue to develop MSEs and seek external  
1351 funding to apply the approach to climate-related issues. The NEFSC should also continue to  
1352 work with academic scientists involved in MSE work in the region. Finally, the NEFSC and  
1353 GARFO should continue to work the NEFMC, MAFMC, and ASMFC to incorporate climate  
1354 factors into management and regulatory frameworks.

1355  
1356 *New Resources* - Hire a federal employee and a postdoctoral associate to work on  
1357 climate-related MSEs at the regional level and contribute to the National level effort. These  
1358 new staff would work closely with NEFSC staff already working on MSEs. These scientists  
1359 would evaluate different management strategies related to changing distributions and  
1360 productivity through direct (e.g., thermal tolerance, ocean acidification effects) or indirect  
1361 (e.g., species interactions, habitat) effects. They would also evaluate the impacts of climate-  
1362 related regime shifts and climate-driven changes in habitat. They would work both on  
1363 fishery and protected species issues including: climate-informed reference points, spatial  
1364 allocations, ESA Section 7 and MSA EFH consultations (time of year windows and spatial  
1365 overlaps), FMP and TRP regulations (dates of requirements, spatial closures), ESA listing  
1366 decisions (extinction risk considerations), ESA recovery plans and candidate species (future

1367 changing recovery needs). Finally, a workshop would be held in FY17 and FY19 to examine  
1368 adaptive management responses to climate change. This workshop would include NOAA  
1369 Fisheries, NEFMC, MAFMC, and ASMFC committee members and staff, and academic  
1370 scientists and would seek to review the current state of use of MSE in the region, define  
1371 various adaptive management responses, and discuss how these responses can be  
1372 evaluated with MSE. This workshop would then guide NEFSC work related to this Action  
1373 from FY18-FY21.

1374

1375 Objective 3 - Design adaptive decision processes that can incorporate and respond to  
1376 changing climate conditions.

1377

1378 Priority Action 6 - Improve spatial management of living marine resources through an  
1379 increased understanding of spatial and temporal distributions, migration, and phenology.

1380

1381 There is ample evidence that species distributions on the Northeast U.S. Shelf are  
1382 changing (Nye et al. 2009, Pinsky et al. 2014, Kleisner et al 2016, Walsh et al. 2016). Studies  
1383 include adult fish and invertebrates, fish early life history stages, fishery landings, and North  
1384 Atlantic Right Whale distributions. A recent Fisheries Climate Vulnerability Assessment  
1385 found that most managed fish and invertebrate species in the region have a high or very  
1386 high potential for a change in distribution (Hare et al. 2016). Species distribution models  
1387 coupled with climate models have indicated that changes in distribution will continue for  
1388 the foreseeable future. These changes are not unidirectional. Many species are shifting  
1389 northward and into deeper waters, but a recent study finds that in the Gulf of Maine  
1390 species are shifting to deeper waters and to the southwest, where waters are cooler  
1391 (Kleisner et al. 2016). However, not all changes in distribution are associated with climate  
1392 factors; the northward expansion of summer flounder on the Northeast U.S. Shelf was  
1393 attributed to a growing population and larger fish moving further north in warmer months  
1394 (Bell et al. 2014). The mechanisms responsible for regional and species-specific variability in  
1395 changes in distribution are important to understand. These changes potentially impact  
1396 management in many ways. Species cross from one management jurisdiction to another.  
1397 Spatial management structures become out-of-sync with the distribution of the resource.  
1398 The economics of a fishery change as the distance to fish from ports change. Stock structure  
1399 may change, which has implications for reference points and stock status determinations  
1400 (Link et al., 2010).

1401

1402 *No New Resources* - Continue current efforts analyzing distribution data and applying  
1403 information in living marine resource management. Most work to date has been based on  
1404 the NEFSC trawl survey, but numerous other datasets exist in the region including

1405 distribution data for other species. Work should be conducted using other datasets  
1406 including state surveys, Northeast Area Monitoring and Assessment Program (NEAMAP),  
1407 Canadian surveys, Southeast Fisheries Science Center surveys (SEFSC), and fishery-  
1408 dependent data (e.g., NEFSC Observer Program, Study Fleet). Tagging data should also be  
1409 incorporated into this effort where appropriate. Further, most work has focused on adult  
1410 stages; work should be conducted on understanding distribution changes of early life  
1411 stages: eggs to juveniles. Finally, most work has been completed on commercially exploited  
1412 fish and invertebrates; emphasis should now be given to other species including  
1413 recreationally important fish, protected species, and forage species.

1414  
1415 In addition to analytical work, efforts to identify and share data among organizations  
1416 and institutions should continue. The Essential Fish Habitat Database under development at  
1417 the NEFSC could be used as the focal point for these efforts; this site is currently set-up to  
1418 serve state trawl survey data and new datasets would be added as they are identified and  
1419 approval is granted for their addition to the database. Additionally, methods of accounting  
1420 for survey bias should continue to be developed. The development of species distribution  
1421 models should continue in the NEFSC; an informal Working Group has already formed.

1422  
1423 Species Distribution Models are one way to account for survey bias and to integrate  
1424 understanding of species distributions (e.g., butterfish). These models also have a direct link  
1425 to physical models (Priority Action 10 and 11) and can be used in short (days-to-years) and  
1426 medium-term (years-to-decades) scientific advice. However, most species distribution  
1427 models completed in the region to date focus on elements of pelagic habitat (e.g.,  
1428 temperature and salinity). Further, most of these models focus on spatial distribution rather  
1429 than distribution in time, for example timing of events or seasonal processes. Efforts should  
1430 be made to broaden the scope of these models to include components of benthic habitat or  
1431 prey habitat (e.g., terrain ruggedness as a component in a species distribution model for  
1432 cusk, Hare et al. 2012) and to examine changes in timing of distribution (e.g., how changes  
1433 in streamflow patterns may change the migration cues for diadromous species, Tommasi et  
1434 al. 2014).

1435  
1436 Finally, stock structure, which is largely defined spatially, needs to be re-evaluated in  
1437 light of documented distribution changes. Link et al. (2010) presented a decision-tree  
1438 approach and one recent assessment revisited stock structure prior to initiating the  
1439 Benchmark Assessment process (i.e., Black Sea Bass). These efforts should continue on a  
1440 stock-by-stock basis. A North Atlantic Regional Team sponsored workshop is being held in  
1441 FY16 related to species distributions. In addition, regulatory, and management barriers exist  
1442 to changing stock boundaries. A workshop would be held in FY18 with NEFSC, GARFO,

1443 Council / Commission staff, and other experts to review these regulatory and management  
1444 barriers and to develop potential processes and strategies for overcoming these barriers.

1445  
1446 *New Resources-* Hire two new staff (federal employee and a postdoctoral associate) to  
1447 contribute to the management implications of climate-driven changes in distribution. One  
1448 position would focus on forage fish issues, in support of the developing MAFMC Forage Fish  
1449 plan and other forage-related management questions in the region. This position would  
1450 augment, not replace current resources devoted to forage fish (e.g., Atlantic mackerel,  
1451 Atlantic herring, and river herring). The purpose is to develop an understanding of the effect  
1452 of climate change on forage in the Northeast U.S. and then to better understand the effect  
1453 of changes in forage on higher-trophic levels, including marine mammals. It would also  
1454 investigate the potential effects on all life stages of managed species (e.g., Atlantic salmon,  
1455 Atlantic cod).

1456  
1457 The second position would support the ongoing re-evaluations of stock structure in the  
1458 Northeast U.S. This position would conduct interdisciplinary stock structure studies and  
1459 again would augment not replace current resources devoted to stock identification and  
1460 stock assessment. This position would also develop and work with Management Strategy  
1461 Evaluations to better understand the effect of changing stock structure on assessments and  
1462 management of living marine resources. Both positions would be expected to consider  
1463 distributions from a species perspective, not a regional management perspective, so if the  
1464 species extended into Canadian or Southeast U.S. Shelf waters, partnerships and  
1465 collaborations would be developed with scientists in these regions.

1466  
1467 Finally, in FY17 the NEFSC would convene a workshop to address larger issue of climate  
1468 change effects on stock distribution and identification. The purpose of this workshop would  
1469 be to develop a regional framework for addressing climate change effects on stock  
1470 identification and distribution. This framework would then be used in subsequent  
1471 assessments and management.

1472  
1473 Priority Action 7 - Continue to build industry-based fisheries and ocean observing  
1474 capabilities and use information to develop more adaptive management.

1475  
1476 The Northeast Cooperative Research Program is responsible for the coordination and  
1477 implementation of federally-supported collaborative fisheries research in the Northeast  
1478 which includes NEFSC-directed projects, research funded through [Research Set-Aside](#)  
1479 [Programs](#), a [Study Fleet](#), [Cooperative Research and Survey Programs](#), an [Enhanced](#)  
1480 [Biological Sampling Program](#) and [Environmental Monitors on Lobster Traps](#). The Research

1481 Set-Aside programs directly support science and assessment related to specific fisheries  
1482 (e.g., Atlantic Sea Scallop and Monkfish). Cooperative Research and Survey Programs  
1483 include the [Maine-New Hampshire Trawl Survey](#), [Northeast Area Monitoring and](#)  
1484 [Assessment Program](#), and a Long-Line Survey Study for the Gulf of Maine. These surveys  
1485 involve industry, collect data used in assessments, and in many cases provide information  
1486 about relatively data-poor species (e.g., Cusk, Thorny Skate). The Enhanced Biological  
1487 Sampling Programs provides industry-collected fish and invertebrates for age, growth, and  
1488 maturity studies to fill data gaps identified by NEFSC and GARFO scientists. Study Fleet are a  
1489 subset of fishing vessels from which high quality, self-reported data on fishing effort, area  
1490 fished, gear characteristics, catch, and environmental observations are collected. The  
1491 eMOLT program started in 2001 and developed low-cost strategies to measure bottom  
1492 temperature, salinity, and current velocity with the help of nearly 100 lobstermen dispersed  
1493 along the entire New England coast. In recent years, efforts between the eMOLT program  
1494 and Study Fleet have been combined with the deployment of temperature sensors on Study  
1495 Fleet boats and the development to satellite-based near-real time reporting of these  
1496 observations. During FY15, several weather stations were purchased and deployed in a pilot  
1497 program with the National Weather Service to use fishing boats to collect meteorological  
1498 observations for use in weather modeling. The potential for industry vessels to collect  
1499 oceanographic data could increase observing capacity in the region by an order of  
1500 magnitude at least and provide critical observations of the water column and near surface  
1501 atmosphere. These observations can contribute to modeling but can also help fishermen  
1502 make decisions with regard to limiting their incidental catch and their ability to adapt to  
1503 changing conditions. Facilitating these interactions in short-term (days-to-years)  
1504 applications would help develop the relationships necessary to make adaptive decisions in  
1505 the medium-term (years-to-decades).

1506  
1507 *No New Resources* - Work should continue with Study Fleet and eMOLT to improve  
1508 environmental data collection and the efficient of data provisioning. This would improve the  
1509 ability of using biological and environmental data from these programs in the assessment  
1510 and management of living marine resources. Specific activities include work with the pelagic  
1511 fisheries in the Mid-Atlantic including the evaluation and improvement of species  
1512 distribution models for use in real-time decision making in the Atlantic mackerel, Atlantic  
1513 herring, Butterfish and Longfin Squid fisheries. Development of tools to help industry avoid  
1514 incidental catch of river herring should also continue. These projects would include  
1515 engagement with industry to work toward an improved understanding of the system. In  
1516 addition, the NEFSC Gulf of Maine longline survey should continue and data should be used  
1517 in protected species assessments including Cusk and Thorny Skate. The Cusk model  
1518 developed by Hare et al. (2012) could be updated using longline data and a similar Thorny

1519 Skate model could be developed. Information from this later model could be considered in  
1520 NOAA Fisheries' decision on whether to list [Thorny Skate under the Endangered Species Act](#).  
1521 Finally, emphasis should be given to the collection, transmission, and archiving of  
1522 environmental data from Study Fleet and eMOLT. The data handling processes should  
1523 continue to be improved with wireless technologies and satellite-transmission of data.  
1524 Additionally, the archive of data should be made available to the oceanographic modeling  
1525 community. The collaboration with NOAA National Weather Service should also continue in  
1526 an effort to improve the data used in weather models. Increased fishing industry  
1527 investment in such processes would be improved by moving toward research that is  
1528 completely collaborative and participatory, i.e., where fishermen are involved in planning  
1529 and write-up as well as data collection.

1530

1531 *New Resources* - Fund a new staff member (federal employee or contractor) to increase  
1532 ability to collect and distribute climate related data from Cooperative Research Program  
1533 activities including Study Fleet, eMOLT, and the NEFSC Longline Survey Study for the Gulf of  
1534 Maine. The new staff member would support the development of automated data transfers  
1535 to allow rapid collection and availability of environmental data to a broad community of  
1536 scientists, modelers, managers, and fishermen. This rapid collection of data would support  
1537 other actions described in the Regional Action Plan. In addition, the effort would support  
1538 adaptive decision-making by industry and managers based on near-real time conditions.  
1539 These feedback loops based on short-term products (days-to-months) would then be used  
1540 to communicate medium-term products as well (years-to-decades).

1541

1542 Objective 4 - Identify future states of marine, coastal, and freshwater ecosystems, LMRs,  
1543 and LMR-dependent human communities in a changing climate.

1544

1545 Priority Action 8 - Work with NOAA Oceanic and Atmospheric Research and academic  
1546 scientists to develop short-term (day to year) and medium-term (year to decade) living  
1547 marine resource forecasting products.

1548

1549 Priority Action 9 - Work with NOAA Oceanic and Atmospheric Research and academic  
1550 scientists to develop and improve regional hindcasts and climatologies.

1551

1552 Numerous advances have been made in the Northeast U.S. region linking living marine  
1553 resource models to oceanographic and climate models. These efforts have included fishery  
1554 and protected species applications at the day to year (Manderson et al. in prep; Turner et  
1555 al., 2015), year to decade (Bell et al. in prep; Pershing et al. 2015), and decade to century  
1556 scale (Hare et al. 2010, 2012, Lynch et al. 2014, Cooley et al. 2015). In addition,

1557 oceanographic and climate modeling in the region is advancing rapidly with data  
1558 assimilative hindcasts and nowcasts ([ROMS](#), [FVCOM](#)), work on decadal forecasting (Stock et  
1559 al., 2012), the development of regional downscaled climate and earth system models (see  
1560 [Appendix 4](#)), the development of regional climatologies ([NODC](#), NCBO), and the  
1561 examination and use of high-resolution global models (Saba et al. 2016). These efforts take  
1562 interdisciplinary groups to develop and improve applications and, as a result of work done  
1563 to date, strong ties have formed in the region between NOAA Fisheries, NOAA Oceanic and  
1564 Atmospheric Research (OAR), and academic scientists. Additional ties with USGS, FWS, and  
1565 EPA are needed to better incorporate climate changes in freshwater and estuarine systems.  
1566 Further, to transition these efforts to living marine resource assessments and management  
1567 takes collaboration with assessment scientists and managers and takes a commitment to  
1568 support operational use of models and products once developed and used.

1569  
1570 *No New Resources* - Continue collaborations with NOAA Oceanic and Atmospheric  
1571 Research (OAR), IOOS, and academic scientists on issues related to short-term (days to  
1572 years) and medium-term (years to decades) forecasting in the context of living marine  
1573 resource management. The oceanographic and climate modeling to support this forecasting  
1574 includes hindcasts, nowcasts, forecasts, and projections. In FY17 and FY18, these  
1575 collaborations would be opportunistic but would include work with Geophysical Fluid  
1576 Dynamics Laboratory, Earth System Research Laboratory, and Coastal and Ocean Climate  
1577 Application Program (COCA) funded projects ([Appendix 4](#)). In addition, efforts to develop  
1578 species distribution modeling in the NEFSC should continue; for example there are ongoing  
1579 projects related to marine mammals, river herring, and Mid-Atlantic fisheries. Where  
1580 possible these activities should be linked to assessment and management needs. An  
1581 excellent example is species distribution modeling using a ROMs hindcast and nowcast to  
1582 evaluate availability to the trawl surveys in the Butterfish, Bluefish, and Scup assessments  
1583 and to fishery operations for Atlantic Mackerel, Atlantic Herring, and Longfin Inshore Squid.  
1584 Links to industry should be strengthened both in terms of prediction and evaluation.  
1585 Emphasis should be given to the development of an ensemble modeling approach, which is  
1586 widely used in long-term (decades to centuries) projections. Other elements of this  
1587 Northeast Regional Action Plan that need modeling output should also be supported by  
1588 providing model output or links to model output and instruction on its use. Post FY18,  
1589 efforts would be more strategic. Efforts at the medium-term time scale (years to decades)  
1590 should work on issues related to fishery stock rebuilding and sustainability, protected  
1591 species assessment and recovery, and evaluation of the sustainability of aquaculture  
1592 operations. Efforts at the short-term (days to years) scale should focus on days-to-weeks  
1593 forecasts in support of fishery operations and incidental-catch reduction and months-to-  
1594 years forecasts in support of fishery stock assessments (e.g., Hobday et al. 2016). A



1595 workshop should be held early in FY17 to develop the FY18-FY21 priorities, thereby allowing  
1596 researchers in the NEFSC and GARFO to develop proposals for internal and external funds to  
1597 support these priorities.

1598  
1599 *New Resources* - Hire two temporary personnel (i.e., postdoctoral associates) to couple  
1600 climate and living marine resource models and to complete research-to-operations  
1601 transition for models that have demonstrated value in an assessment or management  
1602 context. These temporary personnel should have strong ties to the Geophysical Fluid  
1603 Dynamics Laboratory, Earth System Research Laboratory, and Coastal and Ocean Climate  
1604 Application Program (COCA) funded projects ([Appendix 4](#)), as well as to computer scientists  
1605 that are developing web-delivery of climate-related products. Initially, temporary  
1606 personnel would be used to support projects already underway, but would then be  
1607 transitioned to priority areas identified in the FY17 workshop. An emphasis would be on  
1608 making products transparent and available to the broader community by providing not only  
1609 the product, but metadata and provenance related to the product; this emphasis is similar  
1610 to the efforts underway in support of the National Climate Assessment (NCA 2015). An  
1611 important element is to ensure that models developed in the region can be continued to  
1612 support the operational needs of assessments and management. NOAA Fisheries, NOAA  
1613 Research, the Integrated Ocean Observing System, or other partners may support these  
1614 needed and as operational products are identified, plans for continuing their production  
1615 should be developed.

1616  
1617 Objective 5 - Identify the mechanisms of climate impacts on ecosystems, LMRs, and  
1618 LMR-dependent human communities.

1619  
1620 Priority Action 10 - Conduct research on the mechanistic effects of multiple climate  
1621 factors on living marine resources with a goal of improving assessments and scientific  
1622 advice provided to managers.

1623  
1624 A mechanistic understanding of the effect of climate change on behavioral,  
1625 physiological, ecological, and biophysical processes is critical to improving scientific advice  
1626 to managers. There is a long history of research in the region on environmental effects on  
1627 individuals and populations (Laurence 1975). The NEFSC currently has seawater laboratory  
1628 facilities in Sandy Hook, New Jersey and Milford, Connecticut. Both facilities have the ability  
1629 to manipulate temperature, carbonate chemistry, and other factors and the ability to  
1630 examine interactive effects of multiple-stressors. Scientists at these facilities have  
1631 experience working with phytoplankton, molluscs, crustaceans, and fish. Current climate-  
1632 related work at these facilities has focused on the effect of ocean acidification on the early

1633 life stages of fish and molluscs, including biochemical, physiological, behavioral, and  
1634 ecological responses (Chambers et al. 2014, Stehlik et al. 2015, Meseck et al. 2016). In  
1635 addition, research is underway collaboratively at other laboratory facilities in the region  
1636 (e.g., Woods Hole Oceanographic Institution). The effect of temperature on evacuation  
1637 rates is also being studied (Stehlik et al. 2015); evacuation is a key parameter in calculating  
1638 consumption, which is critical to multispecies and ecosystem models. These studies are  
1639 largely funded by the NOAA Ocean Acidification Program and by NEFSC base funds. The  
1640 NEFSC has a long-history of field-based process studies including the Global Ocean  
1641 Ecosystem Northwest Atlantic/Georges Bank Program (GLOBEC, Wiebe et al. 2002). These  
1642 studies differ from monitoring in that they seek to test hypotheses or better understand  
1643 mechanisms affecting living marine resources. Support for field-based process studies has  
1644 declined since GLOBEC and most natural science field work conducted by NOAA Fisheries in  
1645 the region is dedicated to long-term monitoring. Finally, the NEFSC has a long history of  
1646 retrospective research: analyzing previously collected data to improve the understanding of  
1647 the coupled climate-living marine resource-human systems. Retrospective research allows  
1648 the study of long time scales and large space scales that characterize climate variability and  
1649 change. Recent studies examining the change in distribution of living marine resources in  
1650 the Northeast U.S. represent examples of retrospective research (e.g., Nye et al. 2009,  
1651 Pinsky et al. 2013, Walsh et al. 2015, Kleisner et al. 2016). Social science retrospective  
1652 studies related to climate change include Jin et al. (2016) and planned creations of time  
1653 series based on Colburn et al. (In review), as well as the possibility of exploring fishermen  
1654 observations over time.

1655  
1656 *No New Resources* - Continue laboratory experiments at the Sandy Hook and Milford  
1657 laboratories. These experiments should involve the effects of increasing water  
1658 temperature, ocean acidification and decreasing O<sub>2</sub> on key fishery, protected, and  
1659 aquaculture species that are most susceptible to climate change. The Northeast Fisheries  
1660 Climate Vulnerability Assessment should be used as one source to prioritize species to  
1661 study. Other factors include management and assessment priorities and preservation,  
1662 recreational, and commercial value to the region. Much of this work should focus on ocean  
1663 acidification owing to funding from the NOAA Ocean Acidification program and on  
1664 temperature owing to funding from Coastal and Ocean Climate Application Program.  
1665 However, opportunities to study other climate factors and the synergistic effect among  
1666 factors should be pursued. To continue this research, appropriate staffing should be  
1667 maintained and planned improvements in the facilities need to be completed. These  
1668 improvements include increase in the ocean acidification capacity at Milford, improving  
1669 seawater quality at Sandy Hook, and creating a closed-system at Sandy Hook to facilitate  
1670 work at salinities typical in continental shelf waters. Collaborative research with other

1671 institutions should also be encouraged; for example there is work ongoing with Woods Hole  
1672 Oceanographic Institution and these efforts should continue. Finally, to the extent possible,  
1673 links need to be made between the experimental work and climate modeling efforts in the  
1674 region (Priority Actions 8, 9, and 10). To this end, a workshop would be held in FY17 to bring  
1675 the experimental groups in the region together, compare and contrast capabilities and  
1676 research, and to try to link these groups with retrospective analyses and living marine  
1677 resource modeling efforts in the region.

1678

1679 *New Resources* - Fund one postdoctoral associate at the Sandy Hook Laboratory and one  
1680 postdoctoral associate at the Milford Laboratory with a small allowance for supplies and  
1681 travel to conduct research related to the effect of climate factors on the key fishery,  
1682 protected, and aquaculture species in the region. Research should be integrated with  
1683 ongoing activities but represent new approaches, ideas, or biological impacts. This new  
1684 work should be directly tied to modeling and assessment activities, for example the effect  
1685 of climate factors in isolation or in combination on a vital rate of fishery, protected, or  
1686 aquaculture species. Additionally, collaborative work with regional partners would be  
1687 strongly encouraged.

1688

1689 Objective 6 - Track trends in ecosystems, LMRs, and LMR-dependent human  
1690 communities and provide early warning of change.

1691

1692 Priority Action 11 - Develop and implement vulnerability assessments in the Northeast  
1693 U.S. Shelf Region.

1694

1695 Climate change is already affecting fishery resources and the communities that depend  
1696 on them, and these impacts are expected to increase in the future. To help fishery  
1697 managers and scientists identify ways to reduce these risks and impacts, NOAA Fisheries - in  
1698 collaboration with NOAA Oceanic and Atmospheric Research, Earth Systems Research  
1699 Laboratory – developed a methodology to rapidly assess the vulnerability of U.S. marine  
1700 stocks to climate change (Morrison et al. 2015). This methodology uses existing information  
1701 on climate and ocean conditions, species distributions, and life history characteristics to  
1702 estimate the relative vulnerability of fish stocks and species to potential changes in climate.  
1703 The methodology is based on the general trait-based vulnerability assessment framework  
1704 (Foden et al. 2013). The methodology was recently implemented in the Northeast U.S. for  
1705 82 species of fish and invertebrates including all federally managed fishery species and  
1706 protected marine fish species in the region (Hare et al. 2016). The methodology is being  
1707 implemented in other regions of the U.S. as part of the NOAA Fisheries Climate Science  
1708 Strategy. This Fisheries Climate Vulnerability Assessment has been linked to human

1709 communities in the Northeast through the new climate indicators developed for  
1710 Community Social Vulnerability indicators (Colburn et al. in press). As the Species  
1711 Vulnerability Assessment is completed in other regions, the Community Social Vulnerability  
1712 climate indicators would be completed in turn.

1713  
1714 *No New Resources* - NOAA Fisheries Science and Technology is leading an effort to adapt  
1715 the Climate Vulnerability Assessment framework for use with marine mammals and sea  
1716 turtles. NEFSC and GARFO would continue to contribute to this effort (see [Priority Action](#)  
1717 [11](#)). A social vulnerability assessment has been linked to the fisheries climate vulnerability  
1718 assessment (Colburn et al. in review). These interactions should continue, as should the  
1719 collection of time series data on changes in community resilience and vulnerability,  
1720 including those for climate change. Finally, the Northeast Fisheries Climate Vulnerability  
1721 Assessment should be repeated with the next International Panel of Climate Change  
1722 Assessment Report. Hare et al. (2016) identified several improvements and progress should  
1723 be made on these issues. Some of these improvements would be facilitated by other actions  
1724 identified in this Regional Action Plan (e.g., regional downscaling).

1725  
1726 *New Resources* - Additional capacity for vulnerability assessments would be added to  
1727 the NEFSC through the funding of a new federal employee or contractor and support for  
1728 organizing workshops. This position would be responsible for the adapting the Climate  
1729 Vulnerability Assessment Methodology for habitats and aquaculture operations and in the  
1730 Northeast and Highly Migratory Species in the Western Atlantic. The development of these  
1731 assessments would be coordinated with appropriate national (e.g., Habitat Conservation  
1732 Office) and regional (e.g., Southeast Fisheries Science Center, Southeast Regional Office)  
1733 offices, as well as external partners (e.g., members of the aquaculture industry). This  
1734 additional capacity would also contribute to the support of the specific actions identified  
1735 above.

1736  
1737 Priority Action 12 - Continue production of the Ecosystem Status Report, and other  
1738 related products, and improve the distribution of information from the reports through the  
1739 formation of an Environmental Data Center.

1740  
1741 The NEFSC Ecosystem Status Report, Ecosystem Advisories, and State of the Ecosystem  
1742 reports meet one of the immediate-term actions defined in the NOAA Fisheries Climate  
1743 Science Strategy. These products provide information on the current and past states of the  
1744 Northeast U.S. Shelf Ecosystem and are presented via the web: [Ecosystem Status Report](#)  
1745 and [Ecosystem Considerations Update](#). The information in these products is also provided  
1746 to the NEFMC and MAFMC in State of the Ecosystem reports designed specifically for the

1747 Councils. The current Ecosystem Status Report consists of 12 sections: 1) Introduction, 2)  
1748 Climate Forcing, 3) Physical Pressures, 4) Production, 5) Benthic Invertebrates, 6) Fish  
1749 Communities, 7) Protected Species, 8) Human Dimensions, 9) Ecosystem Services, 10)  
1750 Stressors and Impacts, 11) Status Determinations, and 12) Synthesis. The report draws on  
1751 information collected across the NEFSC from oceanographic to social indicators. The  
1752 information is presented in several management contexts including Driver-Pressure-State-  
1753 Impact-Response model, Ecosystem Services, and Overfishing/Overfished. The Report also  
1754 incorporates relevant information from partners including the [Environmental Protection](#)  
1755 [Agency Coastal Condition Reports](#) and [Audubon Society Project Puffin](#). Efforts were  
1756 underway to improve the electronic distribution of data from these reports, but the project  
1757 ended before full implementation could be achieved ([ECO-OP](#)). This effort is similar to  
1758 efforts underway to increase availability of information and data from the [National Climate](#)  
1759 [Assessment](#).

1760  
1761 *No New Resources* - Continue production of the Ecosystem Status Report for a broad  
1762 range of partners and Annual Ecosystem Reports for the Fishery Management Councils and  
1763 Atlantic States Marine Fisheries Commission. Improve reports based on input from partners  
1764 and stakeholders. Work toward steadily increasing the scope of the reports to encompass  
1765 the entire Northeast U.S. Shelf Ecosystem (watersheds to open ocean) including social and  
1766 economic indicators and other social science data. Also work to include industry-based data  
1767 (e.g., eMOLT, observer program, etc.), harvesting related data, and data from coastal and  
1768 estuarine regions (e.g., Chesapeake Bay Interpretive Buoy System). Continue engagement  
1769 with the Fisheries Management Councils and reach out to other stakeholders for comment  
1770 and input. Continue to expand the scope of the Ecosystem Status Report including  
1771 additional Community Social Vulnerability indicators building off recent community  
1772 vulnerability assessment. Improve communication on release of reports. Existing and new  
1773 Community Social Vulnerability indicators (including climate-related) are or would be  
1774 available at <http://www.st.nmfs.noaa.gov/humandimensions/social-indicators/map> for easy  
1775 exploration by the public. Establish an Environmental Data Center in the Northeast to  
1776 inform broad range of climate-related activities (e.g., single species, protected species,  
1777 habitat, and ecosystems). Efforts to develop an Environmental Data Center are underway,  
1778 but the initial plans are relatively small scale owing to limited resources.

1779  
1780 *New Resources* - Fund a new staff member (federal employee or contractor) to support  
1781 development of the Environmental Data Center, as well as the production of the Ecosystem  
1782 Status report and other related products. The emphasis would be on programming and web  
1783 development in support of the Ecosystem Status Report and climate factors used in  
1784 assessments. Priority datasets would include those in the Ecosystem Status Report and

1785 those environmental datasets being used in stock assessments (e.g., Cold Pool Index in the  
1786 Southern New England Yellowtail Flounder assessment, Miller et al. 2016). The  
1787 Environmental Data Center would focus on derived data products, automating their  
1788 production, and describing their source and steps in production. The concept is fully  
1789 transparent indicator development and incorporation into assessment and management  
1790 products. These activities would be completed in cooperation with the Essential Fish  
1791 Habitat Database also under development by the NEFSC. In addition to the Environmental  
1792 Data Center, efforts would be made to improve the Ecosystem Status Report through more  
1793 stakeholder and partner involvement. The goal is to make the report more useful to living  
1794 marine resource managers and decision-makers throughout the region and to better  
1795 integrate with other products with similar goals (e.g., [Gulf of Maine Quarterly Outlook](#),  
1796 [Community Social Vulnerability indicators](#)). The current report would be made available for  
1797 public comment, with emphasis on how managers use the information and what  
1798 improvements could be made. Following the public comment period, several workshops  
1799 would be held throughout the region in FY18 to overview the report and receive additional  
1800 input from managers and decision-makers about the content. A work plan for improving the  
1801 report would then be developed and shared with partners and stakeholders. The new staff  
1802 member involved with the Environmental Data Center would also work with other NEFSC  
1803 and GARFO staff to implement these changes to the Ecosystem Status Report and related  
1804 products. This work-plan would then be followed for FY19-FY21.

1805

1806 Objective 7 - Build and maintain the science infrastructure needed to fulfill NOAA  
1807 Fisheries mandates under changing climate conditions.

1808

1809 Priority Action 13 – Maintain ecosystem survey effort in the Northeast U.S. Shelf  
1810 ecosystem including the Bottom Trawl Survey, Ecosystem Monitoring Program, Sea Scallop  
1811 Survey, Northern Shrimp Survey, and Protected Species Surveys and expand where possible  
1812 (e.g., data poor species).

1813

1814 The NEFSC has a long history of supporting surveys of the Northeast U.S. Shelf  
1815 ecosystem from chemistry through to marine mammals and seabirds. This effort should be  
1816 maintained and is fundamental to success of the NOAA Fisheries Climate Science Strategy in  
1817 the region. The Ship of Opportunity Continuous Plankton Recorder survey was ended in  
1818 2013, and while this was the longest running oceanographic survey in the Northwest  
1819 Atlantic Ocean, operations were successfully transferred to the Sir Alister Hardy Foundation  
1820 for Ocean Science (SAHFOS).

1821

1822 One issue facing the survey programs in the Northeast U.S. region is the strong seasonal  
1823 nature of the Northeast U.S. Shelf ecosystem. The ability to sample the same parts of the  
1824 seasonal cycle is critical, as is sampling over the seasonal cycle to capture the seasonal  
1825 dynamics of the ecosystem.

1826

1827 *No New Resources* – The following surveys should be conducted at pre-2012 levels and  
1828 supported during the seasonally correct times of year:

1829

- 1830 • Bottom Trawl Survey – 2 times per year (including Ecosystem Monitoring  
1831 Program operations)
- 1832 • Ecosystem Monitoring Program – 4 times per year
- 1833 • Sea Scallop Survey – 1 time per year
- 1834 • Northern Shrimp Survey – 1 time per year

1835

1836 In addition various protected species surveys should be supported (e.g., North Atlantic  
1837 Right Whale, sea turtles, Atlantic Marine Assessment Program for Protected Species). To the  
1838 extent possible, climate, ecosystem, and habitat information should be collected on all  
1839 surveys, thereby allowing simultaneous environmental and biological data to be collected  
1840 and used in a number of analyses related to other Actions described here in the Regional  
1841 Action Plan. Continued collection of fishery-dependent data is also critical to living marine  
1842 resource management and these data can be used to improve the scientific understanding  
1843 of the effect of climate change on fisheries in the Northeast U.S. region.

1844

1845 *New Resources* – Hire a federal employee to facilitate the collection of environmental  
1846 data on all NEFSC surveys. Environmental data includes Conductivity-Temperature-Depth  
1847 operations, Thermo-salinograph measurements, nutrients samples, and carbonate  
1848 chemistry samples and measurements. Data would be integrated into NEFSC databases and  
1849 made publically available. The new staff member would also contribute expertise to the  
1850 analyses of environmental data in the context of living marine resource assessments and  
1851 management. Work with other programs to expand surveys and expand variables collected  
1852 on surveys. Priority would be given to the NEFSC Long Line Survey and other cooperative  
1853 research efforts.

1854

1855

1856

1857

1858 Priority Action 14 – Initiate a Northeast Climate Science Strategy Steering Group  
1859 (NECSSSG) to coordinate, communicate, facilitate, and report on issues related to climate  
1860 change and living marine resource management.

1861  
1862 The NOAA Fisheries Climate Science Strategy presents an ambitious vision for  
1863 incorporating climate information into the management of living marine resources. The  
1864 Regional Action Plan presented here puts forth a plan for the next five years for NOAA  
1865 Fisheries in Northeast Region. The Climate Science Strategy and the Regional Action Plan  
1866 are integrated and rely on partnerships and collaborations with many other ongoing  
1867 programs and activities. Given the distributed nature of the effort, there is a need for a  
1868 Steering Group to oversee work initiated as part of this Regional Action Plan.

1869  
1870 *No New Resources - Northeast Climate Science Strategy Steering Group (NECSSSG)*  
1871 *should be established to coordinate implementation of the NOAA Fisheries Climate Science*  
1872 *Strategy in the Northeast U.S. It is important to note that this steering group represents the*  
1873 *Northeast, inclusive of the region North Carolina to Maine and including the Mid-Atlantic,*  
1874 *Southern New England, Georges Bank, and the Gulf of Maine. This Regional Action Plan is*  
1875 *the organizing document for the implementation and the NECSSSG would oversee the*  
1876 *implementation. The NECSSSG would be composed of GARFO, NEFSC, NCBO, Science and*  
1877 *Technology, as well as representatives of different NOAA and non-NOAA partners. In*  
1878 *addition to overseeing the implementation of the Actions described in the Regional Action*  
1879 *Plan, the NECSSSG would work on the following topics.*

- 1880  
1881
- 1882 • Coordinate with Councils (including their Scientific and Statistical Committees),  
1883 ASMFC, Take-Reduction Teams, Atlantic Scientific Review Group, NMFS HMS and  
1884 other groups as applicable on the development and evaluation of climate  
1885 information for living marine resource management. Initial steps involve an  
1886 evaluation of Plan Development Teams, Fishery Management Action Teams, and  
1887 other committee memberships, continue support for EBFM activities for  
1888 MAFMC, NEFMC, ASMFC, and continue engagement with these partners on  
1889 climate change issues including presentations and participation in meetings and  
workshops.
  - 1890 • Coordinate with other NOAA-line offices in the region through participating in  
1891 the [North Atlantic Regional Team](#), NOAA in New England, [NOAA Eastern Region](#)  
1892 [Climate Services](#), and other similar efforts.
  - 1893 • Initiate discussion with NEFSC, GARFO, SEFSC, SERO and HQ to identify overlaps  
1894 and joint issues of interest. This discussion should include current issues and  
1895 potential future issues related to climate change and cover all NMFS mission



- 1896 activities. Hold a workshop and develop a document that identifies joint issues of  
1897 interest. Workshop should include principles from each institution as well as the  
1898 FMCs and MFCs.
- 1899 • Increase interactions with Canadian scientists and managers. Identify and use  
1900 existing, and develop new venues for addressing issues of joint concern,  
1901 including physical, biological, chemical, social and economic impacts of climate  
1902 change. Initially, the following venues would be targeted for increasing  
1903 interactions: ICES Working Group on the Northwest Atlantic Regional Sea  
1904 (WGNARS), other ICES Workings Groups and Steering Groups, and the  
1905 Canada/USA Transboundary Steering Committee. Other avenues for increasing  
1906 interaction would be identified during the FY17-FY21 period.
  - 1907 • Develop an outreach strategy for communicating results of NOAA Fisheries  
1908 Climate Science Strategy implementation in Northeast Region (including New  
1909 England and the Mid-Atlantic). This strategy would be coordinated with GARFO  
1910 and NEFSC communications teams. The purpose of the strategy is to improve  
1911 stakeholder and public awareness and engagement with NOAA Fisheries  
1912 activities on climate change in the Northeast U.S. region. Develop and  
1913 implement a plan for this improvement using existing personnel and resources  
1914 to work with stakeholders and the public. Develop stakeholder engagement and  
1915 communications teams for each region. Improve scientific communication  
1916 among NOAA Fisheries components in the Northeast.
  - 1917 • Support the development of regional meetings (such as Regional Association for  
1918 Research on the Gulf of Maine) that encourage interactions among scientists and  
1919 managers in the region. Encourage broad regional NOAA Fisheries participation.
  - 1920 • Continue to develop partnerships with tribal governments and meet to discuss  
1921 climate change issues. Broaden support of GARFO and NEFSC staff for tribal  
1922 issues.
  - 1923 • Improve partnerships with NOAA Educational Resources Office and other  
1924 organizations to contribute to national and regional education efforts as they  
1925 relate to climate change and the NOAA Fisheries Mission. Develop internship and  
1926 education plan for NEFSC and GARFO in combination with the NEFSC Academic  
1927 Programs Office.
  - 1928 • Support the development of regional town halls and other meetings with  
1929 fishermen and fishing communities to improve outreach to fishermen and fishing  
1930 communities regarding impacts of climate change.
  - 1931 • Increase climate literacy among GARFO, NEFSC and regional NMFS HQ staff to  
1932 assist in identifying the climate vulnerabilities and needs in all regional programs

1933 and mandates. Make staff aware of seminars, lectures, short-courses, and other  
1934 related opportunities.  
1935 • Track and report progress on Action Plan through quarterly teleconferences.  
1936 Develop list of climate-related activities in the region. Make GARFO and NEFSC  
1937 staff aware of climate related funding opportunities. Serve as a clearinghouse to  
1938 connect scientists and managers interested in climate change in the Northeast  
1939 U.S. region.

1940  
1941 *New Resources* – Hire administrative staff member with scientific experience to staff the  
1942 NECSSSG. The staff member would assist the NECSSSG to make progress on the activities  
1943 listed above. In addition, the following list of activities would also be pursued.

- 1944  
1945 • Conduct gap analysis comparing NOAA Trust Resources to regional natural and  
1946 social science observing capabilities. Identify critical gaps and initiate data  
1947 collection programs if possible.  
1948 • Develop regional Ecosystem Observing Plan in collaboration with Regional  
1949 Associations (Integrated Ocean Observing Systems) and other long-term  
1950 observing efforts in the region. Plan should include variety of platforms including  
1951 ships, moorings, gliders, and autonomous vehicles.  
1952 • Hold Workshop with Federally Recognized Tribes to identify, discuss, and  
1953 coordinate living marine resource science and management related to climate  
1954 change.  
1955 • Develop framework for dealing with emergent, climate-related NOAA Trust  
1956 Resource issues including social and economic aspects. Review Council oversight  
1957 for cases where species are likely to move to areas under the jurisdiction of a  
1958 different council or councils.  
1959 • Work with Councils and Commission to revise FMPs to include analyses of the  
1960 impacts of climate change on any proposed regulatory measures.  
1961 • Support redesign and expansion of NEFSC Climate Change webpage. Make page  
1962 more dynamic. Improve links to other components of the Science Enterprise in  
1963 the Northeast U.S. including cooperative research and citizen science  
1964 opportunities.  
1965 • Provide partial support for an East Coast Climate Change and Fisheries  
1966 Governance Workshop every 2-3 years to ensure information is being exchanged  
1967 among regions on the east coast. Canada Department of Fisheries and Oceans  
1968 Canada managers and scientists should be included.  
1969 • Develop monthly seminar series with live-broadcasting capabilities.

- 1970
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- 1974
- Expand regional town hall and other meetings with fishermen and fishing communities to improve outreach regarding climate change impacts.
  - Expand collaborative science to increase fishing industry investment in research and support for its results.

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Priority Action 15 – Coordinate with other NOAA Programs to link living marine resource science and management to climate science and research activities

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Watershed Program for the East Coast - There were a number of actions identified related to diadromous species in the Northeast U.S. Shelf. Diadromous species are important in the region for a variety of reasons (e.g., protected species, commercial and recreational harvest, ecosystem interactions): Atlantic Salmon, Atlantic Sturgeon, Shortnose Sturgeon, Rainbow Smelt, Alewife, Blueback Herring, American Eel, Hickory Shad, American Shad, Striped Bass, Sea-run Brook Trout, Sea Lamprey, White Perch, and Tom Cod. These species are included in the larger group of species considered in many of the actions prioritized here, but there are also a number of specific needs that exceed the scope of the NOAA Fisheries Climate Science Strategy. On the West Coast, the Northwest Fisheries Science Center hosts the [Watershed Program](#), which investigates the ecology of freshwater and estuarine ecosystems to assist with the management and recovery of Pacific Salmon and other NOAA trust resources. The Program provides technical support to NOAA Fisheries policy makers and regulatory staff, and collaborates with other agencies (e.g., USGS, FWS), tribes and educational institutions on research and outreach related to the management of Pacific salmon (*Oncorhynchus* spp.) and other diadromous fishes. NOAA Fisheries should consider developing such a program on the East coast in coordination with USGS and FWS.

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Links to NOAA Integrated Ecosystem Assessment Program and Ecosystem-Based Fisheries Management - There is a continued need to develop and implement single-species models, multi-species and ecosystem models that include species interactions in fisheries and protected species management and fully and appropriately include social and economic data. There are efforts underway in the NEFSC (Richards and Jacobson 2016, Curti et al. 2013, Link et al. 2010) and throughout the region (Townsend et al. 2013, Fay et al. 2013, Stock et al. 2014, <http://www.noaa.gov/iea/>). Further, both the MAFMC and NEFMC are working toward Ecosystem-Based Fisheries Management; the NEFSC and GARFO need to continue to support these efforts. These activities are not directly related to the NOAA Fisheries Climate Science Strategy, but the activities conducted under the Regional Action Plan would support and contribute to these efforts. EBFM, as implemented by the FMCs, could alter the management processes in the region, either incrementally or fundamentally,

2007 and impacts to the stakeholders and the management and regulatory programs would need  
2008 careful consideration.

2009

2010 Links to NOAA Fisheries Habitat Programs - Coordination with Habitat Conservation  
2011 Division, and Restoration Center is required to meet the needs for the region identified  
2012 here. Integration between this Northeast Regional Action Plan the Habitat Assessment  
2013 Improvement Plan is also needed. One element is to better understand the response of  
2014 habitats to climate change including pelagic habitats, benthic habitats, estuarine habitats,  
2015 and freshwater habitats. A second element is to identify habitats vulnerable to climate  
2016 change with a particular emphasis on spawning and nursery habitats since early life stages  
2017 tend to be more vulnerable to climate change than adult stages. These actions are  
2018 embedded I Priority Actions above but also need to be connected to other habitat-related  
2019 programs in the Northeast U.S.

2020

2021 Additionally, coordination with the NOAA Chesapeake Bay Office (NCBO) is needed.  
2022 NCBO is the lead agency coordinating implementation of efforts in the Chesapeake Bay to  
2023 meet the recently established Climate Resiliency Goal of the 2014 Chesapeake Bay  
2024 Agreement. Linkages between the NCBO effort and Priority Actions identified in this  
2025 Northeast Regional Action Plan, include 1) development of a climate resiliency analysis  
2026 matrix and set of Climate Smart Conservation Framework facilitated workshops to explore  
2027 adaptive management of tidal and non-tidal wetlands; 2) facilitation of a small workshop  
2028 series to develop an Analytical Framework for Aligning Monitoring Efforts to Support  
2029 Climate Change Impact and Trend Analyses and Adaptive Management for Submerged  
2030 Aquatic Vegetation, Oysters and Blue Crab; 3) facilitation of a workshop to review Global  
2031 Circulation Models and other climate scenarios, downscaling techniques, and historical  
2032 observation data to establish a framework for climate analysis in the watershed modeling  
2033 and ecological assessments. Work in Chesapeake Bay can also serve as a model for other  
2034 estuaries in the region.

2035

2036 Links to NOAA Fisheries Office of Aquaculture – Aquaculture is a growing commercial  
2037 sector in the Northeast U.S. region and important impacts from climate change have been  
2038 identified. As efforts to promote and support sustainable aquaculture in the Northeast U.S.  
2039 grow, the need for information on the effects of climate change on aquaculture would also  
2040 grow. Aquaculture components are integrated with many of the actions identified above,  
2041 but a number of other aquaculture related needs were identified during the development  
2042 of the Northeast Regional Action Plan. Research and observations to better understand the  
2043 effect of climate change on aquaculture operations would require strong partnerships and  
2044 participation with the aquaculture industry. Some efforts are underway (e.g., [Tracking](#)

2045 [Ocean Alkalinity using New Carbon Measurement Technologies](#)), but further developing  
2046 these partnerships and collaborations is outside the scope of the Northeast Regional Action  
2047 and should be an emphasis of the Office of Aquaculture. Multiple stressor laboratory and  
2048 mesocosm experiments to understand the effect of climate change on aquaculture species  
2049 is partly built into the Priority Action 10, but the development of a mesocosm capacity with  
2050 the NEFSC is beyond the scope of the Northeast Regional Action Plan. There are several  
2051 facilities with the capability to host mesocosms (e.g., University of Rhode Island, Woods  
2052 Hole Oceanographic Institution, University of Connecticut) and discussions could be  
2053 initiated to use these facilities in support of NOAA Fisheries Office of Aquaculture and the  
2054 NMFS Climate Science Strategy. Finally, the action was identified to conduct region wide  
2055 benthic surveys in estuaries stratified by the presence / absence of aquaculture operations  
2056 to evaluate the impact of aquaculture on habitats and other living marine resources. This  
2057 action is outside the scope of the NOAA Fisheries Climate Science Strategy but is a clear  
2058 need to understand the interaction between aquaculture and ecosystems in the region.  
2059

2060 *Links to NOAA Ocean Acidification Program* – A number of the actions identified overlap  
2061 with activities funded by the NOAA Ocean Acidification Program. Specifically, the  
2062 prioritization of maintaining monitoring capabilities and expanding experimental programs  
2063 are directly in line with NOAA Ocean Acidification activities at the NEFSC. The development  
2064 of a large-scale mesocosm capacity was identified as an action during the development of  
2065 the Northeast Regional Action Plan. As described above in the links to aquaculture section,  
2066 the development of a mesocosm capacity with the NEFSC is beyond the scope of the  
2067 Regional Action Plan. However, the NEFSC would reach out to potential partners and assist  
2068 in identifying potential funding sources. Also, an evaluation of regional progress on NOAA  
2069 Ocean and Great Lakes Acidification Research Plan was identified as a potential action. This  
2070 was deemed to be more appropriate for the Principal Investigators funded by the NOAA  
2071 Ocean Acidification program at the NEFSC.  
2072

2073 *Other Actions Identified* - Numerous other actions were identified during the  
2074 development of the Regional Action Plan that were not selected as priority actions for  
2075 implementation within the next five year. This does not mean that these actions are not  
2076 important or may not yield important information related to living marine resource  
2077 management. In many cases, the actions' links to climate change were not as strong as the  
2078 priority actions chosen. Whereas some actions were more closely affiliated with the mission  
2079 of another federal agency or predominantly within another region. Finally, some actions,  
2080 while being important, would require substantial resources to bring the necessary expertise  
2081 to GARFO and NEFSC. University partners would better serve these actions. We encourage

2082 other groups and funding agencies to support these actions and the NEFSC and GARFO  
2083 would be willing partners for such activities.

2084 PARTNERSHIPS

2085 Partnering is critical to the success of the Northeast Regional Action Plan. Effective  
2086 management of living marine resources in the face of climate change needs to be  
2087 collaborative and iterative. Partnerships within NOAA, with other federal agencies,  
2088 Federally-recognized tribes, states, industry, research institutions, NGO's, funding agencies,  
2089 and citizen groups are all necessary for this Action plan to be successful. Both the NEFSC  
2090 and GARFO Strategic Plan recognize the importance of collaborative research and  
2091 management and these core values apply to this Regional Action Plan as well. The  
2092 Northeast Regional Action Plan Working Group would be charged with strengthening  
2093 partnerships and identifying potential new partnerships. Specific partners are noted in  
2094 [Appendix 7](#).

2095

**5. TIMELINE AND METRICS**

Timeline	FY16	FY17	FY18	FY19	FY20	FY21
Priority Setting for Modeling		X		X		
Experimental Workshop		X		X		
OA Plan Review	X					X
Stock Identification Workshop		X			X	
SEFSC Workshop		X		X		X
Canada Workshop		X			X	
ESA Workshop	X			X		
MMPA Workshop		X			X	
Assessment Workshop			X			
TOR Review Workshop		X			X	
ESR Stakeholder Comment			X		X	
Annual Status of the Ecosystem Report	X	X	X	X	X	X
Adaptive Management Workshop		X		X		
Federally Recognized Tribes Workshop			X		X	
Mesocosm Discussion		X				
Aquaculture Discussion		X		X		
Habitat Discussion		X			X	
Hire New Staff		X	X			
NERAPSG Meeting		X	X	X	X	X
Milestones						
CEH ToRs in benchmark assessments FY17-F21		X	X	X	X	X
Stock Assessments - CEHASG Meetings	X	X	X	X	X	X
Workshop Reports	X	X	X	X	X	X
NERAPSG Meeting Reports		X	X	X	X	X

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2433        [http://imos.org.au/fileadmin/user\\_upload/shared/IMOS%20General/ACOMO/Extended\\_Abstracts/5.Wilkin-](http://imos.org.au/fileadmin/user_upload/shared/IMOS%20General/ACOMO/Extended_Abstracts/5.Wilkin-Integrating_modeling_and_data_assimilation_using_ROMS_with_a_Coastal_Ocean_Observing_System_for_the_U.S._Middle_Atlantic_Bight.pdf)  
2434        [Integrating modeling and data assimilation using ROMS with a Coastal Ocean Observing System for the U.S. Middle Atlantic Bight.pdf](http://imos.org.au/fileadmin/user_upload/shared/IMOS%20General/ACOMO/Extended_Abstracts/5.Wilkin-Integrating_modeling_and_data_assimilation_using_ROMS_with_a_Coastal_Ocean_Observing_System_for_the_U.S._Middle_Atlantic_Bight.pdf))  
2435        [Integrating modeling and data assimilation using ROMS with a Coastal Ocean Observing System for the U.S. Middle Atlantic Bight.pdf](http://imos.org.au/fileadmin/user_upload/shared/IMOS%20General/ACOMO/Extended_Abstracts/5.Wilkin-Integrating_modeling_and_data_assimilation_using_ROMS_with_a_Coastal_Ocean_Observing_System_for_the_U.S._Middle_Atlantic_Bight.pdf)  
2436        [Integrating modeling and data assimilation using ROMS with a Coastal Ocean Observing System for the U.S. Middle Atlantic Bight.pdf](http://imos.org.au/fileadmin/user_upload/shared/IMOS%20General/ACOMO/Extended_Abstracts/5.Wilkin-Integrating_modeling_and_data_assimilation_using_ROMS_with_a_Coastal_Ocean_Observing_System_for_the_U.S._Middle_Atlantic_Bight.pdf)  
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2439 **Appendix 1 - Northeast Regional Action Plan Working Group Members**

2440

2441 NERAP Leadership Group

2442 Jen Anderson - GARFO - National Environmental Policy Act

2443 Diane Borggaard - GARFO - Protected Resources

2444 Kevin Friedland - NEFSC - Ecosystem Assessment Program

2445 Jon Hare - NEFSC - Ecosystems Processes Division

2446

2447 NERAP Working Group

2448 Peter Burns - GARFO - Sustainable Fisheries:

2449 Kevin Chu - GARFO - Stakeholder Engagement (Aquaculture):

2450 Trish Clay - NEFSC - Social Sciences Branch

2451 Matt Collins - HQ (at GARFO) - Habitat Restoration

2452 Peter Cooper - HQ (at GARFO) - Highly Migratory Species

2453 Paula Fratantoni - NEFSC - Oceanography Branch

2454 Mike Johnson - GARFO - Habitat Conservation

2455 John Manderson - NEFSC - Northeast Cooperative Research Program

2456 Amy Martins - NEFSC - Fisheries Sampling Branch

2457 Lisa Milke - NEFSC - Aquaculture and Enhancement Division

2458 Tim Miller - NEFSC - Population Dynamics Branch

2459 Chris Orphanides - NEFSC - Protected Species Branch

2460 Eric Robillard - NEFSC - Population Biology Branch

2461 Vince Saba - NEFSC - Ecosystem Assessment Program

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2466 **Appendix 2 - External and NOAA Partners Consulted in Draft Development**

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2468 External Partners

2469 Mid-Atlantic Fishery Management Council Staff

2470 New England Fishery Management Council Staff

2471 Atlantic States Marine Fisheries Commission Staff

2472 Federally-Recognized Tribes

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2474 NOAA Partners

2475 Dwight Gledhill - NOAA OAR Ocean Acidification Program

2476 Elizabeth Turner - NOAA NOS Center for Sponsored Coastal Ocean Research

2477 Charlie Stock - NOAA OAR Geophysical Fluid Dynamics Laboratory

2478 Michael Alexander - NOAA OAR Earth Systems Research Laboratory

2479 Ben Haskell - NOAA NOS National Marine Sanctuaries

2480 Ellen Mecray - NOAA NCEI Regional Climate Services

2481 Nicole Bartlett - NOAA North Atlantic Regional Team

2482 Bruce Vogt – NOAA Chesapeake Bay Office

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2484 **Appendix 3 – List of Northeast Regional Action Plan Draft Actions**

2485 Draft actions were initially identified by the Northeast Regional Action Plan Working Group  
 2486 after reviewing the [regional strengths](#), [weaknesses](#), and needs. These draft actions were  
 2487 subsequently reviewed, prioritized and consolidated into the [Priority Actions](#) identified in the  
 2488 main text of this document. Draft Actions were also mapped to NOAA Mission Areas and NOAA  
 2489 Fisheries Climate Science Strategy Objectives. The average Working Group ranks (1=High,  
 2490 2=Moderate, 3=Low) and the number of top 10 rankings are also presented.

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MSF/MCA	Aquaculture	MMPA	ESA	Habitat	Ecosystem	Objective	Action #	DRAFT Action Statement	Average Rank	Number of Top 10 Identifiers - No New Resources	Number of Top 10 Identifiers - New Resources
x	x	x	x			5	1	Conduct laboratory research to improve biological parameterization in coupled species-climate models. Research should evaluate the effect of climate variables on biological parameters in isolation and in combination (e.g., the effect of temperature on consumption, and the effect of temperature and pH on larval survival).	1.923077	2	3
x	x	x	x			5	2	Conduct laboratory and field-based process research on species to assess behavioral, physiological, ecological and biophysical impacts from climate change (e.g., temperature, ocean acidification and sea level rise) with an emphasis on cumulative impacts, multiple stressors and synergistic interactions.	2.153846	3	4
x	x	x	x			5	3	Conduct research to establish abundance estimates and vital rates (e.g., mortality, population growth) and evaluate climate related changes for data poor species.	1.923077	1	1
				x		5	4	Conduct research on how climate change (e.g., warming, ocean acidification, changes in streamflow) can affect exposure to contaminants in freshwater and estuarine systems.	1.230769	0	0
x	x		x			5	5	Conduct research into climate impacts on watersheds (i.e. rivers, estuaries) that includes field-based studies and regional models. Research includes understanding the interaction of human structures and changes to watersheds to habitat function and connectivity.	1.615385	2	3
x	x		x	x		5	6	Conduct research on the impacts of climate change within the critical transition zone between freshwater and marine environments and assess the affects on NOAA Trust Resources	1.615385	1	2
x	x	x	x			5	7	Conduct research on species' ability to adapt and acclimate to climate change (e.g., evolution, phenotypic plasticity, assisted migration). Reseach should include the ability of habitat to change in response to climate change (e.g., ability of salt marsh to migrate landward with sea-level rise)?	2.230769	3	4
x	x	x	x	x	x	7	8	Increase social and economic scientist involvement in IEAs and climate change research. Most critically through creation of integrated models (e.g., A-CLIM). Efforts should focus on involving social scientists and economists from the beginning rather than as an add-on to a ongoing project.	2.538462	2	1

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MSFMCA	Aquaculture	MMPA	ESA	Habitat	Ecosystem	Objective	Action #	DRAFT Action Statement	Average Rank	Number of Top 10 Identifiers - No New Resources	Number of Top 10 Identifiers - New Resources
x	x			x	x	5	9	Develop large-scale mesocosm capacity to evaluate effects of multiple stressors (e.g., warming, OA) on trust resource species and habitats (e.g., similar to efforts that have been advanced by the European Ocean Acidification Research Community). Conduct multistressor studies considering increased pCO <sub>2</sub> (decreased Ω <sub>arag</sub> ) combined with one or more other stressors such as temperature, hypoxia, and salinity.	2	0	1
x	x	x	x			5	10	Conduct research on the mechanistic effects of climate on resource species as a means to incorporate climate drivers in historical and projected population models.	2.615385	4	5
x	x			x	x	7	11	Evaluate regional progress on NOAA Ocean and Great Lakes Acidification Research Plan ( <a href="http://www.pmel.noaa.gov/co2/files/feel3500_without_budget_rfs.pdf">http://www.pmel.noaa.gov/co2/files/feel3500_without_budget_rfs.pdf</a> ). Review ocean acidification monitoring network and work with partners to fill high priority gaps.	1.923077	2	1
x			x		x	5	12	Conduct research on the effects of climate change on food webs of diadromous species. Efforts are needed across life stages.	2	2	4
x		x	x	x	x	5	13	Conduct research on the spatial and temporal distribution and migration of species (including phenology). Coordinate distribution research with Canada as distributions shift outside of US boundaries and with SEFSC as distributions shift into the Northeast U.S. Shelf ecosystem.	2.538462	4	7
x		x	x	x	x	5	14	Conduct research on climate effects on the distribution of key forage species (e.g., capelin, Atlantic herring, Atlantic menhaden) and the potential effects on all life stages of managed species (e.g., Atlantic salmon, Atlantic cod, striped bass, Atlantic bluefin tuna)	2.461538	5	5
x	x	x	x			5	15	Conduct research on how climate change can change impacts of disease and parasites on resource species on the Northeast U.S. shelf ecosystem	1.615385	1	1
x	x	x	x	x	x	5	16	Conduct research on regime shift effects on NOAA Trust Resources related to thresholds in climate-related variables.	1.846154	0	0

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MSFMCA	Aquaculture	MMPA	ESA	Habitat	Ecosystem	Objective	Action #	DRAFT Action Statement	Average Rank	Number of Top 10 Identifiers - No New Resources	Number of Top 10 Identifiers - New Resources
				x		5	17	Conduct research and observations to better understand the response of habitat to climate change. Evaluate habitat priorities identified in other documents (e.g., Habitat Assessment Improvement Plan, Fishery Management Plans) relative to climate change.	2.307692	4	3
	x					5	18	Conduct research and observations to better understand the effect of climate change on aquaculture operations. Evaluate aquaculture priorities identified in other documents (e.g., state plans, NOAA Aquaculture plans) relative to climate change.	1.769231	1	0
x	x	x	x	x	x	5	19	Conduct research on species and ecosystem phenology (e.g., mismatches of altered spawning and migration cues and prey availability, physiological adaptations to altered temperature regimes).	2.461538	3	4
x			x	x		6	20	Conduct long-term surveys focused on habitats not well sampled by standard trawl surveys (e.g., complex rocky reef habitats). Surveys should also address concerns about the catchability of specific species collected during bottom trawl surveys for important groundfish stocks, and enhance data collection for data poor species and species of concern that are specifically associated with these habitats.	2.230769	1	3
			x			6	21	Quantify and monitor sea turtle nesting habitat availability and monitor sea turtle nesting and habitat availability to determine how climate change may affect the size and distribution of nesting beaches. Coordinate with US Fish and Wildlife Service, other federal agencies, and the appropriate state partners to continue to monitor sea turtle nesting numbers.	2	2	1
x		x	x	x	x	7	22	Maintain existing surveys and expand where possible (e.g., data poor species) to provide foundation for temporal and spatial comparisons in climate assessments. Recognize seasonal and interannual variability in the Northeast U.S. Shelf Ecosystem in the design of surveys.	2.769231	5	6
x	x	x	x	x	x	7	23	Conduct gap analysis comparing NOAA Trust Resources to regional observing capabilities. Identify critical gaps and initiate data collection programs if possible.	2.076923	2	1
x	x		x	x	x	7	24	Coordinate research and observing on freshwater and estuarine systems with other federal agencies; continue interagency communication on climate change to understand science, needs, and application of science to needs	1.692308	1	0

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MSF/MCA	Aquaculture	MMPA	ESA	Habitat	Ecosystem	Objective	Action #	DRAFT Action Statement	Average Rank	Number of Top 10 Identifiers - No New Resources	Number of Top 10 Identifiers - New Resources
x	x	x	x	x	x		7 25	Develop regional Ecosystem Observing Plan in collaboration with Regional Associations (Integrated Ocean Observing Systems) and other long-term observing efforts in the region. Plan should include variety of platforms including ships, moorings, gliders, and autonomous vehicles.	2.615385	3	3
x	x	x	x	x	x		6 26	Establish an Environmental Data Center in the Northeast to inform broad range of climate-related activities (e.g., single species, protected species, habitat, and ecosystems).	2.076923	1	2
x	x	x	x	x	x		3 27	Continue to build Industry-based ocean observing network including fixed and mobile gear. Support integration of data into ocean forecast models and make data available for ocean hindcast models. Develop real time engagement with the industry via Northeast Cooperative Research Program and other cooperative efforts to collect biological and ocean data to describe the ecosystem.	2.230769	2	3
x	x	x	x	x	x		2 28	Develop Management Strategy Evaluation capability to examine the effect of different management strategies under climate change. Specific issues to be addressed are management strategies for changing productivity and distribution, simulating regime shifts and effects on NOAA trust resources and management strategies, and evaluating climate-informed reference points.	2.230769	4	4
x		x	x		x		1 29	Continue development of multispecies models and use of predator indices in single-species models. Build off of efforts underway in NEFSC and others.	2	3	2
x		x	x				1 30	Give greater emphasis to climate-related Terms of Reference and analyses in stock assessments. Current Terms of Reference language may touch on climate/environmental analyses but there needs to be more comprehensive analysis, and attempts to tie in such analyses within assessment models, instead of current practice of a complementary analysis. Need broad NEFSC participation in stock assessment process to contribute climate, ecosystem (including human communities), and habitat expertise.	2.615385	5	4
x		x	x				1 31	Increase understanding of climate impacts on protected species populations to evaluate and set "allowable" removal levels in a changing climate.	1.846154	0	1
x			x				1 32	Continue development of stock assessment models (e.g., Age Structured Assessment Program, new state-space model) that include environmental terms (e.g., temperature, ocean acidification).	2.769231	6	5

MSFMCA	Aquaculture	MMPA	ESA	Habitat	Ecosystem	Objective	Action #	DRAFT Action Statement	Average Rank	Number of Top 10 Identifiers - No New Resources	Number of Top 10 Identifiers - New Resources
x	x	x	x			2	33	Develop framework for dealing with emergent climate related NOAA Trust Resource issues including social and economic aspects.	2	2	1
x		x	x			2	34	Review stock structure questions in the Northeast U.S. Shelf Ecosystem related to climate-driven changes in distribution. All managed species should be included. Framework for review should be consistent among stocks.	2.076923	0	0
		x	x			1	35	Incorporate climate factors in marine mammal assessments. Review structure of marine mammal assessments, review potentially relevant climate information, and identify methods to include climate information in assessments. Work with NMFS HQ and other regions on developing national guidelines.	2.153846	2	1
x	x	x	x	x	x	4	36	Work with NOAA OAR and academic scientists to develop regionally downscaled climate projections that are based on both statistical and dynamical downscaling methods. Develop mechanisms to continue improvement and production of select products.	2.307692	3	4
x	x	x	x	x	x	4	37	Work with NOAA and academic scientists to develop and improve robust regional hindcasts and climatologies. Develop mechanisms to continue improvement and production of select products.	2.307692	2	2
x	x	x	x	x	x	4	38	Work with NOAA and academic scientists to develop short-term (days to months) and medium-term (months to years) forecasting products. Incorporate forecasts into NOAA Fisheries products (e.g., assessments, bycatch avoidance, short-term outlooks).	2.153846	4	3
x	x		x	x	x	4	39	Work with USGS, EPA, and NOAA to develop coupled watershed - ocean climate projections for the region for simulating and projecting aspects of freshwater habitats.	1.615385	1	1
				x		2	40	Incorporate coupled climate-species models in habitat considerations for assessments and other products related to MSA, MMPA, and ESA. These efforts should incorporate Local Ecological Knowledge if possible.	2.384615	2	2

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MSFMCA	Aquaculture	MMPA	ESA	Habitat	Ecosystem	Objective	Action #	DRAFT Action Statement	Average Rank	Number of Top 10 Identifiers - No New Resources	Number of Top 10 Identifiers - New Resources
	x					5	41	Conduct multiple stressor laboratory and mesocosm experiments to understand the effect of climate change on aquaculture species.	1.692308	1	1
	x			x		6	42	Conduct region wide benthic surveys in estuaries where aquaculture is taking place and where it is not to assess how susceptible these habitats are to climate change.	1.461538	0	0
x	x	x	x	x	x	2	43	Continue to expand and develop community social and climate vulnerability indicators to more fully assess marine and coastal climate change impacts on fishing communities.	2.461538	1	3
		x	x			6	44	Develop and implement a climate vulnerability assessment for marine mammals and sea turtles. A national effort is already underway and NEFSC and GARFO should continue to support.	2.230769	1	1
x			x			6	45	Develop and implement a climate vulnerability assessment for highly migratory species. Work with NMFS HQ and SEFSC to ensure coastwide and national coordination.	2.076923	1	1
x	x		x			6	46	Update fish and shellfish vulnerability assessment. Plan an update with the next International Panel on Climate Change (e.g., Assessment Report 6). Make improvements in vulnerability assessment framework in the Northeast including use of downscaled climate models, updated species profiles, updated exposure factors and sensitivity attributes, including climate model uncertainty, including different RCP's, and including a broader set of stakeholders in the assessment.	2.076923	3	2
				x		6	47	Develop and implement a climate vulnerability assessment for habitat in the Northeast U.S. Shelf Ecosystem. Work with NMFS HQ to ensure coastwide and national coordination.	1.923077	1	2
	x					6	48	Develop and implement a climate vulnerability assessment for aquaculture in the Northeast U.S. Shelf Ecosystem. Work with NMFS HQ to ensure coastwide and national coordination.	1.769231	1	0

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MSF/MCA	Aquaculture	MMPA	ESA	Habitat	Ecosystem	Objective	Action #	DRAFT Action Statement	Average Rank	Number of Top 10 Identifiers - No New Resources	Number of Top 10 Identifiers - New Resources
				x			6 49	Identify climate vulnerable and climate resilient spawning and nursery habitats for fish and invertebrates in the ecosystem based on multidecadal climate projections.	2.076923	1	2
x		x	x				2 50	Continue restoration efforts for diadromous species. Examples of activities include involve GARFO and NEFSC in prioritization of restoration activities. Establish an entity like the Watershed Program at the Northwest Fisheries Science Center Form Technical Working Groups for diadromous species similar to the River Herring Technical Expert Working Group.	1.923077	1	1
x	x	x	x	x	x		6 51	Continue production Ecosystem Status Report for a broad range of partners and Annual Ecosystem Reports for the Fishery Management Councils and Atlantic States Marine Fisheries Commission. Improve reports based on input from partners and stakeholders. Improve communication on release of reports. Work toward steadily increasing the scope of the reports to encompass the entire Northeast U.S. Shelf Ecosystem (watersheds to open ocean) including social and economic indicators.	2.384615	3	3
x	x	x	x	x	x		3 52	Coordinate with NEFMC, MAFMC, and ASMFC Ecosystem-Based Fisheries Management activities particularly related to species interactions. Ensure Councils consider broad approach to species interactions including protected species, non-target species, highly migratory species and others.	2.230769	2	1
x	x	x	x	x	x		3 53	Increase interactions with Canadian scientists and managers. Identify and use existing and develop new venues for addressing issues of joint concern, including physical, biological, social and economic impacts of climate change. (This is already in process with the MSEs being created for WGNARS.)	2	0	0
x	x	x	x	x	x		3 54	Coordinate with Councils, ASMFC, Scientific and Statistical Committees, Take-Reduction Teams, Atlantic Scientific Review Group, NMFS HMS and other groups as applicable on the development and evaluation of adaptive management in response to climate change (e.g., warming, sea-level rise, ocean acidification). This includes stakeholder involvement to help define the most important steps and potential solutions. As an example, work with fisheries managers to evaluate spatial allocation schemes and evaluate more a suite of allocation schemes.	2.615385	5	3

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MSFMCA	Aquaculture	MMPA	ESA	Habitat	Ecosystem	Objective	Action #	DRAFT Action Statement	Average Rank	Number of Top 10 Identifiers - No New Resources	Number of Top 10 Identifiers - New Resources
x	x	x	x	x	x	7	55	Develop outreach strategy for communicating results of NOAA Fisheries Climate Science Strategy implementation in Northeast Region (including New England and the Mid-Atlantic Region).	1.846154	1	0
x	x	x	x	x	x	7	56	Improve stakeholder and public awareness and engagement with NMFS activities on climate change including physical, biological, social and economic information	2.307692	4	3
x	x	x	x	x	x	7	57	Support the development of regional meetings (such as Regional Association for Research on the Gulf of Maine) that encourage interactions among scientists and managers in the region. Encourage broad regional NMFS participation.	2.153846	2	2
x	x	x	x	x	x	3	58	Continue to develop partnerships with tribal governments and meet to discuss climate change issues. Broaden involvement of GARFO and NEFSC staff.	1.461538	1	0
x	x	x	x	x	x	3	59	Initiate discussion with NEFSC, GARFO, SEFSC, SER and HQ to identify overlaps and joint issues of interest. This discussion should include current issues and potential future issues related to climate change and cover all NMFS mission activities.	2	2	1
x	x	x	x	x	x	7	60	Improve partnerships with NOAA Educational Resources Office and other organizations to contribute to national and regional education efforts as they relate to climate change and the NOAA Fisheries Mission.	1.692308	0	0
x	x	x	x	x	x	7	61	Provide training to increase climate literacy among GARFO, NEFSC and regional NMFS HQ staff to assist in identifying the climate vulnerabilities and needs in all regional programs and mandates.	1.769231	2	0
x	x	x	x	x	x	7	62	Develop NE Climate Science Strategy Working Group that include NEFSC, GARFO, NOAA OAR, regional NMFS HQ, and other federal and non-federal partners to review and communicate on climate-related activities in the region. Compile a list of climate-related groups/committees, as well as activities (e.g., workshops), in the Northeast (i.e., region-specific social network analysis). Purpose is to keep track of different activities and assist in making connections among different activities.	2.153846	3	3
x	x	x	x	x	x	2	63	Conduct research and share information on climate change mitigation (e.g., helping species adapt through fish-friendly culvert crossings) and climate change adaptation (e.g., working with fishing communities). Work with other government agencies, research institutions, and community groups where appropriate.	1.769231	2	2

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2510 **Appendix 4. Coastal and Ocean Climate Applications Projects**

2511 In partnership with the National Marine Fisheries Service (NMFS) Office of Science and  
2512 Technology, CPO's Coastal and Ocean Climate Applications (COCA) program initiated a new  
2513 program: Sustainable management and resilience of U.S. fisheries in a changing climate: a  
2514 collaboration between OAR and NMFS. The following text is largely taken from a [NOAA](#)  
2515 [Climate Program Press Release](#). Seven projects were competitively awarded in FY 2015 and  
2516 focused on increasing the understanding of climate-related impacts on fish stocks and  
2517 fisheries. The roughly \$5 million in grants cover a two- to three-year time period.

2518  
2519 Resilient and sustainable fisheries provide an important source of jobs, food, recreation  
2520 and economic activity for the nation. In 2013, U.S. marine commercial and recreational  
2521 fisheries contributed \$195 billion in sales impacts and provided 1.7 million jobs.

2522  
2523 Warming oceans, rising seas, ocean acidification, and hypoxia are impacting America's  
2524 marine life and the many people, businesses, communities and economies that depend on  
2525 them. Climate-related impacts can affect the abundance, distribution, and productivity of  
2526 fish stocks. Fishermen, seafood processors, fishery managers and other decision makers  
2527 need more information on current and future changes to better prepare and respond

2528  
2529 To address these issues, a collaboration between the Office of Oceanic and Atmospheric  
2530 Research and the National Marine Fisheries Service has been developed to advance  
2531 understanding of current and future climate-related impacts on living marine resources and  
2532 the communities that depend on them. The goal is to inform sustainable management and  
2533 resilience of the nation's fisheries in a changing climate.

2534  
2535 Six projects support research to understand and respond to climate impacts on fish and  
2536 fisheries in the Northeast U.S. Shelf Ecosystem.

- 2537  
2538 1. Gulf of Maine Research Institute (GMRI): [Evaluating Social-Ecological Vulnerability](#)  
2539 [and Climate Adaptation Strategies for Northeast U.S. Fishing Communities](#)

2540  
2541 Lead Principal Investigator (PI): Katherine Mills (Gulf of Maine Research Institute),

2542  
2543 Co-PIs: Jenny Sun (GMRI), Steve Eayrs (GMRI), Jonathan Labaree (GMRI), Troy  
2544 Hartley (Virginia Institute of Marine Science), Jon Hare (Northeast Fisheries Science  
2545 Center, Narragansett Laboratory), Lisa Colburn (Northeast Fisheries Science Center,  
2546 Narragansett Laboratory), Eric Thunberg (NOAA Fisheries)

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2. University of Rhode Island: [Robust harvest strategies for responding to climate induced changes in fish productivity](#)

Lead Principal Investigator (PI): Jeremy Collie (University of Rhode Island)

Co-PIs: Jon Hare (Northeast Fisheries Science Center, Narragansett Laboratory),  
Richard Bell (Northeast Fisheries Science Center, Narragansett Laboratory), David  
Richardson (Northeast Fisheries Science Center, Narragansett Laboratory)

3. Mid-Atlantic Fishery Management Council: [Climate velocity over the 21st century and its implications for fisheries management in the Northeast U.S.](#)

Lead Principal Investigator (PI): Malin Pinsky (Rutgers University)

Co-PI: Richard Seagraves (Mid-Atlantic Fishery Management Council)

4. Rutgers University and NOAA Earth Systems Research Laboratory: [A high-resolution physical-biological study of the Northeast U.S. shelf: Past variability and future change](#)

Lead Principal Investigators (PI): Enrique Curchitser (Rutgers University), Michael  
Alexander (Earth Systems Research Laboratory)

Co-PI: Charles Stock (Geophysical Fluid Dynamics Laboratory)

5. Rutgers University, NOAA Northeast Fisheries Science Center, University of Delaware - MARACOOS, and University of Rhode Island: [Indicators of habitat change affecting three key commercial species of the U.S. Northeast Shelf: A design to facilitate proactive management in the face of climate change](#)

Lead Principal Investigators (PI): Brad Seibel (University of Rhode Island), Vincent  
Saba (NOAA Northeast Fisheries Science Center), Peter Moore (University of  
Delaware - MARACOOS), Grace Saba (Rutgers University)

6. Northeastern University: [Predicting social impacts of climate change in fisheries](#)

Lead Principal Investigator (PI): Steven Scyphers (Northeastern University)

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CO-PIs: Jonathan Grabowski(Northeastern University), Steven Gray (Michigan State University), Loren McClenachan (Colby College), J. Lad Akins (Reef Environmental Education Foundation), Pamela Schofield (United States Geological Survey)

NOAA Southwest Fisheries Science Center (SWFSC): "Ecosystem Tipping Points in The North Pacific: Identifying Thresholds in Response to Climate Change and Potential Management Strategies,"

Lead Principal Investigators (PI): Francisco Werner (NOAA SWFSC) and Robert Webb (NOAA Earth Systems Research Laboratory)

2598 **Appendix 5 - Background Documents and Websites**

2599 These documents were identified by the Northeast Regional Action Plan Working Group and  
2600 used to support the development of the Northeast Regional Action Plan

2601

2602 Websites and Workshop Reports

2603

- 2604 • [CINAR Climate Change Workshop](#)
- 2605 • [DOI Tribal Cooperative Landscape Conservation Program](#)
- 2606 • [East Coast Climate Change and Fisheries Governance Workshop](#)
- 2607 • [Fishing Community Resiliency Presentation - Peter Burns at GARFO](#)
- 2608 • [Flood Frequency Estimates for New England River Restoration Projects: Considering  
2609 Climate Change in Project Design](#)
- 2610 • GARFO 2013 Climate Change and Management Needs (internal GARFO Coordination  
2611 Team document developed to support GARFO supervisor and NEFSC meeting)
- 2612 • [Greater Atlantic Regional Fisheries Office Strategic Plan FY 2015-2019](#) (associated  
2613 climate change priorities such as community resilience)
- 2614 • [Island Institute Climate Change Workshop Report](#)
- 2615 • [Island Institute Ocean Acidification Panel Report](#)
- 2616 • [Island Institute Preparing for an Uncertain Fishing Future: Bringing communities  
2617 together with climate and marine scientists to understand predictive capabilities and  
2618 information needs](#)
- 2619 • [MAFMC Climate Change White Paper](#)
- 2620 • [National Climate Assessment; Northeast Chapter](#)
- 2621 • [NEFSC Climate Science Plan - 2009](#)
- 2622 • [NEFSC Ecosystem Considerations Webpage](#)
- 2623 • [NEFSC Ecosystem Considerations Webpage](#)
- 2624 • Northeast Fisheries Climate Vulnerability Assessment (will be available soon)
- 2625 • [Northeast Fisheries Science Center Strategic Plan FY 2016-2012](#)
- 2626 • [Proposal for GARFO-WCR Study Group on Fishing Community Resilience](#) (associated  
2627 with above presentation)
- 2628 • [Protected Resources and Climate Change Workshop Report](#)
- 2629 • [River Herring Climate Workshop](#) and [Climate Subgroup](#) Research Needs/Data Gaps
- 2630 • [Understanding Climate Change on Fish Stocks of the Northeast Shelf](#) - JOSS & NMFS
- 2631 • [Union of Concerned Scientists - Confronting Climate Change in the U.S. Northeast](#)

2632

2633 Various publications and associated/relevant research needs:

2634

- 2635 • A'mar, ZT, Punt, AE, and Dorn, MW. 2009. The evaluation of two management strategies  
2636 for the Gulf of Alaska walleye pollock fishery under climate change. ICES Journal of  
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- 2638 • [Beechie et al 2013](#) related to salmon habitat
- 2639 • [Bell et al 2014a](#) related to climate effects on MAB species

- 2640 • [Bell et al 2014b](#) related to climate effects on MAB species
- 2641 • Brander, K., Neuheimer, A., Andersen, K.H., and Hartvig, M. 2013. Overconfidence in
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- 2643 • De Oliveira, JAA and Butterworth, DS. 2005. Limits to the use of environmental indices
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- 2646 • Evans et al. 2015. When 1+1 can be >2: Uncertainties compound when simulating
- 2647 climate, fisheries and marine ecosystems. Deep-Sea Research II 113 (2015) 312–322.
- 2648 <http://dx.doi.org/10.1016/j.dsr2.2014.04.006>
- 2649 • [Fogarty et al. 2009](#) related to climate effects on groundfish
- 2650 • [Friedland et al. 2013](#) related to climate effects on groundfish
- 2651 • [Friedland et al. 2015](#) related to climate effects on groundfish
- 2652 • Gregr, E.J. and K.M.A. Chan. 2015. Leaps of faith: how implicit assumptions compromise
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- 2661 • [Hare et al 2010](#) related to climate effects on MAB species
- 2662 • [Hare et al., 2012](#) related to assessing climate impacts on data poor species
- 2663 • Ianelli, JN et al. 2011. Evaluating management strategies for eastern Bering Sea walleye
- 2664 pollock (*Theragra chalcogramma*) in a changing environment. ICES Journal of Marine
- 2665 Science 68(6): 1297-1304.
- 2666 • Lead Authors: Amber Himes-Cornell and Mike Orbach; Authors: Stewart Allen, Guillermo
- 2667 Auad, Mary Boatman, Patricia M. Clay, Mike Dalton, Di Jin, Sam Herrick, Dawn Kotowicz,
- 2668 Cary Lopez, Phil Loring, Paul Niemeier, Karma Norman, Lisa Pfeiffer, Mark Plummer,
- 2669 Michael Rust, Merrill Singer, and Cameron Speirs. 2012. Section 4 Impacts of Climate
- 2670 Change on Human Uses of the Ocean. In: Griffis, Roger and Howard, Jennifer, eds.,
- 2671 *Oceans and Marine Resources in a Changing Climate: Technical Input to the 2013*
- 2672 *National Climate Assessment*. Draft Report. United States Global Change Research
- 2673 Project, Washington, DC.
- 2674 [http://downloads.globalchange.gov/nca/Griffis\\_Howard\\_Ocean\\_Marine\\_Resources\\_Final\\_1-14-13.pdf](http://downloads.globalchange.gov/nca/Griffis_Howard_Ocean_Marine_Resources_Final_1-14-13.pdf)
- 2675 Discusses social science knowledge to date on impacts of climate change
- 2676 on oceans and coasts.
- 2677 • [Lynch et al., 2014](#) related to assessing climate impacts on data poor species,
- 2678 • [Mills et al 2013](#) related to salmon
- 2679 • [Nye et al. 2009](#) related to distribution shifts
- 2680 • [Perry et al., 2015](#) related to incorporating climate change projections into riparian
- 2681 restoration planning and design
- 2682 • [Pinsky and Fogarty 2012](#) related to distribution shifts

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  - [Tommasi et al., 2015](#) related to assessing climate impacts on data poor species
  - [Walsh et al. 2015](#) related to distribution shifts



2697 **Appendix 6 - NOAA Fisheries Climate Science Strategy Actions**

2698 The Priority Actions defined in the Northeast Regional Action Plan are cross-referenced to the  
 2699 Immediate, Near-Term (6-24 months) and Medium-Terms (2-5 years) Actions defined in the  
 2700 [NOAA Fisheries Climate Science Strategy](#).  
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	<b>Climate Science Strategy Actions</b>	<b>Northeast Regional Action Plan Priority</b>
Immediate actions	1. Conduct climate vulnerability analyses in each region for all LMRs to better understand what is at risk and why.	11
	2. Establish and strengthen ecosystem indicators and status reports in all regions to better track, prepare for and respond to climate-driven changes.	12
		7
	3. Develop capacity to conduct management strategy evaluations regarding climate change impacts on management targets, priorities, and goals.	13
Near-term actions	1. Strengthen climate-related science capacity regionally and nationally to fulfill NOAA Fisheries information requirements in a changing climate.	5
		2
		6
		7
		4
	2. Develop RAPs to customize and execute this Strategy in each region over the next 3 to 5 years, through NOAA Fisheries regional Science Centers, Regional	3
		This document
	3. Ensure that adequate resources are dedicated to climate-related, process-oriented research to better understand how climate impacts LMRs, how to reduce impacts and how to increase resilience of LMRs and LMR-dependent communities.	14
4. Establish standard, climate-smart terms of reference to apply to all of NOAA Fisheries LMR management, environmental compliance requirements, and other processes that cross multiple mandates and core policy areas.	10	
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	<b>Climate Science Strategy Actions</b>	<b>Northeast Regional Action Plan Actions</b>
Medium-term Actions	1. Establish regular, NOAA-wide, national, climate-science workshops with LMR emphasis, with a focus on climate-ready BRPs and science for setting Harvest Control Rules, ESA evaluations (section 7 and section 10), essential fish habitat consultations, aquaculture, and NEPA analyses in a changing climate.	National
	2. Increase awareness of and training for NOAA Fisheries science and management staff on the impacts of climate change on LMRs and climate-informed LMR management practices.	14
	3. Organize and conduct regime-shift detection workshops for each region.	Underway
	4. Organize and conduct distribution shift workshops, with implications for stock and population identification and unit area across all LMRs in each region.	6
	5. Organize and conduct vital rate workshops, with implications for LMR life-history parameters across all LMRs in each region.	10
		13
	6. Organize and conduct workshops aimed at identifying regional data gaps (biological, physical, and socio-economic) related to climate variability and change and devising data collection programs aimed at filling those gaps, especially socio-economic gaps.	4
		13
	7. Develop and execute national and regional science communication plans for increasing dissemination of climate-related LMR science and information to technical users and other interested stakeholder audiences.	13; National
	8. Expand and support engagement with international partners to advance the production, delivery, and use of climate-related information (e.g., Climate-LMR related workshops, symposia, meetings, etc.) with specific focus on climate-informed biological reference points, climate-smart Harvest Control Rules, management strategy evaluations for climate-ready LMR management (including species and habitat recovery) and, climate-smart protected species and habitat consultations.	13; National
	9. Continue and expand NOAA Fisheries participation in cross-governmental, national efforts to advance climate-related science.	National
	10. Work with partners to re-evaluate risk policies under changing climate and ocean conditions.	5
11. Establish science-based approaches for shifting biological reference points to account for changing productivities, distributions, and diversities.	2	
12. Conduct management strategy evaluations on climate scenarios in extant ecosystem and population models in conjunction with the NOAA IEA program, NOAA Fisheries Stock Assessment Improvement Plan Update/Next Generation Stock Assessment, NOAA Fisheries Protected Resources Stock Assessment Improvement Plan, and development of ESA Five-Year Status Reviews.	5	

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	<b>Climate Science Strategy Actions</b>	<b>Northeast Regional Action Plan Actions</b>
<b>Medium-term Actions</b>	13. Establish science-based thresholds for exiting and entering fisheries.	5
	14. Establish and implement clear policies and practices for incorporating climate change into all NEPA and ESA (i.e., listing, recovery planning, interagency consultations, and permitting) activities.	3
	15. Establish and implement standards and guidelines for incorporating climate change information into Fisheries Management Plans and Fisheries Ecosystem Plans.	1
	16. Develop and implement standards and practices to promote climate resilience and climate mitigation in NOAA Fisheries habitat conservation activities.	11
	17. Develop climate-driven regional ocean models for use in projecting climate impacts on LMRs.	8
	18. Develop a national inventory of key science and information gaps related to NOAA Fisheries LMR and socio-economic responsibilities, building on regional data/information gap assessments.	4
	19. Increase support for existing programs addressing priority needs and objectives identified in this Strategy (e.g., Fisheries Oceanography, FATE, and IEAs).	National
	20. Establish common climate-smart input data vectors/matrices for inclusion in LMR assessments in conjunction with NOAA Fisheries Stock Assessment Improvement Plan Update/Next Generation Stock Assessment and Protected Resources Stock Assessment Improvement Plan, and development of ESA Five-Year Status Reviews.	National
	21. Identify and support process research linking changing climate and ocean conditions to LMR dynamics.	10
	22. Identify and maintain capability to execute oceanographic cruises for climate-smart observations and process research.	13
	23. Increase capability to undertake climate-smart, socio-economic research projects and analyses of human uses of LMRs and their ecosystems.	4
	24. Develop climate-resilient and climate-mitigating aquaculture strategies	11

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## Appendix 7 - Northeast Regional Action Plan Action Item Table

Action Name (short title; add rows as needed for Actions)	Funding Scenario (Level or Increase)	Time Frame (years)	Action Description (short description of who, what, key products and expected outcomes)	POC (name)	Partners	Other Objectives Addressed (1 – 7)
<b>Objective 1 – Climate Informed Reference Points</b>						
Climate Terms of Reference	Level / Increase	2017- 2021	Priority Action 1 - Give greater emphasis to climate-related Terms of Reference and analyses in stock assessments.	Jim Weinberg	MAFMC, NEFMC, ASMFC	
Climate-explicit stock assessment models	Level / Increase	2017- 2021	Priority Action 2 - Continue development of stock assessment models (e.g., Age Structured Assessment Program, new state-space model, multi-species models) that include environmental terms (e.g., temperature, ocean acidification).	Tim Miller	CINAR, academic institutions, NOAA Fisheries SF and S&T	
Climate informed protected species management	Level / Increase	2017- 2021	Priority Action 3 - Develop climate- related products and decision support tools to support protected species assessments and other management actions.	Diane Borggaard	NOAA Fisheries PR, Atlantic Scientific Review Group, CINAR, academic institutions, SEFSC, SERO	
<b>Objective 2 – Robust Management Strategies</b>						
Social and Economic Research	Level / Increase	2017- 2021	Priority Action 4 - Increase social and economic scientist involvement in climate change research.	Trisch Clay	CINAR, academic institutions, NOAA Fisheries SF	
Management Strategy Evaluations	Level / Increase	2017- 2021	Priority Action 5 - Develop Management Strategy Evaluation capability to examine the effect of different management	Sarah Gaichas	NOAA Fisheries ST, CINAR,	

			strategies under climate change.		academic institutions	
<b>Objective 3 – Adaptive Management Processes</b>						
Distributions and Spatial Management	Level / Increase	2017-2021	Priority Action 6 - Improve spatial management of living marine resources through an increased understanding of spatial and temporal distributions, migration, and phenology.	Jon Hare	SEFSC, DFO, ASMFC, MAFMC, NEFMC, CINAR, academic institutions	
Cooperative Research	Level / Increase	2017-2021	Priority Action 7 - Continue to build industry-based fisheries and ocean observing capabilities and use information to develop more adaptive management.	John Hoey	Industry, IOOS, NEFMC, MAFMC, ASMFC	
<b>Objective 4 – Project Future Conditions</b>						
Apply climate forecasts and projections	Level / Increase	2017-2021	Priority Action 8 - Work with NOAA Oceanic and Atmospheric Research and academic scientists to develop short-term (day to year) and medium-term (year to decade) living marine resource forecasting products.	Vince Saba	GFDL, ESRL, CINAR, academic institutions	
Improve hindcasts and climatologies	Level / Increase	2017-2021	Priority Action 9 - Work with NOAA Oceanic and Atmospheric Research and academic scientists to develop and improve robust regional hindcasts and climatologies.	Jon Hare	GFDL, ESRL, CINAR, academic institutions	
<b>Objective 5 – Understand the Mechanisms of Change</b>						
CINAR, academic institutions	Level / Increase	2017-2021	Priority Action 10 - Conduct research on the mechanistic effects of multiple climate factors on living marine resources with a goal of improving assessments and scientific advice provided to managers.	Tom Noji	NOAA OA Program, CINAR, academic institutions	
CINAR, academic institutions						
Vulnerability	Level /	2017-	Priority Action 11 - Develop and implement vulnerability	Jon Hare	CINAR,	

Assessments	Increase	2021	assessments in the Northeast U.S. Shelf Region.		academic institutions, NOAA Fisheries HMS, NOAA Fisheries ST	
Track Ecosystem Conditions	Level / Increase	2017-2021	Priority Action 12 - Continue production of the Ecosystem Status Report, and other related products, and improve the distribution of information from the reports through the formation of an Environmental Data Center.	Kevin Friedland	CINAR, academic institutions	
<b>Objective 7 – Science Infrastructure to Deliver Actionable Information</b>						
Maintain NEFSC Surveys	Level / Increase	2017-2021	Priority Action 13 – Maintain ecosystem survey effort in the Northeast U.S. Shelf ecosystem including the Bottom Trawl Survey, Ecosystem Monitoring Program, Sea Scallop Survey, Northern Shrimp Survey, and Protected Species Surveys and expand where possible (e.g., data poor species).	Jon Hare	IOOS, OOI,	
Northeast Climate Science Strategy Working Group	Level / Increase	2017-2021	Priority Action 14 – Initiate a Northeast Climate Science Strategy Steering Group (NECSSSG) to coordinate, communicate, facilitate, and report on issues related to climate change and living marine resource management.	Jon Hare	Internal	
Coordinate with Other Programs	Level / Increase	2017-2012	Priority Action 15 – Coordinate with other NOAA Programs to link living marine resource science and management to climate science and research activities	Jon Hare	HAIP, Aquaculture, Watershed Program, IEA Program, NOAA OA Program	

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## **Abstract**

A series of climate workshops recently held by the Mid-Atlantic Fishery Management Council (Council) identified the need to generate projections of future climate velocities (i.e., the rate and direction that isotherms shift across the seascape) in the region as explanatory mechanisms for the response of fish distributions to climate change. The purpose of the proposed research is to inform the Council about the rate, magnitude, and uncertainty surrounding future distributional changes for managed and other important species likely to occur as a result of climate change over the next several decades and for the remainder of this century.

In this proposal, we are proposing to project climate velocities and species distributions for a suite of species important to the Council in the Northeast U.S. Continental Shelf Large Marine Ecosystem (NE LME). We will downscale and bias-correct IPCC-class global climate model projections for 2020-2100, build species niche models from temperature and other environmental data, and develop an ensemble of species distribution projections. These ensembles will account for uncertainty more completely than has been done in the past, including uncertainty in greenhouse gas emissions, climate model formulation, climate variability, statistical niche model formulation, and niche model parameters. We will rank species by the rate and magnitude of range shift as well as the uncertainty in those values while also diagnosing the dominant source of uncertainty. In collaboration with the Council, we will identify potential priority species for adaptation of fisheries management to climate. Finally, we will expand an existing website to share these projections with the public, fishing communities, and other stakeholders.

The results of the proposed research will help the Council in the development of an adaptive fishery management framework that can deal effectively with shifting distributions of both managed and unmanaged fish stocks as part of its Ecosystem Approach to Fisheries Management (EAFM) Guidance Document. The Council proposes a novel, adaptive approach to conducting this work by utilizing its EAFM Working Group to help refine the analyses as the modeling work unfolds. EAFM WG oversight is expected to insure that the results of the proposed work will directly address the information and analytical needs required for inclusion in the Council's EAFM Guidance Document.

The research we propose directly addresses the primary focus of the COCA competition by seeking to understand and predict the future scope of distributional changes of fish stocks in the Mid-Atlantic as a result of climate change induced warming of the Atlantic Ocean. These analyses are critical to understanding future changes in the region and are a fundamental prerequisite to integrating these effects into fishery stock assessment and management efforts. The proposed research also supports the attainment of NOAA's long-term NGSP goal of climate adaptation and mitigation by improving our scientific understanding of the changing climate and its impacts on fisheries. Ultimately, the work will help the Council and Nation to prepare for and mitigate against the impacts of climate change with the goal of maintaining sustainable fisheries which support vibrant coastal fishing communities.



## Scientific Objectives

This project will focus on four objectives related to living marine resources in the northeast U.S.:

- Develop climate-velocity-driven species distribution projections for 2020 through 2100
- Characterize the dominant sources and magnitude of uncertainty in these projections
- Identify potential priority species for adaptation of fisheries management to climate
- Develop a website to share these projections with the public and other stakeholders

## Proposed Methodology

### Overview and focal species

Temperature has strong and well-understood impacts on fish and marine invertebrate physiology, abundance, and distribution (Pinsky et al. 2013b; Pörtner & Knust 2007). These impacts are often expressed in terms of a thermal niche, or the range of temperatures within which an organism can survive and reproduce. As temperatures warm or cool, thermal niches move across the seascape and are therefore expected to affect the distribution and abundance of species (Burrows et al. 2011; Cheung et al. 2009; Hare et al. 2012a). The rate and direction that thermal niches move is termed “climate velocity,” and climate velocities vary substantially from one location to another in the ocean (Burrows et al. 2011). Analyses of historical scientific surveys have shown that changes in marine animal distributions are explained well by climate velocity, thereby providing confidence in the thermal niche approach (Pinsky et al. 2013b).

Any projections, however, can be highly misleading if not accompanied by an understanding of uncertainty in those projections (Planque et al. 2011). Uncertainty in future species distributions derives not only from a range of possible future temperatures, but also from uncertainty in species responses to temperature and uncertainty in model form or parameters (Planque et al. 2011). Past research in the NE LME has shown that species distributions are shifting (Murawski 1993; Nye et al. 2011; Nye et al. 2009; Overholtz et al. 2011; Pinsky et al. 2013b) and has projected future distributions with uncertainty for a small number of individual species (Hare et al. 2010; Hare et al. 2012a; Hare et al. 2012b). Other work has projected future distributions for a range of species, including some in the NE LME, but has not characterized the magnitude or sources of climate uncertainty (Cheung et al. 2009; Shackell et al. 2014).

Species of particular interest to the Council include those that are the focus of Fishery Management Plans (FMPs), commercially and recreationally important species that may become substantially more abundant north of Cape Hatteras in the coming century (most were historically found in low numbers in the NE LME), and forage species that are important prey for any of the above (Table 1). We propose to produce the species distribution projections needed by the Council, characterize uncertainty in these projections, help to identify priorities for climate adaptation, and share the results with a wide range of stakeholders through a website.

**Table 1. Focal species for species distribution projections**

Common name	Scientific name	Relevance
Summer flounder	<i>Paralichthys dentatus</i>	Summer Flounder, Scup, and Black Sea Bass FMP
Scup	<i>Stenotomus chrysops</i>	Summer Flounder, Scup, and Black Sea Bass FMP
Black sea bass	<i>Centropristis striata</i>	Summer Flounder, Scup, and Black Sea Bass FMP
Monkfish/goosefish	<i>Lophius americanus</i>	Mackerel, squid, butterfish FMP
Atlantic mackerel	<i>Scomber scombrus</i>	Mackerel, squid, butterfish FMP
Illex squid	<i>Illex illecebrosus</i>	Mackerel, squid, butterfish FMP
Longfin squid	<i>Doryteuthis pealeii</i>	Mackerel, squid, butterfish FMP
Butterfish	<i>Peprilus triacanthus</i>	Mackerel, squid, butterfish FMP
Spiny dogfish	<i>Squalus acanthias</i>	Spiny Dogfish FMP

Golden tilefish	<i>Lopholatilus chamaeleonticeps</i>	Tilefish FMP
Bluefish	<i>Pomatomus saltatrix</i>	Bluefish FMP
King mackerel	<i>Scomberomorus cavalla</i>	Potential future Mid-Atlantic U.S. species
Spanish mackerel	<i>Scomberomorus maculatus</i>	Potential future Mid-Atlantic U.S. species
Snowy grouper	<i>Epinephelus niveatus</i>	Potential future Mid-Atlantic U.S. species
Spanish sardine	<i>Sardinella aurita</i>	Potential future Mid-Atlantic U.S. species
Atlantic thread herring	<i>Opisthonema oglinum</i>	Potential future Mid-Atlantic U.S. species
Sand lance	<i>Ammodytes</i> spp.	Forage
Atlantic menhaden	<i>Brevoortia tyrannus</i>	Forage
Atlantic herring	<i>Clupea harengus</i>	Forage
Round herring	<i>Etrumeus teres</i>	Forage
Striped anchovy	<i>Anchoa hepsetus</i>	Forage
Bay anchovy	<i>Anchoa mitchilli</i>	Forage

#### Data on historical distributions

Building models for climate-velocity-driven species distributions starts with data on the historical distribution and abundance of each species. We propose to use a set of five scientific surveys relevant to the northeast U.S. (Table 2), including surveys that sample species at lower latitudes but that may move into the northeast U.S. over the coming century. Surveys were chosen based on consistent methods and the availability of *in situ* temperature data. All surveys are fishery-independent, and the NEFSC and DFO surveys have been operating for more than 40 years. The datasets are currently available in the Pinsky lab or through the MAFMC.

**Table 2. Proposed scientific surveys for data on historical species distributions**

Organization	Survey	Region	Reference
Northeast Fisheries Science Center (NEFSC)	Bottom Trawl Survey	Cape Hatteras, NC to the Gulf of Maine	Azarovitz (1981)
Department of Fisheries and Oceans (Canada)	Multi-Species Bottom Trawl Survey	Bay of Fundy and Scotian Shelf, NS	Shackell and Frank (2003)
Northeast Area Monitoring and Assessment Program (NEAMAP)	Multispecies research trawl surveys	Cape Hatteras, NC to Cape Cod, MA	Bonzek et al. (2013)
Southeast Area Monitoring & Assessment Program South Atlantic (SEAMAP-SA)	Coastal Survey (bottom trawl)	Cape Canaveral, FL to Cape Hatteras, NC	SEAMAP-SA (2000)
Southeast Area Monitoring & Assessment Program South Atlantic (SEAMAP-SA)	Reef Fish Survey (traps and longlines)	St. Lucie, FL to Cape Hatteras, NC	Bacheler et al. (2013)

#### Data on environmental conditions

Explanatory variables for species distribution projections are primarily of two types: environmental factors that can be projected forward over the coming century, and environmental conditions that are approximately constant over the coming century. From the set of possible explanatory variables, we will focus on temperature, benthic habitat, and solar elevation given the clear evidence linking them to species abundance and distribution in the scientific surveys. Temperature has a well-understood physiological impact on marine ectotherms (Pörtner & Knust 2007) and historical tests with marine fish and invertebrates suggest that temperature in particular has a strong ability to explain changes in species distributions (Pinsky et al. 2013b). However, benthic habitat may be an important constraint for species closely tied to certain habitat types (Hare et al. 2012a), and solar elevation can affect the catchability of some species in the survey gear (Casey & Myers 1998). The relative importance of these variables will be testing in the model-building process. We do not include depth because models with depth terms

poorly explain changes in species depth through time, while models without a depth term perform substantially better (Pinsky et al. 2013b). Many species in the northeast have been moving towards deeper waters (Nye et al. 2009; Pinsky et al. 2013b), and we expect that this pattern will continue.

We will use *in situ* bottom and surface temperature measurements from the scientific surveys (Table 2). For benthic habitat, we will use a Terrain Ruggedness Index (Hare et al. 2012a) calculated from the 3-arc second NGDC Coastal Relief Model (<http://www.ngdc.noaa.gov/mgg/coastal/coastal.html>) (Manderson et al. 2011). Terrain ruggedness is the square root of the sum of the difference of squared elevations between a focal grid cell and the eight surrounding grid cells. In addition, we will use sediment grain size maps derived from the usSEABED database (Goff et al. 2008; Reid et al. 2005). Both terrain ruggedness and grain size will be matched to the locations of each species observation.

#### Building species niche models

The core of a climate-velocity-driven species distribution projection is a model that estimates a species' thermal niche. However, to fit this model statistically, we also need to account for other factors that affect the observed abundance and distribution of a species. As in Pinsky et al. (2013b), we will fit two-part statistical models to account for the large number of zeros in the scientific survey biomass data. The first part of the model will be fit to presence/absence data, while the second will be fit to log-abundance data where the species is present (Fletcher et al. 2005). We will use an ensemble of statistical techniques to explore uncertainty in numerical model formulation (Planque et al. 2011), including Generalized Additive Models (GAMs) (Wood 2011), Generalized Linear Models (GLMs) (Guisan et al. 2002), and Boosted Regression Trees (BRTs) (Elith et al. 2008). All three methods have been useful for species distribution modeling (Elith et al. 2006).

Explanatory factors will include bottom temperature, surface temperature, Terrain Ruggedness Index, sediment grain size, solar elevation, survey, season, survey gear type, and region-wide average biomass for the year. Penalized regression splines (GAMs) and quadratic terms (GLMs) will be used for each temperature, benthic habitat, and solar-elevation terms to allow non-linear responses. BRTs automatically fit non-linear responses for continuous terms. The categorical survey, season and gear type terms will help account for differences in catchability between and within surveys. Similarly, the average biomass terms corrects for region-wide changes in abundance (such as from overfishing or recovery) that are not relevant to our focus on spatial shifts (Pinsky et al. 2013b).

In each of the models, we will eliminate terms using smoothing penalties (GAMs), Akaike's Information Criterion (GLMs), or cross-validation (BRTs). We will also investigate survey-dependent and season-dependent responses to temperature and benthic habitat, but expect that such interaction terms will be eliminated during model selection based on previous analyses (Hare et al. 2012a). We will evaluate model performance with sensitivity (presence/absence), specificity (presence/absence), Area Under the Curve (presence/absence), point biserial correlation (presence/absence), % deviance explained (log-abundance), serial correlation (log-abundance), and cross-validation performance (both). We will also test for spatial autocorrelation in the residuals and add spatial error terms if necessary (Dormann et al. 2007).

#### Climate projections

Our approach for climate projections will use the delta method for regional bias corrections and climate downscaling. This method has the advantage of allowing us to consider an ensemble of Global Climate Models (GCMs) for our projections, thereby including a major

source of uncertainty in future climate change and contributing towards our goal of accounting for the dominant sources of uncertainty throughout our projection process. The delta method has been widely applied in species distribution modeling, including for species in the NE LME (Hare et al. 2012a; Hare et al. 2012b; Shackell et al. 2014). However, previous applications have not examined multiple species and multiple climate models. In this proposal, we will apply the delta method in the northeast U.S. for the years 2020-2100 across an ensemble of climate models, across multiple climate change scenarios, and across more than twenty species.

The delta method calculates projected temperature from GCM  $m$  in year  $t$  for a particular location ( $\hat{T}_{t,m}$ ) as the sum of the observed climatological temperature ( $\bar{T}^o$ ) and the expected change in temperature from model  $m$  ( $\Delta_{t,m}$ ), after correcting for drift in the model ( $D_{t,m}$ ).

$$\hat{T}_{t,m} = \bar{T}^o + \Delta_{t,m} - D_{t,m}$$

The drift term helps account for the fact that climate models can spuriously warm or cool through time, even without forcing from greenhouse gases. If not accounted for, this “model drift” can lead to over- or under-estimation of future warming (Sen Gupta et al. 2013).

We will calculate the first term ( $\bar{T}^o$ ) by developing historical climatologies from the more than 30,000 surface and bottom temperature measurements available from public regional databases from 1977-2013 in the NE LME and adjacent Scotian Shelf (Fratantoni et al. 2011; Gregory 2004). We will trim bottom temperature measurements to those within 10m of the bottom by using a 1' gridded dataset of the seafloor terrain (Amante & Eakins 2009). We will bin and average the measurements by 0.25° latitude and longitude and by two month periods, a spatial and temporal resolution that balances high data density with low intra-bin variance (Hare et al. 2012a). We will also evenly weight each decade so that heavily sampled later decades do not dominate the averages.

The expected temperature change ( $\Delta_{t,m}$ ) will be calculated from each of thirteen GCMs that are part of the latest phase of the Coupled Model Intercomparison Project (CMIP5) (Knutti & Sedláček 2013). These models (Table 3) have met rigorous quality standards in order to be included in the Intergovernmental Panel on Climate Change (IPCC) reports. Together, they help to characterize uncertainty in future climate change. Temperature change is calculated relative to a reference time period that matches the climatologies (1977-2013):

$$\Delta_{t,m} = T_{t,m}^p - \bar{T}_{1977-2013,m}^p$$

for projected temperature  $T_{t,m}^p$  in year  $t$  (2020 to 2100) from model  $m$ , and average modeled temperature  $\bar{T}_{1977-2013,m}^p$  over the reference period. As for the climatologies, this calculation will be applied separately to each two-month period throughout the year and for each of surface and bottom temperatures. Given the resolution of the GCMs, these calculations will be applied to 1° grid cells, and climate model output will be re-gridded to 1° where necessary.

We will also linearly interpolate  $\Delta_{t,m}$ s among adjacent depths when the observed depth from the climatology does not match the depth bins in a climate model. We will use the lowest depth bin if a model does not extend as deep as actual ocean depth. We note that these re-gridded data are already available within the Pinsky lab from a previous project (Pinsky et al. 2013b).

Across all climate models, we will examine two future climate scenarios, which are expressed in terms of Representative Concentration Pathways (RCPs). RCPs provide standardized scenarios of future greenhouse gas emissions, land use change, and other processes that affect global warming (van Vuuren et al. 2011). We will examine a “business-as-usual”

(RCP8.5) and a “mitigation” (RCP4.5) climate change scenario. Scenario names indicate their radiative forcing values (e.g., 4.5 or 8.5 watts/m<sup>2</sup>) in the year 2100.

**Table 3. General circulation models (GCMs) from the Coupled Model Intercomparison Project 5 (CMIP5) to be included in the climate model ensemble**

Modeling center	Country	Model name
Centre National de Recherche Meteorologiques	France	CM5
Institut Pierre Simon Laplace	France	CM5A-MR
Institut Pierre Simon Laplace	France	CM5B-LR
Met Office Hadley Centre	U.K.	HadGem2-CC
Max Planck Institut fur Meteorologie	Germany	ESM-LR
Max Planck Institut fur Meteorologie	Germany	ESM-MR
Meteorological Research Institute	Japan	CGCM3
National Center for Atmospheric Research	USA	CCSM4
Norwegian Climate Centre	Norway	NorESM1-M
Norwegian Climate Centre	Norway	NorESM1-ME
Geophysical Fluid Dynamics Laboratory	USA	CM3
Geophysical Fluid Dynamics Laboratory	USA	ESM2G
Geophysical Fluid Dynamics Laboratory	USA	ESM2M

The term for model drift ( $D_{t,m}$ ) will be calculated for each climate model from its respective control simulation (i.e., without external forcing from greenhouse gases). The drift term is calculated as the difference between future temperature in the control run ( $T_{t,m}^c$ ) and average temperature during a reference period in the control run ( $\bar{T}_{1977-2013}^c$ ):

$$D_{t,m} = T_{t,m}^c - \bar{T}_{1977-2013}^c$$

To reduce the influence of internal variability, we will then smooth the  $D_{t,m}$ s over time with a linear regression, as is common practice (Sen Gupta et al. 2013). We will calculate drift separately for each GCM, RCP, grid cell, season, and surface and bottom temperature.

While straightforward to apply, we recognize that this projection, downscaling, and bias correction method has a number of assumptions. For example, the delta method assumes that differences between  $\bar{T}_{1977-2013}^o$  and  $\bar{T}_{1977-2013,m}^p$  result primarily from biases in the mean climate state, rather than from differences in the phase of climate variability. We average this reference period over 37 years to minimize the influence of climate variability and to help meet this assumption. In addition, the method assumes that changes in ocean temperature result predominately from large-scale changes in radiative forcing and hydrodynamic changes resolved by the models, rather than unresolved local-scale shelf processes (Hare et al. 2012a; Stock et al. 2011). Finally, the method assumes that the mean climate state and amount of warming are not strongly correlated. These assumptions are likely valid to first order (Stock et al. 2011) and so can serve as initial guidance to the Council. However, additional research on dynamic and statistical downscaling will be helpful in refining climate projections for the region. When such projections become available, it will be straightforward to re-run our models with new climate data.

## Projections and analysis

Future projections of species shifts under future climate will be calculated by applying the species niche models to the projected, annual temperature fields while holding other terms constant (e.g., benthic habitat). We will then calculate the rate of shift of the distribution centroid and high and/or low latitude range edges in terms of latitude ( $^{\circ}\text{N}/\text{decade}$ ), depth (m/decade), and absolute horizontal speed (km/decade) (see example in Fig. 1). For definition of range edges, we will use an optimal probability threshold for each presence/absence model as defined by the minimum difference threshold (Jiménez-Valverde et al. 2008; Lobo et al. 2008).

## Uncertainty

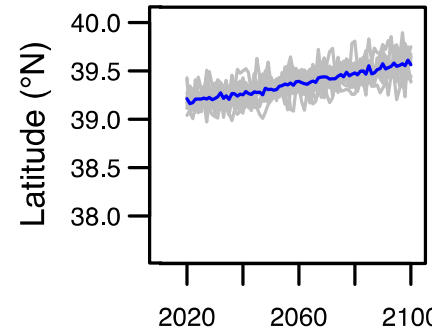
An accounting of uncertainty is critical for incorporating projections into management decisions. Highly uncertain projections carry less weight, while more certain projections can play a stronger role (Planque et al. 2011). For projection of distributions, uncertainties derive from the observation process, conceptual and numerical model formulations, parameter estimates, model evaluation, spatial and temporal scales, and adaptation of species (Planque et al. 2011). In addition, uncertainty about future climate derives from numerical model formulation, internal climate variability, and emissions scenarios. We have previously addressed conceptual model uncertainty by demonstrating the utility of climate velocities for explaining shifts in marine distributions (Pinsky et al. 2013b). We will discuss adaptation but do not plan to address it quantitatively given data limitations. Other sources of uncertainty are addressed above (e.g., model evaluation) or will be addressed with an ensemble approach.

We will calculate ensemble projections across each year in two time periods (2020-2060 and 2060-2100) and across each two-month seasonal period ( $n = 6$ ), statistical niche model type ( $n=3$ ), GCM ( $n = 13$ ), and emissions scenario ( $n = 2$ ). To account for uncertainty in niche model parameterization and the observation process, we will repeat this process 1000 times while sampling each parameter from its uncertainty distribution and adding an error value sampled from model residuals. A scientific workstation with 256GB of RAM and a 10TB harddrive is available in the Pinsky lab for these calculations.

We will recalculate the speed of shift for each iteration of the projection process, and determine the amount of uncertainty for each species. We hypothesize that we will find higher uncertainty for species with fewer historical observations. We will also decompose variation in these projections to identify the dominant sources of variation and uncertainty. This decomposition is a key aspect of our research, addresses Objective 2, and will shed new light on areas in need of scientific research to improve projections going forward. We will fit a general linear model to the rates of shift with species, GCM, emissions scenario, statistical niche model type, time period, seasonal period, and year within time period as categorical variables, plus error terms as continuous variables. The year term accounts for internal climate variability. We will use the sums of squares to determine the proportion of variance explained by each factor.

## Identifying potential management priorities

To aid the Council in choosing priority fisheries for which to address climate adaptation, we will rank species by the speed of shift (centroid and range edges) and the magnitude of uncertainty. Species with high speeds and low uncertainty will be suggested as highest priorities,



**Figure 1.** Preliminary projections of longfin squid distribution. The y-axis shows the latitude of the distribution centroid. Each grey line indicates a climate model from Table 3 and the blue line is the ensemble mean.

while those with low speeds and high uncertainty will be the lowest. This approach fits well with the NMFS Methodology for Assessing the Vulnerability of Marine Fish Stocks to a Changing Climate (Hare et al. 2014). We will also examine the magnitude of shift relative to historical distributions (proportion of habitat lost and gained) and relative to U.S. vs. Canadian waters. We will also highlight species fished with less mobile gear (e.g., traps) and those managed with static temporal or spatial allocations (scup, black sea bass, summer flounder, bluefish, longfin squid, and spiny dogfish). These latter management systems are less responsive to shifts in distribution.

### Communicating results

The primary purpose of this project is to provide tools and information to improve the adaptation of fisheries and fisheries management to climate change. In addition to the partnership between research and management (Pinsky and Seagraves) that underlies this project and the integration of project results into the Council process (see below under Collaborative Partnerships), we will also expand our audience through a website designed for a broad range of decisionmakers, members of the fishing community, and the public.

The website will leverage the current OceanAdapt portal

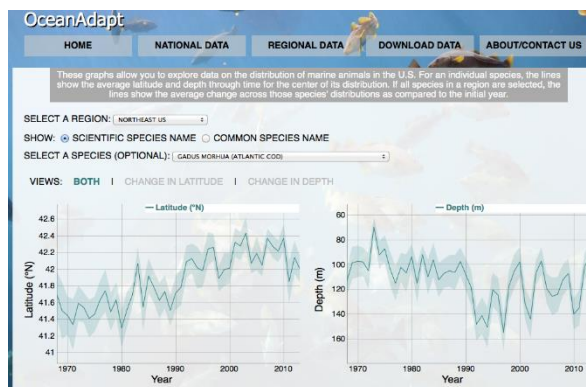
(<http://oceanadapt.rutgers.edu>), which was

developed by Pinsky and NMFS colleagues to provide information on historical shifts in marine species distributions (Fig. 2). The website curates and serves up data from NMFS and other bottom trawl surveys around North America in a fully traceable manner. Through the proposed project, we will expand the database underlying the website to host our ensemble of projections of species distributions through 2100, then expand the visualization tools to allow visitors to explore these data. We will use graphs to show shifts in the centers and edges of species distributions, as well as maps to display these changes in geographic context. In addition, we will partner with the Duke Marine Geospatial Ecology Lab (Halpin and Boustany) and will provide data to their climate change decision support tool if both of our projects are funded.

### Relevance to the Competition and to NOAA's NGSP

As noted in the Federal Funding Opportunity description, this competition is focused on understanding and responding to the impacts of climate variability and change on NOAA's marine resource management responsibilities, including implications for marine ecosystems, fish stocks, fishery management, and the communities and economies that depend on them. The research we propose directly addresses the primary focus of the competition by seeking to understand and predict the likely future scope of distributional changes of fish stocks in the Mid-Atlantic as a result of climate-change-induced warming of the Atlantic Ocean.

The proposed research will inform the development of future Council management policies that seek to incorporate ecosystem considerations into existing management programs. By directly addressing the information needs identified by the Council in its Strategic Plan, the proposed research is also directly relevant to NOAA's National Climate Goal and Strategic Plan. This stems from the fact that the Council's vision for Mid-Atlantic fisheries - *Healthy and*



**Figure 2.** Image from the OceanAdapt website, showing historical changes in the distribution of Atlantic cod (*Gadus morhua*). In the proposed project, the website will be expanded to include future projections.

*productive marine ecosystems supporting thriving, sustainable marine fisheries that provide the greatest overall benefit to stakeholders* is closely aligned with NOAA's Vision of the Future-*Healthy ecosystems, communities, and economies that are resilient in the face of change.*

Having a reasonable understanding of the future state of the ecosystems in the Mid-Atlantic as they respond to climate change is a fundamental prerequisite to the development of management policies that allow for the achievement of both the Council and NOAA's vision for the future of those ecosystems. The proposed research will provide the tools for the prediction of the future distributions of fish stocks in response to climate change. The research also directly supports NOAA's Mission statement – to understand and predict changes in climate, weather, oceans and coasts; to share knowledge and information with others; and to conserve and manage ecosystems and resources.

The proposed research is directly relevant to NOAA's long-term objective relative to climate adaptation and mitigation. The results will contribute to informing society about the anticipated impacts of climate change and help to respond to its impacts by improving our understanding of the changing climate system and its impacts on fishery resources. The results of our research will inform the Council about the future states of Mid-Atlantic ecosystems, which in turn will help identify mitigation and adaptation choices to be considered when making future fishery management decisions.

The research will contribute to the public's understanding of the vulnerability of fisheries to climate change and to help the Council make informed decisions. Most importantly, the research will contribute to the Council's EAFM effort, which involves weighing the trade-offs that are inescapable when deciding between alternative courses of action when responding to climate change impacts.



## Annual and Final Progress Report Template

**Information in this first section is standard and can be copied from previous reports:**

**NOAA Award Number** - NOAA-OAR-CPO-2014-2004106

**Time Period Addressed by this report** - *(e.g., August 2015 - March 2016 or final report)*  
August 2015 - March 2016

**Project Title** - Climate velocity over the 21<sup>st</sup> century and its implications for fisheries management in the Northeast U.S.

**Principal Investigator(s)** - *Include institution, email address, and phone number*

Malin Pinsky – Assistant Professor, Rutgers University  
Institute of Marine and Coastal Sciences and Department of Ecology, Evolution, & Natural Resources; (848) 932-8242; [malin.pinsky@rutgers.edu](mailto:malin.pinsky@rutgers.edu)

Richard Seagraves – Senior Scientist, Mid-Atlantic Fishery Management Council  
(302) 526-5259; [rseagraves@mafmc.org](mailto:rseagraves@mafmc.org)

**Project Team Members** - *Any additional team members who are not the lead PIs working on this project- please note graduate students and postdocs.*

James Morley – Postdoc, Rutgers University; (717) 858-2584; [jw.morley@rutgers.edu](mailto:jw.morley@rutgers.edu)

**Project Goal**- *Describe your project's goal social media style using 140 characters or less*

Our research will inform the marine resource management community about the rate, magnitude, and uncertainty surrounding future changes in fish distribution.

**Geographical Location of Study** – The continental shelf of the northeast U.S., from Cape Hatteras, NC to the Gulf of Maine and Georges Bank

**Partners** - *List any partners collaborating on the project including NOAA, other federal agencies, academia, non-governmental organizations, private sector, etc.*

NOAA  
NEAMAP (VIMS)  
MAFMC

**End User(s)** – *If applicable, list the end users you are working with on this project who will directly benefit from the project results and deliverables.*

## **Annual and Final Progress Report Template**

Rich Seagraves (PI on the project) is Chief Scientist on the Mid-Atlantic Fishery Management Council, so we anticipate our work will be useful to the MAFMC. Further, we are presenting results to council members of the MAFMC in June of 2016 and will fine tune output from our analysis based on their feedback. We are also working in association with the National Marine Fisheries Service, specifically individuals that are involved with NOAA's climate change and ecosystem based fisheries management initiatives.

**Matching Funds/Leveraging** - *List any matching funds and/or activities/research being leveraged for this project.*

A related project has been funded by The Pew Charitable Trusts to expand the methods to other regions in the US (outside the northeast US).

**Research Objectives** - *Provide one paragraph on the objective of the project*

The purpose of our research is to inform the marine resource management community about the rate, magnitude, and uncertainty surrounding future distribution changes that are likely to occur as a result of climate change in the 21<sup>st</sup> century. We will also project changes in suitable habitat area for important resource species within the northeast region as a result of climate change. Ultimately, species with robust projections that are predicted to be sensitive to climate change will be identified for proactive management.

**Research Approach and Methodology** - *Provide information on the methodological framework, models used, theory developed and tested, project monitoring and evaluation criteria, etc. (Limit 2 pages)*

We are calibrating statistical models of species distribution using data from the Northeast Fisheries Science Center's annual bottom trawl survey, as well as other surveys in the region. The models use a two-part generalized additive model (GAM) framework and include habitat variables such as bottom temperature and seafloor rugosity. Species distributions are being projected forward using output from a set of 13 IPCC-class global climate models. Temperature projections from climate models are being downscaled to  $\frac{1}{4}$  degree latitude  $\times$  longitude resolution based on a regional climatology derived from temperatures recorded at sea during the survey. The delta method is being used to project temperatures forward, which is a standard way to incorporate finer-spatial scale climatology onto the relatively coarse scale of climate projection models.

We summarize results for distribution projections under two scenarios for future climate, which are expressed in terms of Representative Concentration Pathways (RCPs). RCPs provide standardized scenarios of future greenhouse gas emissions, land use change,

## **Annual and Final Progress Report Template**

and other processes that affect global warming. We examine projected responses to a “mitigation” (RCP4.5) and a “business-as-usual” (RCP8.5) climate change scenario, with the latter scenario representing more intense global warming. Projected distribution changes for a given species represent directional shifts in the predicted mean center of biomass. These changes occur when the areas of overlap between preferred temperatures and bathymetry shift across the seascape. Uncertainty in distribution projections arise from multiple factors including differences in carbon emissions scenarios and uncertainty among the 13 climate projection models.

**The information below should be updated annually. If this is the final report, it should include information from the entire project, not just specific reporting periods.**

**Accomplishments - Research Results and Findings** - *Include the most recent findings from this reporting period that resulted from your research. (Limit 2 pages)*

The general difference between the two climate change scenarios for all regions was an increase in the range of species responses under the business-as-usual scenario, and also more extreme values within regions. For example, Atlantic butterfish *Peprilus triacanthus* and weakfish *Cynoscion regalis* are both projected to shift northward on the east coast of the U.S. with increases in water temperature. However, the magnitude of that shift is dependent on the intensity of ocean warming, especially for weakfish which are predicted to be relatively robust to moderate increases in temperature. For both of these species, under a business-as-usual scenario, distributions are projected to shift northwards by about 2° latitude. Under this more intense warming scenario, major areas of thermal habitat are predicted to open up for weakfish on the northern Mid Atlantic Bight shelf and for butterfish in the Gulf of Maine.

An important result from preliminary modeling is that, within any given region, species that are projected to shift similar distances may vary greatly in the uncertainty among model predictions. For example, weakfish and butterfish in the northeast were projected to shift similar distances under the RCP8.5 scenario, but the prediction for weakfish was less precise among climate models. Species that are projected to shift a large distance and that have a low uncertainty, such as butterfish, may be the highest priority species, while those with more uncertainty may be somewhat lower priority.

**Accomplishments - Deliverables produced** – *Include deliverables produced during this reporting period (e.g., workshop, whitepapers, website, outreach activities, tools, etc.) and/or future work developed based on project results. (Limit 2 Pages)*

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Presented preliminary results at the Climate Impacts on Fish PI Meeting workshop in Princeton, May 16.

**Highlights of Accomplishments** – *Include a bulleted list of up to five accomplishments. Accomplishments should be written in a narrative form, 2-3 sentences each.*

- Survey data from the NEFSC, SEAMAP, and MARMAP have been obtained and standardized for use in projection modeling.
- We have assimilated the temperature projection data for the northeast region, from the 13 climate forecasting models.
- Thermal envelope models have been developed for each species of interest, which will be used for projecting species distribution changes.
- Preliminary distribution projections have been developed.

**Significant Deviations from Proposed Workplan** - *Provide information on changes to the project, if any (e.g., shift in priorities following consultation with program manager, delayed fieldwork due to late arrival of funds, obstacles encountered during the course of the project that have impacted outcome delivery) (one paragraph)*

We have no significant deviations to report at this time.

**List of completed, peer and non-peer reviewed publications, white papers, or reports (with internet links if possible)** - *For peer-review publications, list either published or in press, but not “in review”.*

None to date

**List website addresses relevant to the project for further information (if available)**

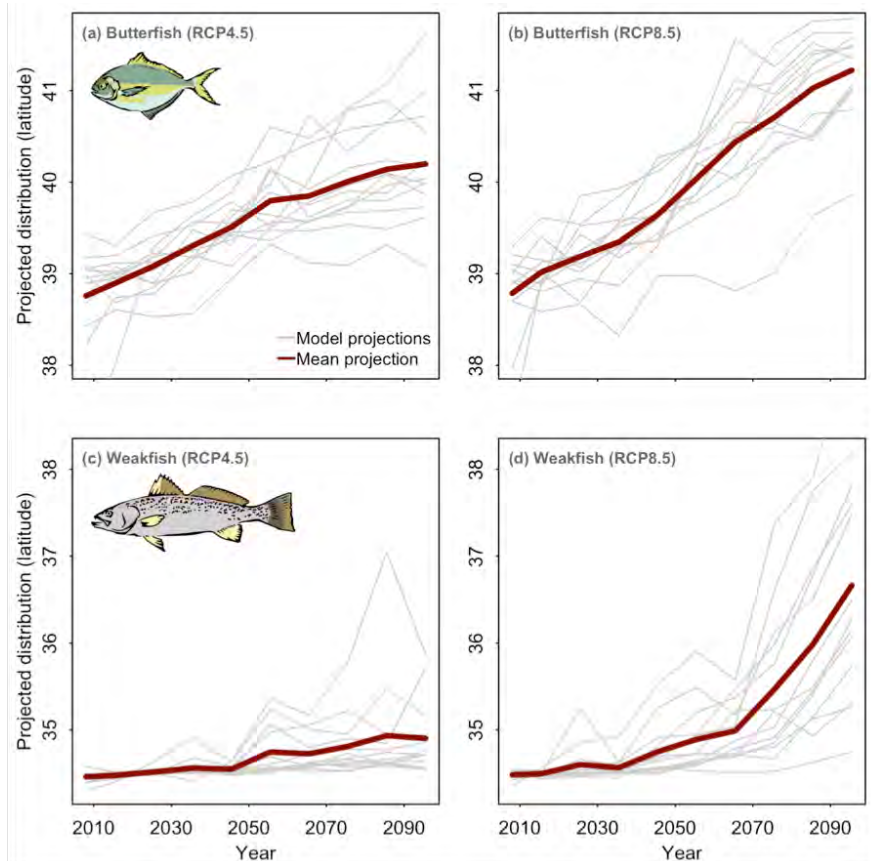
<http://oceanadapt.rutgers.edu>

**List of presentations/seminars, photos, or other visuals related to project** - *If you wish to share these items, please upload them as an attachment with the annual progress report.*

1. Rogers L, Pinsky M, (2015) Quantifying Spatial Patterns of Risk to Species from Climate Change. 145<sup>th</sup> Annual Meeting of the American Fisheries Society, Portland, OR.
2. Pinsky M, Rogers L, Frolicher T (2016) Can we “future-proof” marine spatial planning? Ocean Sciences Meeting, New Orleans, LA.

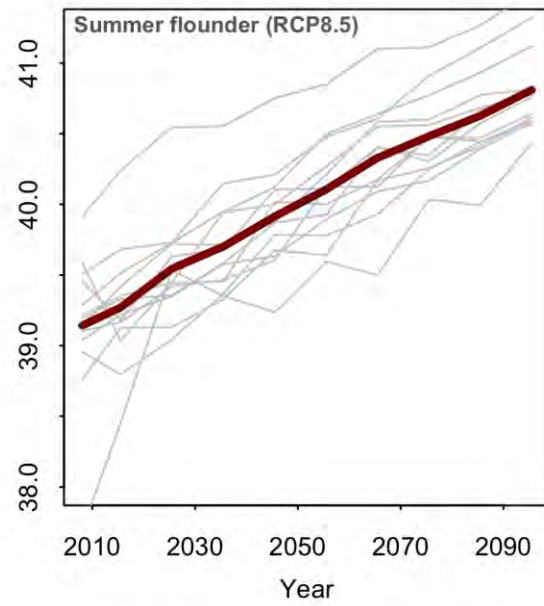
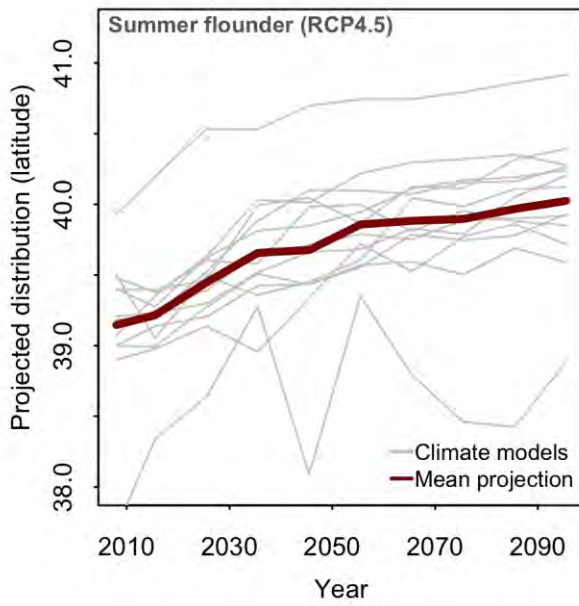
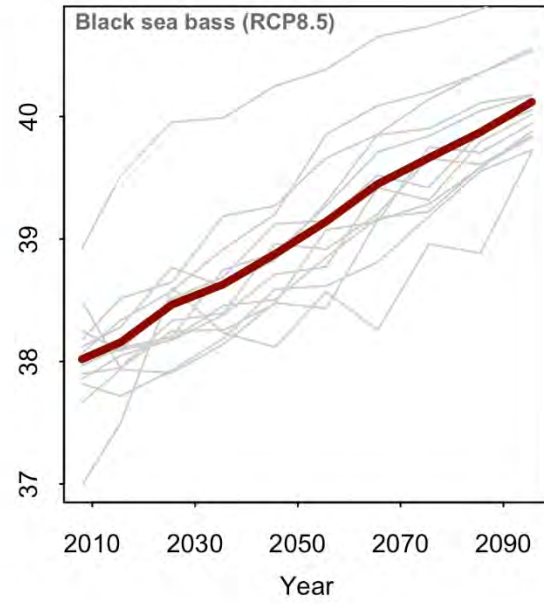
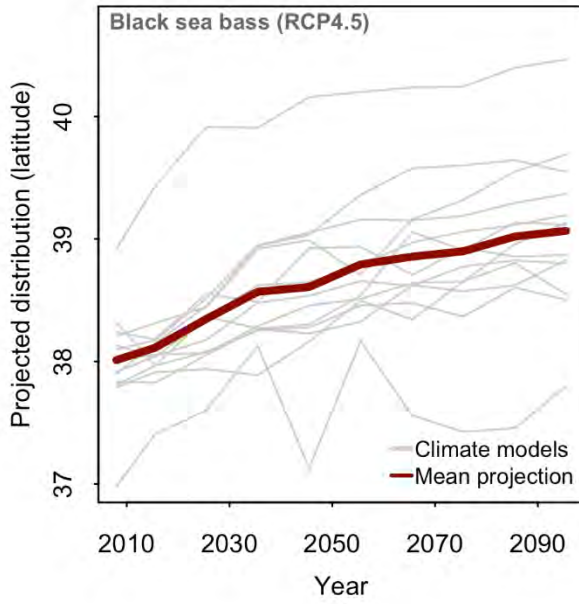
## Annual and Final Progress Report Template

For Final Report please include - PowerPoint slide summarizing project and major accomplishments (should be in .ppt format)

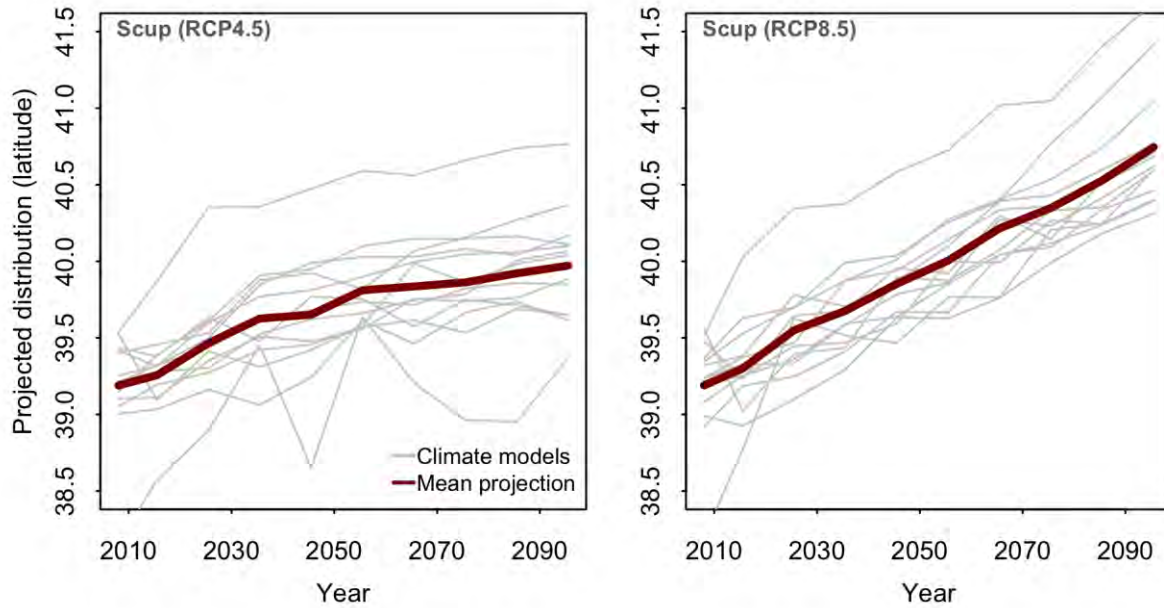


**Fig. 1** Projected changes in distribution for Atlantic butterfish (a, b) and weakfish (c, d) on the northeast U.S. continental shelf using a mitigation (a, c) and a business-as-usual climate scenario (b, d). Gray lines show distribution projections from individual climate models ( $n = 13$ ) and the red line shows the model average. Values are averaged over 10 year periods.

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**Fig. 2** Projected changes in distribution for black sea bass, summer flounder and scup on the northeast U.S. continental shelf using a mitigation (RCP4.5) and a business-as-usual climate scenario (RCP8.5). Gray lines show distribution projections from individual climate models ( $n = 13$ ) and the red line shows the model average. Values are averaged over 10 year periods

TO: MAFMC Members

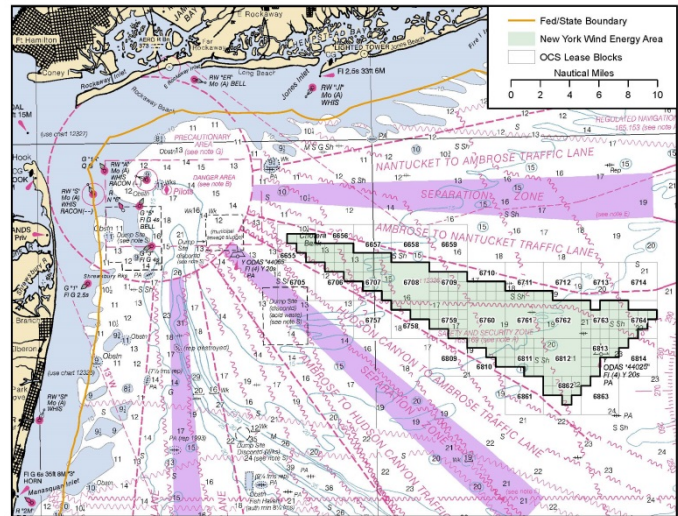
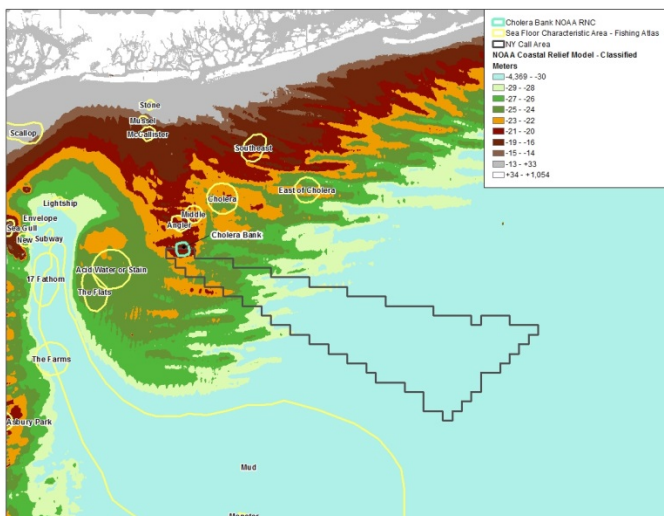
FROM: Brian Hooker, Bureau of Ocean Energy management, Office of Renewable Energy Programs

SUBJECT: June MAFMC Briefing regarding BOEM Atlantic Offshore Wind Energy Leasing

BOEM will be updating the Council on the status of Atlantic offshore renewable energy leases and soliciting comments from the Council regarding an environmental assessment (EA) for the New York wind energy area (WEA). BOEM published an EA on June 6th for a 30-day public comment period. Comments received electronically or postmarked within that period will be made available to the public and considered before the publication of a revised EA. The EA considers potential impacts associated with issuing a lease, including those from conducting surveys, and approving the installation of resource assessment facilities (i.e., meteorological tower and/or buoys) in the area. BOEM will also consider these comments in determining whether to issue a Finding of No Significant Impact, or conduct additional analysis under NEPA. For information on how to submit comments, go to [www.boem.gov/New-York](http://www.boem.gov/New-York).

BOEM will hold four public meetings in June to provide an overview of the EA findings and offer additional opportunities for public comments. BOEM's public meetings will be held at the following locations: Long Branch, N.J. (June 20, 2016), Hempstead, N.Y. (June 21, 2016), West Hampton Beach, N.Y. (June 22, 2016), and Narragansett, RI (June 23, 2016). Specific times and venues will be posted online at [www.boem.gov/New-York](http://www.boem.gov/New-York).

Concurrent with the EA BOEM also published a proposed sale notice for the New York WEA for a 60-day comment period. The proposed lease area, approximately 11 miles south of Long Island, is identical to the New York Wind Energy Area, which Interior's Bureau of Ocean Energy Management (BOEM) identified earlier this year in consultation with members of its New York Intergovernmental Renewable Energy Task Force. This task force includes federal, state, tribal and local government partners. In addition, BOEM considered information gathered through outreach with stakeholders. This document provides detailed information concerning the area available for leasing, the proposed lease provisions and conditions, auction details (e.g., criteria for evaluating competing bids and award procedures) and lease execution. Comments received electronically or postmarked by the end of public comment period will be made available to the public and considered before the publication of the Final Sale Notice, which will announce the time and date of the lease sale. For information on how to submit comments, visit [www.boem.gov/New-York](http://www.boem.gov/New-York). Also see BOEM's new fisheries stakeholder website: <http://www.boem.gov/Atlantic-Fishing-Industry-Communication-and-Engagement/>.





# Explore Commercial Fishing in the Mid-Atlantic with New Interactive Maps

Over two dozen maps now available on the Portal present a more detailed picture than ever before of the extent and locations of commercial fishing activities throughout the upper East Coast.

With the new “Communities at Sea” and Federal Vessel Monitoring System (VMS) map collections, Portal users can identify the ocean places upon which the Mid-Atlantic’s commercial fishing communities most depend. Specifically, these interactive maps enable users to better understand places that are most important for particular ports, specific fisheries, and gear types.

The public release of these datasets is an important step forward for ocean planning and education in the Mid-Atlantic. The maps can help focus and guide essential engagement and consultation with specific fishing communities for a range of ocean planning, permitting and management decision-making processes.



Communities at Sea map showing bottom trawler concentrations.

Over two years in the making, the Portal’s Communities at Sea maps (labeled in the Marine Planner mapping application as “Commercial Fishing – VTR”) were created using methodology developed by Dr. Kevin St. Martin at Rutgers University. Vessel Trip Report (VTR) and permit information were integrated to create a new database that links fishing port communities to the

places at sea where they spend the most time. Produced at much higher resolution than previous VTR maps, warm and cool colors are used to represent higher and lower number of days spent fishing. Portal users can click on any point on the map to activate a pop-up window that indicates which specific communities use the area. For example, clicking on an area off the New Jersey Shore may reveal that that gillnetters from Barnegat Bay or trawlers from Ocean City fish in the selected waters.

The maps were reviewed, discussed and improved through meetings with commercial fishermen throughout the Mid-Atlantic. The Communities at Sea collection currently includes eight maps based on 2011-13 data and will be expanded this summer via a new user interface for querying and selecting from the full library of over 100 maps.



“We really appreciate the critique and advice we got from fishermen from Montauk to Virginia Beach during our map review sessions,” said Jay Odell, Technical Lead for the Portal and Director of the Mid-Atlantic Marine Program at The Nature Conservancy. “They noted some important strengths and limitations of the data and what we learned is helping to drive the development of an expanded map library that we hope to have ready for the Portal this summer.”

The Portal’s Data Catalog section summarizes some of the caveats raised by commercial fishermen. For example, the maps are based on information from recent years and may not represent fishing areas that were historically important and could be again. Also, fishing patterns are driven by complex ecological, regulatory and economic factors that can change from year to year.

The Portal’s 19 new Vessel Monitoring System (VMS) maps show areas where commercial fishing activities take place, grouped by specific regulated fishery categories (for example, scallops, herring or monkfish). These maps (labeled “Commercial Fishing – VMS”) were created by our ocean planning partners in the Northeast region using VMS data from 2006-2014. VMS data are produced by satellite technology that tracks the movements of vessels participating in several federally managed fisheries. This data is also presented in a heat map format, with cooler colors representing low activity and dark reds showing high activity.

The Communities at Sea and VMS maps can be layered together on the Portal in complementary ways to provide rich detail about the region’s fishing communities and the ocean places they

depend on. Both datasets were carefully screened and aggregated by NOAA before maps were made so that the fishing activity of individual fishermen or vessels would not be revealed.



VMS map layer showing scallop dredge areas.

Finally, additional maps were added at the request of commercial fishing advisors to show the boundaries of some of the region's important fishery management zones, including ocean quahogs, surf clams and scallops. Additional regulatory boundaries may be added in the future based on specific interests and requests.

The Portal Team will host a "How Tuesday" webinar on June 21 at 11 a.m. that offers a guided tour of the new maps and other datasets on the site related to fishing in the region. [Click here](#) for more details.

To access and explore the new maps, please visit the [Marine Planner](#) page and click on the Fishing link for a dropdown menu of map layer options. Additional map options currently available in the Fishing theme include party and charter boat fishing activity, artificial reef locations and fathom lines.

Users can [register for a free Portal account](#) to start and join online map groups, draw and share their own map shapes, create and save map bookmarks and more. Please use the Portal's feedback tab to share any comments, concerns or questions!



Map layer depicting scallop management areas.

# MEMORANDUM

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TO: Chris Moore, Executive Director MAFMC

FROM: Andrew Loftus, MAFMC Contractor

DATE: June 1, 2016

SUBJECT: Framework 1 document for proposed mandatory electronic VTRs in for-hire fisheries

Attached is the Framework 1 document outlining options and justification for proposed mandatory electronic submission of VTRs by for-hire vessels with Federal permits for species managed by the Council beginning January 1, 2017. This proposed action was outlined in the Council's 2016 Implementation Plan adopted in December, 2015.

While the general information and the currently-required VTR paper form are included in this document for reference (Attachment A), detailed VTR instructions have been made available at <http://www.mafmc.org/briefing/june-2016> should Council members wish to review those.

The initial Framework Meeting will be during the Council meeting June 13-16, 2016 in Newark, DE during which I will present the options and be available for questions and discussion. Following this meeting, I will work with Council staff to arrange and host an interactive session and other mechanisms to solicit input from constituents. The second Framework Meeting will be at the Council's meeting August 8-11, 2016 in Virginia Beach, VA with final action anticipated during that meeting. Implementation of the requirements under this action is anticipated January 1, 2017.

Omnibus Framework for

Mandatory Electronic Vessel Trip Reports From  
Federally-Permitted For-Hire Vessels and Operators in  
the Mid-Atlantic Region

Framework Meeting 1 Document

June 14, 2016

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## **Introduction**

Federally-permitted for-hire fishing vessels in the Mid Atlantic are required to submit Vessel Trip Reports (VTRs) documenting all fishing activity and catches (.50 CFR 648.7). Electronic vessel trip reports (eVTRs), which allow direct entry of data by the vessel operator using a computer-based system, have been available as an option since 2011. In early 2016, the first mobile-based system for submitting eVTRs was approved by NOAA Fisheries (the Atlantic Coastal Cooperative Statistics Program's SAFIS eTrips app for Apple and Android platforms). The Mid-Atlantic Fishery Management Council (Council) has explored the use of eVTRs and as part of the 2016 Implementation Plan elected to develop an omnibus Framework to require electronic submission of VTRs by the for-hire sector beginning January 1, 2017.

## **Purpose and Need for Action**

### **Purpose of the Action**

The purpose of this action is to require for-hire vessels with Federal permits for species managed by the Council to submit currently-required VTRs to NOAA through electronic means beginning January 1, 2017. This action is not a change in reporting requirements but an administrative modification in the method for submitting VTRs.

### **Need for the Action**

This action is expected to: 1) increase the timeliness (availability) of data submitted through VTRs; 2) reduce the reporting burden on data providers (for-hire operators and/or captains) by eliminating the need of paper-based reporting, and; 3) increase the accuracy and quality of data by reducing recall bias associated with delayed completion and submission of paper forms. According to NOAA Fisheries, "electronic reporting will make the collection of important data on fishing vessel activity more efficient, convenient, and timely for the fishing industry, fishery managers, and other data users."<sup>1</sup>

### **Timeline for Action**

The initial Framework Meeting will be during the Council meeting June 13-16, 2016 in Newark, DE. The second Framework Meeting will be at the Council's meeting August 8-11, 2016 in Virginia Beach, VA with final action anticipated during that meeting. Implementation of the requirements under this action is anticipated January 1, 2017.

## **Background<sup>2</sup>**

In 1992, NOAA Fisheries began mandating reporting of catch, landings, and trip information through Vessel Trip Reports (VTRs) for federally permitted vessels holding summer flounder permits. This requirement was expanded during 1994-96 to include all vessels with federal fishing permits. In 2004, mandatory electronic reporting by federally permitted dealers was implemented for almost all federally-managed species. Requirements for weekly reporting were implemented in 2010 for fisheries under catch shares, with weekly reporting later expanded to herring, mackerel, surf clam/ocean quahog IFQ fisheries. In July 2011, the NOAA Fisheries

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<sup>1</sup> <http://www.greateratlantic.fisheries.noaa.gov/aps/evtr/electronic/index.html>, May 26, 2016.

<sup>2</sup> Some information extracted from: StCyr, J., Conigliari, T., Witzig, J. 2013. Fisheries Dependent Data Collections Vessel and Dealer Reporting. Presentation prepared August 6, 2013. NOAA Fisheries Northeast Regional Office. 41p.

Greater Atlantic Regional Fisheries Office (GARFO) approved the use of electronic reporting of VTRs on a limited, voluntary basis. Currently, XX for-hire vessels in the Mid-Atlantic region hold permits requiring them to submit VTRs. In 2015, XX vessels submitted XX VTRs, with few submitted electronically according to preliminary discussion with GARFO staff.[NOTE: will clarify numbers before Framework 2].

### Summary of Current Reporting Regulations

Owners and operators of federally permitted vessels possessing any of the permits listed below are required to submit a VTR for every commercial, party, or charter trip taken, regardless of where they fish (state or federal waters) or what they catch.

Northeast multispecies	Atlantic bluefish*	Spiny dogfish*
Atlantic sea scallop	Atlantic herring	Summer flounder*
Monkfish*	Northeast skate	Scup*
Ocean quahog*	Tilefish*	Surf Clam*
Black sea bass*	Atlantic deep sea red crab	Atlantic mackerel, squid, butterfish*

\* Covered by a MAFMC Plan

VTRs must be received or postmarked by the 15th day of the month, following the month in which the trip occurred except for Northeast Multispecies, Herring, Surf Clam & Ocean Quahog, Squid, Mackerel and Butterfish which require weekly reporting where VTRs must be submitted by midnight of the Tuesday following the reporting week (Sunday through Saturday) in which fish were offloaded for any trip, including trips landing other species. If a trip encompasses multiple chart areas a separate VTR must be submitted for each area where fishing activity takes place. If a vessel does not fish for an entire reporting period, a “Did Not Fish” report was initially required.<sup>3</sup> A separate VTR is required for each reporting period. If a vessel does not land any fish on a trip, all trip information must be completed and “No Catch” entered in as the species code name. A VTR is required regardless of where fishing occurs, meaning that a vessel subject to these requirements in the Northeast must report even if they fish in the Southeast Region or for Highly Migratory Species (HMS) except for vessels holding only an American lobster permit. Since VTRs are in addition to any other reports which may be required by other Regions or plans, multiple reports may be required. VTRs, and any records upon which the reports were based, must be kept on board the vessel for at least 1 year and retained by the owner/operator for a total of 3 years after the date of the last entry on the report.

Attachment A contains additional information and the currently-required VTR form. Detailed instructions for submitting VTRs are available at <http://www.mafmc.org/briefing/june-2016> .

<sup>3</sup> Although a “Did Not Fish” report was initially required, this was eliminated August 26, 2015 under the Secretary's authority at section 305(d) of the Magnuson-Stevens Act to promulgate regulations necessary to carry out Councils' amendments consistently with the Act (Federal Register Vol. 80, No. 165). However, there is some initial discussion of reinstating this requirement.



Operators have the option to submit their VTRs electronically (eVTR). At present, the following software applications are approved to meet the technical requirements of eVTR submissions:<sup>4</sup>

- Fisheries Logbook and Data Recording Software (FLDRS)
- Fishing Activity & Catch Tracking System (FACTS™)
- Ecotrust Canada Electronic Logbook (Elog)
- Dynamic Data Logger (DDL)
- Standard Atlantic Fisheries Information eTrips Mobile (SAFIS eTrips/M)

The SAFIS eTrips application is currently the only approved mobile-based application (Apple iOS and Android operating platforms) while the others are computer-based systems.

### **Problems with the Current Reporting Regulations**

With the advent and ubiquitous availability of high-speed Internet, paper forms are no longer the most efficient method for permit holders to submit the required information, nor for NOAA Fisheries to process it. As previously stated, NOAA Fisheries considers that electronic reporting “will make the collection of important data on fishing vessel activity more efficient, convenient, and timely for the fishing industry, fishery managers, and other data users.” At present, paper-based reports create a substantial time delay between the time when fishing activity occurs and when the data are available to fisheries managers. Reports may not be mailed (or faxed) to NOAA Fisheries for up to six weeks after the fishing activity occurs (if regulations are followed). Following receipt of paper forms, data must be entered into the system and checked for anomalies and errors (creating further delay if contact must be made with the operator for clarification or correction). Paper reports may also suffer from illegible handwriting or messy forms that further impede accurate data entry.

Under VTR regulations, operators must submit a separate VTR for each area fished, theoretically requiring multiple paper forms for a single trip. While eVTRs still require reporting of fishing activity in each area fished, eVTRs eliminate the paper associated with such reporting and ease the reporting associated with multiple areas. Operators are required to retain VTRs for three years after the date of the last entry on the report. Electronic VTRs alleviate the need to maintain paper-based copies since the original electronic copy will be stored in the system (although additional supporting documentation, if any, may still need to be retained). Additionally, vessel operators may be faced with duplicate reporting if they are fishing in another region or for a species (e.g., HMS) that also requires reporting through a separate system. Several states also require reporting from for-hire vessels with information that is identical, or similar, to that provided through VTRs. As electronic data entry by vessel operators is established, the development of systems to submit multiple reports from a single data entry screen will be facilitated.

Recommendations were made during a May 2016 Atlantic Coastal Cooperative Statistics Program (ACCSP) workshop addressing for-hiring reporting on the Atlantic coast that all federal fisheries reporting programs should investigate means to develop a common reporting system to

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<sup>4</sup> <http://www.greateratlantic.fisheries.noaa.gov/aps/evtr/electronic/index.html> , May 26, 2016.

reduce the burden of duplicate reporting, which could be achieved through an electronic reporting system.

## **Proposed Management Measures and Alternatives**

### **Proposed Action**

The proposed action is to modify the administrative requirements to require for-hire fishing vessels with Federal permits for species managed by the Council to submit currently-required VTRs to NOAA through electronic means beginning January 1, 2017. No changes are proposed for the data types being collected; this is simply a change in the means of submission.

### **Preferred Alternative 1: Require Electronic Submission of VTRS**

Beginning January 1, 2017, owners/operators of for-hire fishing vessels with Federal permits for species managed by the Council will be required to submit Vessel Trip Reports through one of the NOAA-approved electronic Vessel Trip Report systems. Five options are currently available for this:

#### Computer-based systems

- Fisheries Logbook and Data Recording Software (FLDRS)
- Fishing Activity & Catch Tracking System (FACTS™)
- Ecotrust Canada Electronic Logbook (Elog)
- Dynamic Data Logger (DDL)

#### Mobile-based system

- Standard Atlantic Fisheries Information eTrips Mobile (SAFIS eTrips/M), for use on smart phones or tablets operating the Apple iOS or Android platforms.

Additional systems may be developed and, upon approval by NOAA for submitting VTRs, would automatically be added to this list.

This alternative does not change any of the requirements for data elements that are currently-reported through paper-based VTRs. This alternative does not change any of the NOAA-mandated reporting deadlines, although electronic reporting facilitates an increased frequency of reporting of VTRs should the vessel owner/operator so choose or the Council/NOAA so require in later action. Geographic locations of effort and catch will not change from that required through paper VTRs; permit holders will report by NOAA Chart Area and depending on the system used may be able to choose greater geographic specificity if they desire.

The cost of this alternative is free or minimal. Computer based reporting options are available through any computer with internet connection which many people have in their homes/businesses and which is available for free through most public libraries. The mobile-based option (SAFIS eTrips) would require a tablet computer (many basic models available for under \$200) and either a cellular data plan or wireless internet connection (many free access points) for submitting reports.

There would be no increased cost to the government for this alternative. Electronic systems are available and already operational for submitting and receiving eVTRs. It is anticipated that in the long run, administrative costs would be reduced due to the reduction in need for physically entering (scanning) paper-based VTRs and reduction in inaccuracies due to illegible hand writing, messy paper forms, or other obstructions causing delays in processing.

Because this proposed action deals entirely with the administrative mechanisms by which for-hire fishing vessels permit holders submit reports, the alternative would not affect fishing vessel effort, operations, species targeted, or areas fished and there would be no direct impacts of the proposed action on any fishery resources or habitat managed under a Council FMP or on any associated protected resources.

### ***Rationale for Proposed Action***

As stated previously, the proposed action is expected to increase efficiencies in data submission, improve accuracy in data management, and vastly expedite data availability for all fisheries management purposes. The May 2016 ACCSP Workshop participants identified several desirable aspects to help programs move to electronic reporting that are encompassed in this proposed action, including:

- Multiple ways to access the reporting feature, including smart phones, tablets, and pc-based system;
- Provide incentives to users of the system (including ease of data entry/submission);
- Provide functionality requiring report submission;
- Provide training opportunities to help individuals learn the system;
- Provide for multiple federal and state reporting capabilities through a single application

The proposed action will achieve or facilitate many of these recommendations and meet the desired intent at little or no cost to permit holders and ultimately reduce administrative costs of NOAA Fisheries currently associated with data entry.

### **Non-Preferred Alternative 2: No Action**

Under this alternative, VTRs would continue to be submitted by paper (mail or fax) or optionally through the use of an available eVTR system. This status quo is not preferred since it would perpetuate the lengthy delay of the availability of VTR data for managers and the burden on permit holders to maintain paper VTR records. Continued use of paper VTRs would not facilitate the development of integrated systems with state agency partners (and other federally mandated reporting programs) to provide a single point of data entry by permit holders to satisfy multiple reporting requirements, thus continuing the burden of multiple reporting requirements for some users. The continued use of paper VTRs would necessitate the maintenance of administrative resources to accept, process, and manage paper forms.

### **Non-Preferred Alternative 3: Vessel Monitoring System (VMS)**

This non-preferred alternative would implement electronic reporting through the use of Vessel Monitoring Systems (VMS). VMS is a satellite surveillance system to monitor the location and movement of fishing vessels using on-board transceiver units. These units send position reports that include vessel identification, time, date, and location, and are paired with a catch reporting mechanism to accurately capture catch, effort, and location of fishing activity. While VMS is

suitable for larger commercial vessels, it requires installation of equipment that may be logistically unfeasible for some of the smaller for-hire vessels to install, is substantially more costly than the preferred alternative, and imposes data reporting burdens on for-hire vessels that are not currently a part of VTR submission.

## **Impacts of the Proposed Action and Alternatives**

### **Impacts on Fishery Resources**

Because the proposed action deals entirely with the administrative mechanisms by which Federal permit holders in the for-hire fisheries would report currently-required VTRs, and would not affect fishing vessel effort, operations, species targeted, or areas fished, there would be no direct impacts of the proposed action on any fishery resources managed under a Council FMP. There are no differences between the alternatives as far as direct impacts on fishery resources.

### **Impacts on Habitat**

Similar to the impacts on fishery resources, due to the nature of the measures in the proposed action, there would be no direct impacts of the proposed action on the habitat, including essential fish habitat (EFH), of any fishery resources managed under a Council FMP. There are no differences between the alternatives as far as direct impacts on any fish habitat, including EFH.

### **Impacts on Protected Resources**

Similar to the impacts on fishery resources, due to the nature of the measures in the proposed action, there would be no impact, either direct or indirect, of the proposed action on protected resources. There are no differences between the alternatives as far as direct or indirect impacts on any protected resources.

### **Economic Impacts**

There is little to no direct economic impact to permit holders. The approved eVTR systems are freely available to users once registered. The ubiquitous nature of computers and Internet availability in private homes and businesses, as well as free access to both in most public libraries and other locations, provides a free to low cost means for permit holders to access eVTRs. The ability to use electronic reporting programs to automatically fill in some reporting fields may decrease reporting burden. In the long term, government costs for administering this program are expected to be reduced resulting from efficiencies gained in data processing. Improved and expedited availability of the data is expected to expand the utility of the data currently collected to fisheries management, research, and law enforcement purposes.

### **Consistency with Applicable Laws-to be completed**

Magnuson-Stevens Fishery Conservation and Management Act  
Compliance with the National Standards  
Compliance with Other Requirements of the Magnuson-Stevens Act  
National Environmental Policy Act  
Executive Order (EO) 12866 – Regulatory Impact Review  
Statement of the Problem and Need for Action  
Management Objectives  
Description of the Affected Entities  
Description of the Alternatives  
Expected Economic Effects of the Alternatives

Determination of Significance under EO 12866  
Administrative, Enforcement, and Information Costs

Regulatory Flexibility Act-  
Reasons the Action is Being Considered  
Management Objectives and Legal Basis  
Description of the Affected Entities  
Description of the Reporting, Recordkeeping, and Compliance Requirements  
Identification of Relevant Federal Rules  
Description of the Alternatives  
Economic Impacts on Small Entities  
Endangered Species Act  
Marine Mammal Protection Act (MMPA)  
Paperwork Reduction Act (PRA)  
Coastal Zone Management Act  
Data Quality Act  
EO 12898, 13132, and 13158

# **Greater Atlantic Region**

## **Fishing Vessel Trip Report (VTR) Reporting Instructions**

**December 5, 2014**

These instructions may be found online at:

[http://www.greateratlantic.fisheries.noaa.gov/aps/evtr/doc/vtr\\_inst.pdf](http://www.greateratlantic.fisheries.noaa.gov/aps/evtr/doc/vtr_inst.pdf)

## VESSEL TRIP REPORTING (VTR) OVERVIEW

The Greater Atlantic Region is reissuing our VTR instructions because we have clarified several sections to improve the information we collect. While you may want to focus on the changes and pages pointed out below, we urge you to review the entire set of instructions—we have tried to make them easier to understand so that fewer reports will have to be returned to you for correction. If you have any questions, please don't hesitate to contact the VTR support team at (978) 281-9246. This line is heavily used, so if you get voicemail, please leave your name and number—in most cases, we are able to return calls within one business day.

### VTR requirements by vessel permit type

	Frequency of reporting	Report deadline	If you did not fish.....
If a vessel is issued a permit for: *Atlantic herring; *Atlantic mackerel; *Illex squid; *Longfin squid/butterfish; *Northeast multispecies; *Ocean quahogs; *Surfclams . . . .	Then the owner/operator must submit trip reports weekly	Reports must be postmarked or received by midnight of the Tuesday following the reporting week (Sunday through Saturday). If a trip starts in one week, and offloads in the next, it should be reported in the week the catch was offloaded.	If subject to weekly reporting, you must submit a Did Not Fish report for each week that there is no fishing trip activity. If you know your vessel will be inactive, you may submit these reports electronically up to 3 months in advance.
If a vessel is issued a permit for: *Atlantic bluefish *Atlantic deep-sea red crab *Atlantic sea scallop *Black sea bass *Monkfish *Northeast skate *Scup *Spiny dogfish *Summer flounder *Tilefish . . . .	Then the owner/operator must submit trip reports monthly	Reports must be postmarked or received within 15 days of the end of the month. If a trip starts in one month, and offloads in the next, it should be reported for the month in which the catch was offloaded	If subject to monthly reporting, you must submit a Did Not Fish report for each month that there is no fishing trip activity. If you know your vessel will be inactive, you may submit these reports electronically up to 3 months in advance.
If a vessel is issued a permit for American lobster <b>and</b> no other Greater Atlantic Region vessel permit . . . .	Then the owner/operator is not required to submit trips reports (check with your state, which may require reporting).	--	--

### Defining fishing trip activity that requires a VTR

If your vessel is issued any of the fishery permits with reporting requirements shown in the table above, you are required to complete a VTR for every fishing trip, whether the vessel is fishing in state or federal waters, or in another region of the country, such as Gulf of Mexico. This is true for all trips, no matter what species is being fished for or caught. Having an observer or at-sea monitor on board during a trip does not relieve you from this requirement.

These instructions clarify that a VTR is required for any trip on a federally permitted vessel when you catch

fish, or when your operations include activities that would support fishing, such as preparing to catch or harvest fish, or attempting to catch or harvest fish. All such fishing activities must be reported, even if no landings are made. The trip is the period of time during which these activities are conducted, beginning when the vessel leaves port and ending when the vessel returns to port.

**There are only two instances where a VTR isn't required for a specific trip:**

- **If you are transiting without any product onboard and don't engage in any fishing activity. For example, you're moving your vessel to a shipyard or you're returning to your home port.**
- **If you are operating under a scientific Letter of Acknowledgement**

You are required to report fishing trips even if no fish are caught or onboard if the following events occur:

- If you begin a fishing trip, but must return to port before setting or retrieving gear because of issues like bad weather or mechanical problems, then you must still complete a VTR. In this case, you must complete the information in VTR Fields 1-6, along with fields 24-27, and enter "No Effort" in the lower portion of the VTR.
- If you make a fishing trip just to set out gear you must still complete a VTR. Complete the information in VTR fields 1-6, along with fields 24-27, and enter "Set Only" in the lower portion of the VTR.
- If you make an unsuccessful trip, and don't catch any fish, you must still complete a VTR. In this case, you must complete all of the trip information in VTR Fields 1-16, and enter "No Catch" or "NC" in the species code field (#17).

**Submitting a VTR if you conducted no fishing trip activity**

As noted in the table, you must submit a VTR even if you did not use your vessel for any fishing activity for the entire reporting period, weekly or monthly, that is applicable to your permit types. In this case, you must fill out the "Did Not Fish" field at the top of the form, complete the vessel identification information in Fields 1-3, and sign and submit the form. However, we remind you that activity such as starting a fishing trip or preparing to catch fish is considered fishing activity. For example, if you start a fishing trip on Wednesday, but land and offload your catch the following Monday (i.e., after a trip of 6 days), the VTR must be submitted by midnight Tuesday of the third week and must provide all of the information about the trip. In this case, there is no week in which you "Did Not Fish".

Did Not Fish (DNF) reports may be submitted on the NMFS issued paper VTR or through our secure webpage, "Fish-On-Line" at <https://www.greateratlantic.fisheries.noaa.gov/NMFSlogin> **DNF reports submitted electronically through Fish-On-Line do not need to be mailed into NMFS.** If you need your confidential vessel Personal Identification Number (PIN) or cannot access Fish-On-Line please contact NMFS at (978) 281-9133 or by email at [nmfs.gar.data.requests@noaa.gov](mailto:nmfs.gar.data.requests@noaa.gov)

You must report all species caught (both kept and discarded), including all protected species. To report sea turtles or ESA-listed fish species (e.g., Atlantic salmon or sturgeon) incidentally caught, injured, or killed, enter the species code for each turtle or fish under the species code name column (#17) on the VTR. Enter the actual number (count) of sea turtles or listed fish caught in the discard column (#19). Under the dealer name column (#21), comment on the condition of the sea turtles or listed fish (e.g., alive, injured, or dead).

When an incidental mortality or injury of a marine mammal (seals, dolphins, porpoises, and whales) occurs during commercial fishing activities, you must also fill out and return the Marine Mammal Authorization Program Mortality & Injury Reporting Form within 48 hours of returning from the trip on which the incident occurred. You may obtain additional information, including a reporting form at: [www.greateratlantic.fisheries.noaa.gov/prot\\_res/mmap/certificate.html](http://www.greateratlantic.fisheries.noaa.gov/prot_res/mmap/certificate.html) or call 978-281-9328.



## **When to complete and submit more than one VTR page**

You must complete all of the fields on a new VTR page each time you change your fishing area or gear. This means a new page is required each time you:

- Change the chart area (inshore or offshore) in which you are fishing;
- Change the type of gear you are using; or
- Change the mesh size or ring size in the gear you are using.

## **New gear codes**

VTR Field #7 requires you to identify the type of gear you used. New codes have been added to the gear code table (page 9) so that we can get better information about fishing gears. The scallop dredge codes are critical for evaluating the effectiveness of scallop dredge gear modifications for reducing interactions with sea turtles. The codes are summarized below:

- DRS – this code should be used for the standard scallop dredge
- DSC – this code should be used for the standard scallop dredge with chain mat
- DTS – this new code should be used for the scallop turtle deflector dredge
- DTC – this new code should be used for the scallop turtle deflector dredge with chain mat
- OTT – this code should be used for otter trawls (OTF) that are joined together in a “Twin Trawl” configuration.

## **How to report when you fish in more than one chart area**

If your fishing activity occurs in more than one chart area, you must submit a VTR for each chart area where you started to haul back or retrieve gear. If your tow or the placement of your fixed gear (for example, gillnets) crosses chart area boundaries, the area you report must be the area you were in when you started to retrieve or haul back your gear. For the gear types shown in the gear code table on page 9, this means:

- For mobile gear (trawl gears and dredges), you report the area where the hauling equipment is put into gear with the intention of hauling back and retrieving a net or dredge;
- For fixed gear (gillnets, longline, pots, traps, and weirs) you report the area where the hauling equipment is put into gear or retrieval of one end of the set begins.
- For purse seine gear, and other seine gears, you report the area where the skiff hits the water upon setting the gear, or when the first piece of gear hits the water, whichever occurs first.
- For handline, rod and reel, and the gears listed as “other gears”, you report the area where the gear is completely retrieved and aboard the vessel.

For example, if you start a tow in chart area 522, start hauling back in area 525, and land 100 pounds of monkfish, then all the catch from this tow would be reported in chart area 525.

The National Marine Fisheries Service requires this information for the conservation and management of marine fishery resources in accordance with the Magnuson-Stevens Fishery Conservation and Management Act. The data reported will be used to develop, implement, and monitor fishery management strategies and for a variety of other uses. Submission is mandatory for those persons falling under the requirements of 50 CFR 648.7 (b). All data submitted will be handled as Confidential material in accordance with NOAA Administrative Orders. Public reporting burden for the survey is estimated to average 5 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to NOAA Fisheries, 55 Great Republic Drive, Gloucester, MA 01930.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number.





## Mid-Atlantic Fishery Management Council

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

# MEMORANDUM

**Date:** 5/31/2016  
**To:** Council  
**From:** Jason Didden  
**Subject:** Industry-Funded Monitoring (IFM) Omnibus Amendment

The Council is scheduled to review and approve for public hearings an updated draft Environmental Assessment (EA) document. The Council has already selected preliminary preferred alternatives for several administrative alternatives, and may select preliminary preferred alternatives for mackerel coverage options prior to public hearings. The decision points for this meeting include:

- identify a preferred weighting scheme within the Council-led prioritization process
- clarify slippage consequence measures for IFM monitoring types
- clarify coverage target calculation
- select preliminary preferred mackerel coverage target alternatives with sub-options

The full draft Environmental Assessment and Appendices (500+ pages) have been posted to <http://www.mafmc.org/briefing/june-2016>. Related to the decision points above and areas where substantial edits have been made to the draft EA, several excerpts and supporting documents have been included below. A running underlined page number at the top of all pages in this tab is included to facilitate referencing.

Page 2 : May 4 PDT/FMAT Summary  
 Page 6 : Amendment EA Executive Summary and Table of Contents  
 Page 20: Council-led Prioritization Process Details  
 Page 30: Mackerel Monitoring Alternatives  
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**MEMORANDUM**

**DATE:** May 27, 2016

**TO:** New England Fishery Management Council  
Mid-Atlantic Fishery Management Council

**FROM:** Industry-Funded Monitoring Plan Development Team/Fishery Management Action Team

**SUBJECT:** Industry-Funded Monitoring (IFM) Omnibus Amendment Development

1. The PDT/FMAT met by via teleconference on May 4, 2016, to consider the motions made at the Mid-Atlantic and New England Fishery Management Council meetings held in April 2016 and discuss revisions to the Draft Environmental Assessment (EA). PDT/FMAT participants included: Brant McAfee, Brett Alger, Carly Bari, Carrie Nordeen, Dan Luers (NMFS GARFO); Dr. Andrew Kitts, Amy Martins (NMFS NEFSC), Jason Didden (MAFMC); Dr. Jamie Cournane, Maria Jacob, Dr. Rachel Feeney (NEFMC).
2. The New England Fishery Management Council (NEFMC) recommended that the Draft EA include additional narrative descriptions for the box plots used in the economic impacts section to help the public interpret these figures. PDT/FMAT members had provided three sets of language to help better describe these figures. The group selected one alternative as the language to use as an illustrative example for the first figure and make highlight statements for the following figures in the EA.
3. A member of the Herring Advisory Panel requested that we investigate the economic impacts based on trip declaration as opposed to landings data. Drew was able to do some preliminary analysis to present to the group. The PDT/FMAT reviewed this analysis and discussed some of the improvements and modifications that could be made for inclusion in the Draft EA.
4. Andrew Kitts provided an explanation to the group on why it is not appropriate to use herring return-to-owner (RTO) in the economic analysis. In order to properly apportion RTO to a particular fishery in instances where a vessel participates in more than one, both revenues and costs (the two components of RTO) must be apportioned among the different fisheries. Revenues can be easily apportioned because the data on revenue is tracked by fishery. However, some types of costs cannot easily be allocated to a fishery due to the nature of these costs. For example, insurance costs don't correspond with the

amount or type of fishing being done and so methods for apportioning such costs (they could be apportioned based on the value gained from each fishery or by the weight or effort in each fishery) are arbitrary. Other types of costs (e.g., fuel costs), could be apportioned to each fishery if those costs were collected at the trip level. The survey used in the RTO analysis did not use trip level cost data, but instead used data at the annual level. In the previous attempt to calculate a herring RTO (vs. total RTO), revenue shares were used to apportion all costs to each fishery. In retrospect, this method should not have been used due to its arbitrary nature. And so it was decided that a separate herring RTO analysis should not be provided. Instead, the Draft EA will describe in detail the different sources of revenue for each of the vessel types examined.

5. Brant McAfee provided the group an update on the CV analysis he is working on for inclusion in the Draft EA. This analysis was done previously, but following motions made at the April Council meetings to adjust the at-sea monitoring (ASM) sampling design, this analysis has been updated (the draft analysis will be provided as a supplemental document to the Draft EA). Also, based on suggestions made by the NEFMC, the update will include CV analysis for the No Action alternative. Brant also notified the group of varying limitations on the analysis primarily due to lack of data.
6. GARFO staff clarified that the Draft EA will provide language that is more explicit on having 50% or 100% as options for the electronic monitoring (EM) and portside sampling alternatives.
7. In April both Council made motions that would extend slippage reporting requirements, restrictions (i.e., allowable slippage events include mechanical failure, excess catch of dogfish, or safety concerns), and consequence measures to all types of industry-funded monitoring. The PDT/FMAT discussed the ability of EM to determine and verify the cause of a slippage event which would be required to extend the slippage consequence measures. At this time, there is confidence that EM can detect whether or not a slippage event occurs, therefore making it reasonable to extend the slippage reporting requirements and restrictions to EM. However, it is unknown if EM can detect the cause of a slippage event, therefore making it difficult to extend the slippage consequence measures to EM. The Herring/Mackerel EM Project may provide more information on the capability of EM to determine the cause of a slippage event, but we will not know those results until 2017.

There was additional discussion about alternative consequence measures that could potentially be considered for EM trips. One idea was that if EM can generally identify slippage events, then a uniform consequence that does not differentiate between causes may be feasible. Another idea included altering the video review rate, per vessel, based

on compliance with slippage restrictions. For example, if a vessel had been found to out of compliance with the slippage restriction, their video review rate would be increased. Alternatively, good behavior in regards to the slippage restrictions could be rewarded with a lowered video review rate. However, the overall sentiment was that it would be best to consider slippage consequence measures on EM trips after the conclusion of the EM pilot.

The PDT/FMAT recommends that the Council not apply consequence measures to EM at this time, but that applying the slippage consequence measures to different types of industry-funded monitoring be made frameworkable.

8. In April the NEFMC made a motion that would require at-sea monitors to collect length data, but not age data (i.e., scales or otoliths from fish) or biological samples (from marine mammals, sea birds, and sea turtles). Some PDT/FMAT members would like to investigate if there are data utility links between collecting age and length data together. GARFO staff will be reaching out to NEFSC staff in the Population Dynamics Branch to verify there are no data utility concerns for this change in sampling design.
9. The PDT/FMAT discussed the differences in sampling design between NEFOP-level observers and portside samplers. They are collecting baskets for sampling at different rates and applying them differently, either by the haul or by the trip. However, both sets of data are extrapolated for the entire trip, therefore the results won't necessarily be different despite using different sampling intensities.
10. In April the NEFMC made a motion that would require ASM through the IFM alternatives to obtain a high volume fisheries (HVF) training. The PDT/FMAT verified that there are no technical concerns with this change and that the Fisheries Sampling Branch can develop HVF training tailored for ASM.
11. In April both Councils made motions to clarify that the coverage targets in the IFM alternatives should be calculated using a combined method to take into account SBRM observer coverage. It is understood that there are some technical challenges to calculating the coverage targets using this approach. The PDT/FMAT clarified that the methodology used to calculate the coverage targets in the herring and mackerel fisheries would need to be simplified from the methodology used in the groundfish fishery, to feasibility issues regarding timing difference in the herring and mackerel fishing year and workload.

The PDT/FMAT recommends that the Council specify the combined coverage target be calculated using the previous year's SBRM coverage in the herring and mackerel

fisheries as a proxy for determining the amount of industry-funded monitoring needed to reach the desired coverage target. Therefore, this methodology would always operate on a one-year lag.

The PDT/FMAT discussed some of the timing challenges in obtaining the finalized SBRM coverage for the previous year and how that coordinates with the herring and mackerel fishing year. Additionally, it was suggested the additional coverage would be calculated by NMFS, based on the Councils target and the SBRM coverage on the previous year.



# Industry-Funded Monitoring

An Omnibus Amendment to the  
Fishery Management Plans  
of the Mid-Atlantic and New England  
Fishery Management Councils

May 2016



## Executive Summary

The New England and Mid-Atlantic Fishery Management Councils are interested in increasing monitoring and/or other types of data collection in some fishery management plans to assess the amount and type of catch, to more precisely monitor annual catch limits, and/or provide other information for management. This increased monitoring would be above coverage required through the Standardized Bycatch Reporting Methodology (SBRM), the Endangered Species Act (ESA) or Marine Mammal Protection Act (MMPA). The amount of available Federal funding to support additional monitoring and legal constraints on the sharing of costs between the National Marine Fisheries Service (NMFS) and the fishing industry have recently prevented NMFS from approving proposals for industry-funded monitoring in some fisheries, specifically Atlantic Herring Amendment 5, Atlantic Mackerel, Squid, and Butterfish Amendment 14, and Northeast (NE) Multispecies Framework Adjustment 48.

This amendment would provide the measures necessary for industry funding and available Federal funding to pay for additional monitoring to meet specific monitoring coverage targets for each fishery management plan (FMP). This action is needed for the Council to prioritize industry-funded monitoring programs across fishery management plans when available Federal funding falls short of the total needed to fully fund all monitoring programs. This omnibus amendment would also ensure consistency for industry-funded monitoring programs across New England and Mid-Atlantic FMPs.

This amendment is composed of a set of Omnibus Alternatives that would modify all the FMPs managed by the New England and Mid-Atlantic Councils to allow streamlined development of future FMP-specific industry-funded monitoring programs. Additionally, this amendment includes alternatives for specific industry-funded monitoring programs for the Atlantic Herring FMP and the Atlantic Mackerel, Squid, and Butterfish FMP, which would be implemented as part of this action. All of the alternatives are summarized below.

### Overview of Omnibus Alternatives

The Omnibus Alternatives consider (1) standard cost responsibilities associated with industry-funded monitoring for NMFS and the fishing industry, (2) a process for FMP-specific industry-funded monitoring to be implemented via a future framework adjustment action, (3) standard administrative requirements for industry-funded monitoring service providers, (4) a process to prioritize industry-funded monitoring programs in order to allocate available Federal resources across all FMPs, and (5) a process for monitoring set-aside programs to be implemented via a future framework adjustment action.

Omnibus Alternative 1 (No Action) – No standardized structure for industry-funded monitoring programs

- No standard definition of cost responsibilities of industry and NMFS;
- No standardized framework adjustment process to implement future industry-funded monitoring programs in other FMPs;

- No standardized observer service provider requirements;
- No process for prioritizing industry-funded monitoring programs in order to allocate available Federal resources across all FMPs; and
- No standardized framework adjustment process to implement future monitoring set-aside programs.

Omnibus Alternative 2 – Standardized structure for industry-funded monitoring programs and option for monitoring set-aside provision.

- Standard definition for cost responsibilities of industry and NMFS;
- Standard framework adjustment process to implement future industry-funded monitoring programs in other FMPs;
- Standard observer service provider requirements;
- Process for prioritizing industry-funded monitoring programs in order to allocate available Federal resources across all FMPs; and
- Option for standard framework adjustment process to implement future monitoring set-aside programs.

Omnibus Alternatives 2.1-2.5 are variations on the prioritization process in Omnibus Alternative 2, and consider specific options for what to do when Federal funding is not sufficient to cover NMFS costs to support the Council’s desired monitoring coverage level for a given FMP.

1. Omnibus Alternative 2.1 – NMFS-led prioritization process. NMFS prepare analysis and prioritization in consultation with the Councils.
2. Omnibus Alternative 2.2 (Preferred Alternative) – Council-led prioritization process. Council prepares analysis and recommended priorities to NMFS.
3. Omnibus Alternative 2.3 – Proportional prioritization process. Available Federal funding would be allocated proportionally among all industry-funded monitoring programs.
4. Omnibus Alternative 2.4 – Coverage ratio-based prioritization process. The amount of available Federal funding would be allocated to each FMP related to the extra coverage needed and total fleet activity. Alternative 2.4 would favor coverage for the FMPs that don’t need much additional coverage to meet targets and the most active FMPs with IFM programs.
5. Omnibus Alternative 2.5 – Coverage ratio-based prioritization process. The amount of available Federal funding would be allocated to each FMP related to the extra coverage needed and total fleet activity. Alternative 2.5 would favor coverage for the FMPs that need more coverage to meet targets and the least active FMPs with IFM programs.

Omnibus Alternative 2.6 – Monitoring Set-Aside

This alternative would provide a structure to develop future monitoring set-aside programs which could generally consist of reserving a portion of the annual catch limit for a fishery to assist in funding vessel/non-governmental costs for additional monitoring coverage beyond the SBRM requirements. No monitoring set-aside program would be directly established by this action.

## Overview of Herring Coverage Target Alternatives

The New England Fishery Management Council is interested in increasing catch monitoring in the Atlantic herring fishery to address the following goals and objectives: (1) Accurate estimates of catch (retained and discarded), (2) accurate catch estimates for incidental species for which catch caps apply, and (3) affordable monitoring for the herring fishery. The Herring Alternatives provide a range of data collection and monitoring costs through various monitoring types including Northeast Fisheries Observer Program (NEFOP)-level observing, at-sea monitoring, electronic monitoring, and portside sampling. Existing industry reporting requirements and observer coverage to meet SBRM, ESA, and MMPA requirements under the No Action alternative would continue. Any information collected under the herring coverage target action alternatives would be in addition to existing reporting and monitoring.

**TABLE 1. RANGE OF INDUSTRY-FUNDED MONITORING HERRING COVERAGE TARGET ALTERNATIVES**

<b>Gear Type</b>	<b>Purse Seine</b>	<b>Midwater Trawl</b>	<b>Small-Mesh Bottom Trawl (SMBT)</b>
<b>Herring Alternative 1:</b> No Coverage Target for IFM Program (No Action)	SBRM	SBRM	SBRM
<b>Herring Alternative 2:</b> Coverage Target for IFM Program	Includes Sub-Options: 1) Waiver Allowed, 2) Wing Vessel Exemption, 3) 2 Year Sunset, 4) 2 Year Re-evaluation, and 5) 25 mt Threshold		
<b>Herring Alternative 2.1:</b> 100% NEFOP-Level Coverage on Category A and B Vessels	100% NEFOP-Level Observer	100% NEFOP-Level Observer	100% NEFOP-Level Observer
<b>Herring Alternative 2.2:</b> At-Sea Monitor (ASM) Coverage on Category A and B Vessels	[25,50,75,100%] ASM	[25,50,75,100%] ASM	[25,50,75,100%] ASM
<b>Herring Alternative 2.3:</b> Combination Coverage on Category A and B Vessels and MWT Fleet	[25,50,75,100%] ASM	[50,100%] EM/Portside	[25,50,75,100%] ASM
<b>Herring Alternative 2.4:</b> EM and Portside Coverage on MWT Fleet	SBRM	[50,100%] EM/Portside	SBRM
<b>Herring Alternative 2.5:</b> 100% NEFOP-Level Coverage on MWT Fleet in Groundfish Closed Areas*	SBRM	100% NEFOP-Level Observer	SBRM

<b>Herring Alternative 2.6:</b> Combination Coverage on MWT Fleet in Groundfish Closed Areas	SBRM	Coverage would match selected alternatives 2.1-2.4	SBRM
* Sub-Options do not apply to Herring Alternative 2.5.			

As noted in the table above, Herring Alternative 2 would allow several sub-options to apply to the herring coverage target alternatives. Sub-options could apply to any of the alternatives except Herring Alternative 2.5.

- Sub-Option 1 would allow vessels to be issued waivers to exempt them from industry-funded monitoring requirements, for either a trip or the fishing year, if coverage was unavailable due to funding or logistics. Selection of this sub-option preserves the NEFMC's intent for additional monitoring in the herring fishery, but would not prevent vessels from participating in the herring fishery if monitoring coverage was not available. **Should the NEFMC not select Sub-Option 1, then fishing effort would be reduced to match the available level of monitoring (i.e., the fleet would not fish if NMFS does not have funding to support the administration of the program).** Reducing fishing effort to match available monitoring may lack sufficient justification and be inconsistent with National Standards.
- Sub-Option 2 would exempt a wing vessel pair trawling with another vessel from industry-funded monitoring requirements, provided the vessel does not carry any fish.
- Sub-Option 3 would require that industry-funded monitoring requirements expire two years after implementation.
- Sub-Option 4 would require the NEFMC to examine the results of any increased coverage in the herring fishery two years after implementation, and consider if adjustments to the coverage targets are warranted. Depending on the results and desired actions, subsequent action to adjust the coverage targets could be accomplished via a framework adjustment or an amendment to the Herring FMP, as appropriate.
- Sub-Option 5 would exempt trips that land less than 25 mt of herring from industry-funded monitoring requirements.

### Overview of Mackerel Coverage Target Alternatives

The Mid-Atlantic Fishery Management Council is interested in increasing catch monitoring in the Atlantic mackerel fishery to address the following goals and objectives: (1) Accurate estimates of catch (retained and discarded), (2) accurate catch estimates for incidental species for which catch caps apply, and (3) affordable monitoring for the mackerel fishery. The Mackerel Alternatives provide a range of data collection and monitoring costs through various monitoring types including NEFOP-level observing, at-sea monitoring, electronic monitoring, and portside sampling. Existing industry reporting requirements and observer coverage to meet SBRM, ESA, and MMPA requirements under the No Action alternative

would continue. Any information collected under the mackerel coverage target action alternatives would be in addition to existing reporting and monitoring.

**TABLE 2. RANGE OF INDUSTRY-FUNDED MONITORING MACKEREL COVERAGE TARGET ALTERNATIVES**

Gear Type	MWT	SMBT	SMBT	SMBT
Permit Category	All Tiers	Tier 1	Tier 2	Tier 3
Mackerel Alternative 1: No Coverage Target for IFM Program (No Action)	SBRM	SBRM	SBRM	SBRM
Mackerel Alternative 2: Coverage Target for IFM Program	Includes Sub-Options: 1) Waiver Allowed, 2) Wing Vessel Exemption, 3) 2 Year Sunset, 4) 2 Year Re-evaluation, and 5) 25 mt Threshold			
Mackerel Alternative 2.1: NEFOP-Level Coverage	100%	100%	50%	25%
Mackerel Alternative 2.2: ASM Coverage	[25,50,75,100%] ASM	[25,50,75,100%] ASM	SBRM (No Action)	SBRM (No Action)
Mackerel Alternative 2.3: Combination Coverage	[50,100%] EM/Portside	[25,50,75,100%] ASM	SBRM (No Action)	SBRM (No Action)
Mackerel Alternative 2.4: EM and Portside Coverage	[50,100%] EM/Portside	SBRM (No Action)	SBRM (No Action)	SBRM (No Action)
MWT indicates midwater trawl vessels and SMBT indicates small mesh bottom trawl vessels.				
Mackerel alternatives would only apply to trips that land greater than 20,000 lb of mackerel. Sub-Options could apply to any of the alternatives.				

As noted in the table above, Mackerel Alternative 2 would allow several sub-options to apply to the mackerel coverage target alternatives. Sub-options could apply to any of the Mackerel Alternatives (2.1-2.4).

- Sub-Option 1 would allow vessels to be issued waivers to exempt them from industry-funded monitoring requirements, for either a trip or the fishing year, if coverage was unavailable due to funding or logistics. Selection of this sub-option preserves the MAFMC's intent for additional monitoring in the mackerel fishery, but would not prevent vessels from participating in the mackerel fishery if monitoring coverage was not available. **Should the MAFMC not select Sub-Option 1, then fishing effort would be reduced to match the available level of monitoring (i.e., the fleet would not fish if NMFS does not have funding to support the**

**administration of the program).** Reducing fishing effort to match available monitoring may lack sufficient justification and be inconsistent with National Standards.

- Sub-Option 2 would exempt a wing vessel pair trawling with another vessel from industry-funded monitoring requirements, provided the vessel does not carry any fish.
- Sub-Option 3 would require that industry-funded monitoring requirements expire two years after implementation.
- Sub-Option 4 would require the MAFMC to examine the results of any increased coverage in the mackerel fishery two years after implementation, and consider if adjustments to the coverage targets are warranted. Depending on the results and desired actions, subsequent action to adjust the coverage targets could be accomplished via a framework adjustment or an amendment to the MSB FMP, as appropriate.
- Sub-Option 5 would exempt trips that land less than 25 mt of mackerel from industry-funded monitoring requirements.

**List of Acronyms and Abbreviations**

ABC	Acceptable Biological Catch
ACCSP	Atlantic Coastal Cooperative Statistics Program
ACFCMA	Atlantic Coastal Fishery Cooperative Management Act
ACL	Annual Catch Limit
AM	Accountability Measure
APA	Administrative Procedure Act
APAIS	Access Point Angler Intercept Survey
ASMFC	Atlantic States Marine Fisheries Commission
CEQ	Council of Environmental Quality
CFDBS	Commercial Fisheries Database System
CV	Coefficient of Variation
CZMA	Coastal Zone Management Act
DAS	Days-at-sea
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EO	Executive Order
ESA	Endangered Species Act
eVTR	Electronic Fishing Vessel Trip Report
FMP	Fishery Management Plan
FOIA	Freedom of Information Act
FONSI	Finding Of No Significant Impact
FVTR	Fishing Vessel Trip Report
GAM	Generalized Additive Model
GARFO	Greater Atlantic Regional Fisheries Office (formerly NERO)
GPS	Global Positioning System
IBS	Industry-Based Survey
ICNAF	International Commission for the Northwest Atlantic Fisheries
IFQ	Individual Fishing Quota
IQA	Information Quality Act (also known as the Data Quality Act or DQA)
IRFA	Initial Regulatory Flexibility Analysis



ITQ	Individual Transferable Quota
km	Kilometer
lb	Pounds
MA	Mid-Atlantic
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MRIP	Marine Recreational Information Program
MRFSS	Marine Recreational Fisheries Statistics Survey
MSR	Master Site Register
NAFO	Northwest Atlantic Fisheries Organization
NASCO	North Atlantic Salmon Conservation Organization
NE	New England
NEAMAP	Northeast Area Monitoring and Assessment Program
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fisheries Observer Program
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NERO	Northeast Regional Office (renamed GARFO in 2014)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council of the National Academies of Science
NWGB	National Working Group on Bycatch
OLE	NOAA Office of Law Enforcement
PRA	Paperwork Reduction Act
PREE	Preliminary Regulatory Economic Evaluation
PSP	Paralytic Shellfish Poisoning
QA/QC	Quality Assurance/Quality Control
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFE	Stock Assessment and Fishery Evaluation
SAFIS	Standard Atlantic Fisheries Information System
SAP	Special Access Program
SAW/SARC	Stock Assessment Workshop/Stock Assessment Review Committee

SBRM	Standardized Bycatch Reporting Methodology
SFCPO	State-Federal Constituent Programs Office
SSC	Scientific and Statistical Committee
TAC	Total Allowable Catch
TAL	Total Allowable Landings
U.S.	United States
USFWS	United States Fish and Wildlife Service
VMS	Vessel Monitoring System

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### ***2.1.2.2 Omnibus Alternative 2.2: Council-led Prioritization Process for Industry-funded Monitoring Programs***

Under Omnibus Alternative 2.2, the Regional Administrator and Science and Research Director would inform the Councils of NMFS's available funding to achieve coverage targets for industry-funded monitoring coverage, including supporting NMFS's infrastructure costs and/or any offset of industry costs established in this amendment for the Herring and MSB FMPs and other FMP actions. If available funding in a given year was sufficient, this distribution would be based on the allocation necessary to fully implement the industry-funded monitoring coverage targets specified in each FMP. If available funding was not sufficient, the Councils could apply the weighting approach below to determine the best prioritization of industry-funded monitoring in order to allocate available funding across FMPs with industry-funded monitoring programs to meet regional priorities and make recommendations to NMFS. NMFS and industry's costs would be defined as described by Omnibus Alternative 2. Funding for SBRM, ESA, and MMPA observer coverage would not be changed by this measure.

The prioritization process would have the following steps:

1. If available funding is not sufficient to fully fund all industry-funded monitoring programs, the Councils could work together to develop criteria to evaluate and prioritize industry-funded monitoring programs (example weighting approach detailed below) in order to allocate NMFS resources across FMPs with industry-funded monitoring programs that would include:
  - The total amount of funding and seadays necessary to meet the coverage targets specified by each FMP if each FMP were fully funded, including each FMP's share of the total;
  - The coverage level for each FMP if each FMP maintains its percentage share of the total funding (e.g., a fishery with a bigger proportion of the total funding would absorb a bigger proportion of the shortfall);
  - The coverage levels that incorporate the weighting approach; and
  - The rationale for the recommended prioritization.
2. The Councils would coordinate to propose priorities in order to allocate funding for NMFS infrastructure costs and offsets for industry costs. The Councils would also coordinate any modifications to the prioritization process and recommend a prioritization to NMFS. This would be the opportunity to resolve any differences in prioritization between the two Councils.
3. NMFS would provide the Councils, at the earliest practicable opportunity: (1) The estimated industry-funded monitoring coverage levels that incorporate the recommended prioritization, based on available funding; and (2) the rationale for the recommended prioritization, including the reason for any deviation from the Councils' recommendations. The Councils may recommend revisions and additional considerations to be made by the Regional Administrator and Science and Research Director.

Timing for this process is discussed below.

### Weighting Approach

The weighting approach is generally based on the draft processes developed by the Mid-Atlantic Fishery Management Council Scientific and Statistical Committee to prioritize research proposals. The weighting approach could give NMFS or the Council a transparent, deliberative process for prioritizing industry funded monitoring coverage in order to allocate NMFS's available resources for funding of NMFS cost responsibilities required to achieve coverage targets for industry-funded monitoring.

If Alternative 2.1 (NMFS-led Prioritization) is selected, NMFS will use the approach outlined below to prioritize industry-funded programs in order to allocate available NMFS funding. The proposed weighting approach has 2 steps outlined in more detail in the following pages:



## Step 1

- Compare industry-funded monitoring criteria to each other to create a criteria weighting

## Step 2

- Evaluate how each industry-funded monitoring program meets each criterion

### Step 1: Compare industry-funded monitoring criteria to each other to create a criteria weighting

The weighting approach first requires NMFS or the Councils to determine the relative importance of criteria that will be used to evaluate the industry-funded monitoring programs. The list of eight criteria proposed below would be used by NMFS, and could be used by the Councils, for the first prioritization cycle, and every cycle thereafter, unless the Councils change the criteria in a framework adjustment.

1. The industry-funded monitoring program relates to stocks that are overfished or subject to overfishing.

Overfished stocks have biomass levels depleted to a degree that the stock's capacity to produce maximum sustainable yield (MSY) is jeopardized. Stocks subject to overfishing have a mortality rate that is higher than the rate that produces MSY. Under this criterion, preference would be given to stocks that are in poor condition because those stocks may benefit from additional monitoring support.

2. The species has high commercial or recreational value.

This criterion prioritizes industry-funded monitoring programs related to species with high dollar value in the case of a commercial fishery, or a high number of annual landings or gross weight in the case of a recreational fishery.

3. The industry's daily revenue is high relative to the cost of industry costs for monitoring.

This criterion evaluates industry's ability to fund its cost responsibilities related to industry-funded monitoring programs requirements established by the Councils. Preference will be given to industry-funded monitoring programs with high daily revenue relative to the daily costs of the industry funded monitoring.

4. The species has special importance to the ecosystem.

An industry-funded monitoring program may be important because of the biological relationship of the target species to the ecosystem. For example, the species could be a choke species, a forage fish, or have positive or negative impacts on other species. This criterion evaluates the need to prioritize industry-funded monitoring programs species with special ecosystem importance.

5. Industry-funded monitoring program has clear objectives, and a strong statistical basis for the FMP coverage target, including evaluation of the basis for the coverage target.

Monitoring should have clear objectives and a statistical design for sampling that achieves those objectives. Monitoring programs should also have a clear link to current or future FMP needs. The basis for coverage rates, and/or target coefficient of variation (CV) or variance should be justified. As an example, an industry funded monitoring program with a 100 percent coverage target should have statistical analysis supporting this need (e.g., identification/quantification of significant bias).

6. Fleets monitored under the program are compatible with existing SBRM fleet definitions.

There are a number of reasons why it is beneficial to design monitoring programs to be compatible with SBRM fleet definitions.

First, NMFS must be able to identify trips *a priori* in order to deploy coverage effectively. The SBRM fleet definitions (gear, mesh size, area) are robust to this requirement. Some other definitions (e.g., by target species or permit category) have proven difficult to implement coverage for, leading to inefficient use of resources. One example is the design of the coverage requirements for the longfin squid fishery related to the butterfish cap. Vessels intending to land over 2,500 lb longfin squid must notify the observer program 48 hours prior to departure in order to facilitate observer placement. Many vessels fishing with small mesh gear wished to have the option to land large quantities of longfin squid, should they encounter it. However, in that case, requiring vessels to notify the observer program about intent to target squid could lead to coverage on trips that do not ultimately target squid.

Second, vessel trip reports typically include information on gear and statistical area associated with a trip, but do not include other identifiers to link the landed catch (e.g., several sector exempted fisheries). If a vessel trip report does not include details on a specific type of gear (e.g., Ruhle Trawl) or indicate that the trip is part of an exempted fishery or in an access area, then one cannot properly use the information to obtain expanded discard totals for the fleet.

Finally, increasing coverage for a specific target species or certain permit types can bias discard estimates for a given SBRM fleet.

Overall, industry-funded monitoring programs designed to allocate observer coverage according to SBRM fleets should have priority over those that allocate observers using other criteria because monitors can be deployed effectively, and can provide information to be included in SBRM discard analyses, which makes them more cost-efficient.

7. Uncertainty surrounding catch estimates

This criterion prioritizes industry-funded monitoring programs related to target and non-target species with high uncertainty regarding catch estimates. This means that species with higher CVs related to discards or landings would be rated higher and receive higher priority for funding.

8. Risk to management based on fishery performance

A stock for which the quota is consistently under-harvested is unlikely to face the same management risk as one with a constraining quota. Industry-funded monitoring programs related to fisheries for stocks with constraining quotas should have priority over those for under-harvested stocks.

Some of the information above would be defined or analyzed in the original FMP action that created the industry-funded monitoring program. NMFS or the Council would first look to the original FMP action for information and update or supplement this information as necessary.

The eight criteria may not have equal importance, so NMFS or the Councils can assign weights to the relative importance of these criteria. The end result of this process is just a simple percentage weight for each criterion. For example, one criterion might count for 15% of the decision. The proposed method described below, and shown in Table allows an explicit evaluation of each criterion against all the other criteria so that the final weights are consistent with the values decision makers actually place on the criteria. While it seems intricate, it is a systematic way to arrive at weights for the criteria based on what decision makers really think is important.

- The comparison table is built by entering each criterion to be prioritized into a table, with criteria repeated along both the horizontal and vertical axis.
- The NMFS or the Councils would then compare the criterion to each other to determine importance. For example, first “stock status” is compared to “ecosystem importance”, then “stock status” is compared to “SBRM compatibility,” and so on, until all of the criteria have been compared to each other. Place an “x” in the boxes where the same two criteria are being compared.
- Each time a weight is recorded in a row cell, its reciprocal value must be recorded in the corresponding column.

- Comparison values:
  - 1 = criteria are equally important
  - 5 = criterion is more important
  - 10 = criterion is much more important
  - 0.2 = criterion is less important
  - 0.1 = criterion is much less important
  
- After completing the comparisons, total each horizontal row.
  
- The row totals should then be added to create a grand total.
  
- Then each row should be divided by the grand total to get a relative weighting value. This value is termed the “IFM Criterion Weighting.”

TABLE 6. EXAMPLE IFM CRITERIA COMPARISON TABLE

IFM Evaluation Criteria	Stock status	Com/Rec Value	Ability to pay	Ecosystem importance	Strong statistical basis	SBRM compatibility	Catch estimate uncertainty	Risk to management	Row total	IFM Criterion Weighting	Percent
Stock status	x	10	0.1	5	1	10	1	0.2	27.3	0.15	15%
Com/Rec Value	0.1	x	5	1	10	0.1	0.2	10	26.4	0.14	14%
Ability to pay	10	0.2	x	1	5	0.2	10	5	31.4	0.17	17%
Ecosystem importance	0.2	1	1	x	0.2	1	10	1	14.4	0.08	8%
Strong statistical basis	1	0.1	0.2	5	x	0.2	0.1	0.1	6.7	0.04	4%
SBRM compatibility	0.1	10	5	1	5	x	10	0.2	31.3	0.17	17%
Catch estimate uncertainty	1	5	0.1	0.1	10	0.1	x	10	26.3	0.14	14%
Risk to management	5	0.1	0.2	1	10	5	0.1	x	21.4	0.12	12%
								Grand total	185.2		

In the above example, industry's ability to pay and SBRM compatibility are the most important criteria, and will each contribute 17% to the weight of the score of the industry-funded monitoring programs. The statistical basis for the program is the least important criterion, and will only contribute 4% to the weight of the score.

In practice, a very simple survey of Council members can be used to implement this exercise, and the New England Council's Observer Policy Committee has already successfully participated in a trial of such a survey.

Once the relative importance of each evaluation criteria is determined, the next step is to compare how the industry-funded monitoring programs measure up against the criteria.

## Step 2: Evaluate how each industry-funded monitoring program rates relative to each criterion

Rate each industry-funded monitoring program:

- For criteria, reading across the vertical axis, assign a number based on how much each industry funded monitoring program meets the criterion. These are the ratings in the table below:
  - 0 = doesn't meet criterion at all

- 1 = slightly meets criterion
  - 2 = somewhat meets criterion
  - 3 = mostly meets criterion
  - 4 = fully meets criterion
- After completing the comparisons, multiply the rating assigned to each criterion by the IFM Criterion Weighting in Step 1.
  - Total the columns. Now the industry-funded monitoring programs can be ranked.

**TABLE 7. EXAMPLE FMP RANKING USING IFM EVALUATION CRITERIA**

IFM Evaluation Criteria	IFM Criteria Weighting	FMP 1 Ranking	IFM Criteria Weighting x FMP 1 Ranking	FMP 2 Ranking	IFM Criteria Weighting x FMP 2 Ranking	FMP 3 Ranking	IFM Criteria Weighting x FMP 3 Ranking
Stock status	0.15	4	0.59	0	0.00	2	0.00
Com/Rec Value	0.14	1	0.14	3	0.43	1	0.43
Ability to Pay	0.17	2	0.34	1	0.34	0	0.00
Ecosystem importance	0.08	0	0.00	2	0.00	4	0.00
Strong objective	0.04	3	0.11	3	0.33	1	0.33
SBRM compatibility	0.17	1	0.17	3	0.51	4	2.03
Catch estimate uncertainty	0.14	0	0.00	4	0.00	4	0.00
Risk to management	0.12	1	0.12	1	0.12	4	0.46
<b>IFM Program Overall Ranking</b>			1.46		1.71		3.24

In the example, FMP 3 ranks the highest, followed by FMP 2, then FMP 1.

After the process is complete, NMFS and the Councils may now use the rankings to prioritize the industry-funded monitoring program for allocation of available funding to the FMPs to cover NMFS's costs. One possible way to do this would be to fully fund the highest ranked program, and then work through the ranking list sequentially until funding to cover NFMS's cost was completely allocated. Funding would not be allocated to a program if the available allocation would fund less than  $\frac{1}{4}$  of the necessary funding.

If Alternative 2.2 (Council-led Prioritization) is selected, the Councils have the option to use this weighting approach outlined above, or develop their own joint process for prioritization, provided that criteria used to evaluate industry-funded monitoring

programs, as well as the rationale for the recommended prioritization approach, are made available to the public in advance.

Both the MAFMC and the NEFMC have identified a Council-led prioritization process (Omnibus Alternative 2.2) as their preliminary preferred alternative to prioritize new industry-funded monitoring programs in order to allocate available Federal funding across FMPs when funding falls short of Federal cost responsibilities for fully administering new industry-funded monitoring programs.

This action may establish industry-funded monitoring coverage targets for the mackerel and/or herring fisheries. The Council-led prioritization process would apply to those industry-funded monitoring programs, if there is a funding shortfall to support NMFS administrative cost responsibilities. The Councils will need to identify a weighting approach to prioritize industry-funded monitoring programs under the Council-led prioritization process alternative in this action. The Councils may want to consider specifying an equal weighting approach in this action, acknowledging that a more complex weighing approach could be developed in the future. An example of an equal weighting approach would be funding both industry-funded monitoring programs at 70%, if only 70% of the Federal funding needed to administer both programs was available.

Revising the prioritization process (e.g., change from Council-led to NMFS-led) could be done in a future framework action. But, the Councils could also change the weighting approach for the Council-led prioritization process by considering a new weighting approach at a public meeting, where public comment is taken, and asking NMFS to publish a notice or rulemaking modifying the weighting approach. Both Councils would have to agree to any weighting approach. Establishing an equal weighting approach in this action would ensure that the management objectives of both Councils are initially given equal weight and allow time for more complex weighting systems to be developed without delaying implementation.

### **Timing for discretionary alternatives (Alternatives 2.1 and 2.2)**

The discretionary prioritization alternatives (Alternatives 2.1 and 2.2) require a more time-intensive evaluation and ranking of industry funded monitoring programs, and would require rulemaking to solicit public comment on NMFS or the Council's recommended allocation of available funding. The status quo timing outlined under the status quo alternative would still apply, and this new process would apply alongside the existing timeline.

There are two options for this process so that it could be matched with annual funding levels and the SBRM cycle:

1. The Council could choose to have the entire process occur on an as-needed basis (i.e., whenever new IFM programs are approved, or whenever existing IFM programs are adjusted or terminated), with the adjusted prioritization implemented in time for the next SBRM cycle. This path would mean that, once the prioritization

was developed it could be in place indefinitely, until the next industry-funded monitoring program was finalized. Readjusting the weighting approach on an as-needed basis would mean that, after going through the entire timeline, the process outlined in Year 2 below would repeat each year until new programs were added/old programs were adjusted or terminated, at which point the timeline would start over as outlined for Year 1.

2. Alternatively, the Councils could elect to do the process every 3 years unless new IFM programs are approved, or whenever existing IFM programs are adjusted or terminated.



### 2.3 ATLANTIC MACKEREL MONITORING ALTERNATIVES

As described in the Introduction, the MAFMC is interested in increasing catch monitoring in the Atlantic mackerel fishery. This increased monitoring would be above coverage required through the SBRM, the ESA, or MMPA. Limited Federal funding and legal constraints on the sharing of costs between NMFS and the fishing industry have recently prevented NMFS from approving new industry-funded monitoring programs. Examples of new industry-funded monitoring programs that were not approved include Amendment 14 to the Atlantic Mackerel, Squid, and Butterfish (MSB) FMP, Amendment 5 to the Atlantic Herring FMP, and Framework Adjustment 48 to the Northeast Multispecies FMP. This amendment is intended to remedy the industry-funded monitoring program disapproval in MSB Amendment 14 by establishing (1) a process by which available Federal funding could

be allocated to the MSB FMP to support industry-funded monitoring and (2) an industry-funded monitoring coverage target to meet MSB FMP objectives.

Establishing monitoring coverage targets would allow NMFS to approve and implement new industry-funded monitoring programs, without committing to support industry-funded monitoring coverage targets above appropriated funding or before funding is determined to be available.

Although this action may select desired coverage targets beyond SBRM requirements, the availability of Federal funds to support industry-funded monitoring may impact the realized coverage level in any given year. The realized coverage level for the mackerel fishery in a given year may be constrained if available Federal funding falls short of NMFS cost responsibilities for administering new industry-funded monitoring programs. During years when there is no additional funding to cover NMFS cost responsibilities above SBRM requirements, there would be no additional monitoring coverage in the mackerel fishery, even if industry is able to fully fund their cost responsibilities. However, if Federal funding is available to allow NMFS to meet its administrative responsibilities for new industry-funded monitoring programs, the specified coverage target levels would likely be met. Therefore, over time, the realized coverage level for the mackerel fishery would fall between SBRM requirements and the industry-funded monitoring coverage target.

#### **Amendment 14 to the Atlantic Mackerel, Squid, and Butterfish FMP**

In Amendment 14 to the MSB FMP, the Mid-Atlantic Council recommended 100% observer coverage on all limited access mackerel trips using midwater trawl, 100% coverage on Tier 1 mackerel vessels using small mesh bottom trawl, 50% coverage on Tier 2 vessels using small mesh bottom trawl, and 25% coverage on Tier 3 vessels using small mesh bottom trawl. The Mid-Atlantic Council believed that the provisions for observer coverage recommended in Amendment 14 could enhance estimates of river herring and shad catch in the mackerel fishery. Support for high levels of observer coverage on limited access mackerel vessels, especially vessels using midwater trawls, was driven by a majority of stakeholders. Those stakeholders, as well as some members of the mackerel industry, believed that 100% observer coverage was necessary for the most active vessels to either confirm or disprove the claims that have been made regarding incidental river herring and shad catch in the mackerel fishery.

The Mid-Atlantic Council agreed with the need to increase observer coverage in the mackerel fishery to improve the precision of estimates of river herring and shad incidental catch, with the goal of using this information to improve management measures to reduce river herring and shad incidental catch in the mackerel fishery in the future. Recognizing that NMFS would not have sufficient funding to cover the costs of additional observer coverage, the Council recommended that industry contribute \$325 per sea day to offset costs of expanding this monitoring program. The Council also recommended lower levels of coverage for Tier 2 and 3 vessels using small mesh bottom trawl to limit the economic impacts of this contribution to the smaller participants in the fleet. The recommendations

for increased observer coverage in Amendment 14 were ultimately disapproved. The rationale for the disapproval is included in the Appendix.

### **Monitoring Interests in the Mackerel Fishery**

In Amendment 14 to the MSB FMP, the Mid-Atlantic Council recommended measures to improve the monitoring of river herring and shad catch (RH/S) in the mackerel fishery, and to reduce mackerel fishery interactions with river herring and shad to the extent practicable. These measures included: (1) Establishing river herring and shad catch caps on the mackerel fishery, (2) supporting and evaluation an ongoing river herring avoidance program, and (3) prohibiting slipping on limited access mackerel and longfin squid trips.

Once abundant along the East Coast, populations of river herring (alewife and blueback herring) and shad (American and hickory) have declined compared to historical levels due to various factors. Governmental agencies, non-profit organizations, tribal groups, academia, industry, and others are currently engaged in numerous efforts to further river herring and shad conservation.

Vessels fishing for herring and mackerel herring can encounter river herring and shad. Both the New England Council and Mid-Atlantic Councils recommended river herring and shad caps for the herring and mackerel fisheries beginning in 2014. Managers don't currently have enough data to determine biologically based river herring and shad catch caps or to assess the potential effects of such catch caps on river herring and shad populations coastwide. However, the Councils believe river herring and shad catch caps provide a strong incentive for the herring and mackerel fleets to continue avoiding river herring and shad. These catch caps are intended to allow for the full harvest of the mackerel and herring annual catch limits while reducing river herring and shad incidental catch.

The mackerel specifications established a river herring and shad catch cap of 82 mt for 2016-2018. River herring and shad caught on all trips landing 20,000 lb or more of mackerel would count against the cap. Once the mackerel fishery catches 95 percent of the river herring and shad cap (either 77.9 mt), the directed mackerel fishery will be closed and vessels will be limited to a 20,000-lb incidental catch trip limit for the remainder of the fishing year.

Monitoring is critical to understanding the nature and extent of river herring and shad catch in the herring and mackerel fisheries. Because the seasonal and inter-annual distribution of river herring and shad are highly variable, the Councils believe that the most effective measures to address river herring and shad catch would be those that increase at-sea sampling, improve bycatch accounting of incidental catch, and promote cooperative efforts with the industry to minimize catch.

Analysis of river herring and shad catch from 2010-2013 done as part of this amendment indicates that the fleets responsible for catching the majority of river herring and shad are the midwater trawl fleet (57%) followed by the small mesh bottom trawl fleet (33%). The

analysis also indicated that the purse seine fleet is responsible for a negligible amount of river herring and shad catch (0.3%).

### **Current Monitoring of the Mackerel Fishery**

In recent years, observer coverage for the mackerel fishery has largely been allocated as part of the SBRM. The SBRM is the combination of sampling design, data collection procedures, and analyses used to estimate bycatch in multiple fisheries. The SBRM provides a structured approach for evaluating the effectiveness of the allocation of fisheries observer effort across multiple fisheries to monitor a large number of species. Although management measures are typically developed and implemented on an FMP-by-FMP basis, from the perspective of developing a bycatch reporting system, there is overlap among the FMPs and the fisheries that occur in New England and the Mid-Atlantic that could result in redundant and wasteful requirements if each FMP is addressed independently.

For example, New England vessels using extra-large mesh gillnets catch monkfish, skates, and Northeast multispecies, often on the same fishing trip, and, therefore, most participants in this fishery must operate according to the regulations implemented under three different FMPs. To distinguish between the management units identified in individual FMPs and the fisheries that operate under one or more FMPs, the SBRM is designed around “fishing modes” defined by the type of fishing gear used and the area from which the vessels depart.

There are 56 fishing modes defined in the SBRM, some of which further subdivide a fishery by the mesh size of the gear used (for gillnets and otter trawls), or by the type of permit and access area program (for sea scallop dredges). Although there are differences among the modes, the participants in these fishing modes fish throughout the Gulf of Maine, Georges Bank, and the Mid-Atlantic Bight, and land their catch across a large number of fishing ports from the Outer Banks of North Carolina to Downeast Maine. The SBRM is limited to those fisheries that are prosecuted in the Federal waters of the Greater Atlantic Region and managed through an FMP developed by either the Mid-Atlantic or New England Council.

### **Overview of Mackerel Industry-Funded Monitoring Alternatives**

The Mid-Atlantic Council recommended increased monitoring in the mackerel fishery address the following goals: 1) Accurate estimates of catch (retained and discarded), 2) accurate catch estimates for incidental species for which catch caps apply, and 3) effective and affordable and monitoring for the mackerel fishery.

The industry-funded monitoring coverage target alternatives for the mackerel fishery provide a range of data collections and monitoring costs. This document evaluates how different coverage target alternative meet specific monitoring goals identified by the MAFMC while comparing the costs of the monitoring programs, particularly costs that would be borne by the fishing industry. The mackerel coverage target action alternatives

include Northeast Fisheries Observer Program-level (NEFOP-level) observer, ASM, electronic monitoring (EM), and portside sampling coverage.

Under any of the mackerel coverage target action alternatives, existing industry reporting requirements and observer coverage to meet MSA, ESA, and MMPA requirements under the no action alternative would continue. Any information collected under the mackerel coverage target action alternatives would be in addition to existing reporting and monitoring.

**TABLE 15. RANGE OF MACKEREL INDUSTRY-FUNDED MONITORING ALTERNATIVES**

<b>Gear Type</b>	<b>MWT</b>	<b>SMBT</b>	<b>SMBT</b>	<b>SMBT</b>
<b>Permit Categories</b>	All Tiers	Tier 1	Tier 2	Tier 3
<b>Mackerel Alternative 1: No Coverage Target for IFM Program (No Action)</b>	SBRM	SBRM	SBRM	SBRM
<b>Mackerel Alternative 2: Coverage Target for IFM Program</b>	Includes Sub-Options: 1) Waiver Allowed, 2) Wing Vessel Exemption, 3) 2 Year Sunset, 4) 2 Year Re-evaluation, and 5) 25 mt Threshold			
<b>Mackerel Alternative 2.1: NEFOP-Level Coverage</b>	100% NEFOP-Level Observer	100% NEFOP-Level Observer	50% NEFOP-Level Observer	25% NEFOP-Level Observer
<b>Mackerel Alternative 2.2: ASM Coverage</b>	[25,50,75,100%] ASM	[25,50,75,100%] ASM	SBRM (No Action)	SBRM (No Action)
<b>Mackerel Alternative 2.3: Combination Coverage</b>	[50,100%] EM/Portside	[25,50,75,100%] ASM	SBRM (No Action)	SBRM (No Action)
<b>Mackerel Alternative 2.4: EM and Portside Coverage</b>	[50,100%] EM/Portside	SBRM (No Action)	SBRM (No Action)	SBRM (No Action)
MWT indicates midwater trawl and SMBT indicates small mesh bottom trawl vessels.				
Mackerel Alternatives would only apply to trips that land greater than 20,000 lb of mackerel. Sub-Options could apply to any of the alternatives.				

### 2.3.1 Mackerel Alternative 1: No Coverage Target for Industry-Funded Monitoring Program

Under Mackerel Alternative 1 (No Action), there would be no coverage target specified for an industry-funded monitoring program in the mackerel fishery. Observer coverage for mackerel vessels would be allocated according to SBRM, and there would be no additional cost to the mackerel industry for observer coverage. If there was Federal funding available after SBRM coverage requirements were met, additional monitoring for the mackerel fishery would be evaluated on a case-by-case basis.

Under SBRM, the Atlantic mackerel fishery receives NEFOP coverage under the following 4 fleets: New England and Mid-Atlantic small mesh otter trawl and New England and Mid-Atlantic paired and single midwater trawl. Table describes the sea days proposed for April 2016 through March 2017. The sea days listed below for small mesh otter trawl cover all FMPs that use this gear type, so only a portion would cover trips targeting mackerel. The midwater trawl fleets is largely comprised of vessels targeting herring and mackerel.

**TABLE 16. PROPOSED AND OBSERVED SEA DAYS FOR FLEETS THAT TARGET MACKEREL**

Fleet	Region	Proposed sea days for April 2016 to March 2017	Observed sea days, July 2014 to June 2015	VTR sea days, July 2014 to June 2015	Observed trips, July 2014 to June 2015	VTR trips, July 2014 to June 2015
Small Mesh Bottom Trawl	MA	1,717	997	6,761	360	3,088
Small Mesh Bottom Trawl	NE	798	933	8,847	319	3,381
Midwater Trawl (Pair and Single)	MA	30	8	134	1	26
Midwater Trawl (Pair and Single)	NE	440	160	1,189	43	363

Source: 2016 Discard Estimation, Precision, and Sample Size Analyses for 14 Federally Managed Species Groups in the Waters off the Northeastern United States; Wigley et al., 2016 (included in Appendix 4).

Under SBRM, NEFOP collect the following information on mackerel trips:

- Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations);
- Tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends);
- All retained and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition);
- Retained catch on unobserved hauls (species, weight, and disposition);
- Actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling;
- Whole specimens, photos, and biological samples (i.e., scales, otoliths, and/or vertebrae from fish, invertebrates, and incidental takes);
- Information on interactions with protected species, such as sea turtles, marine mammals, and sea birds; and
- Vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

Currently, NEFOP observers are required to possess a HVF certification in order to observe the mackerel fishery. The HVF certification was developed in order to more effectively train certified NEFOP observers in high volume catch sampling and documentation. HVF certification allows observers to cover any of the fisheries that pump catch, typically the

mid-water trawl and purse seine fleets. This certification was developed to prepare observers for changes in the regulations and new requirements that were under consideration in MSB Amendment 14.

NEFOP determined that data quality was sub-optimal when collected by observers without specialized training, potentially resulting in data loss. In addition, the high variety of deck configurations, fish handling practices and fast-paced operations proved more demanding for observers. Having additional training to identify these practices allowed for improved decision-making while at sea, which, ultimately, improved data accuracy and maximized data collection.

In order to qualify for HVF training, NEFOP observers need to be certified and in a positive data quality standing with all trip data. Prior data and data quality history are critically examined in order to determine if an observer would be a good candidate for certification.

Currently, the HVF training is conducted at the NEFOP training center in Falmouth, MA and is one day in duration. Training consists of species identification, sampling and subsampling methodologies, practice and documentation, gear identification and a review of the regulations. Regulations are discussed in order to educate observers in regard to Groundfish Closed Area coverage, haddock and river herring and shad catch accounting, slippage and operational discarding. Sampling and subsampling high volume catch is the main focus of training to ensure that observers understand the challenges that exist in trying to account for and accurately extrapolate catch on a haul-by-haul basis. Training on the use of a Marel scale is also conducted as most of the high volume vessels have volunteered to keep Marel scales onboard for the observers to utilize. An exam is administered at the end of training and if successfully completed an observer is certified to observe the high volume fisheries.

Vessels with limited access mackerel permits are required to bring catch aboard and make it available to the observer for sampling. If catch is discarded prior to making it available to the observer for sampling, discarded catch is considered “slippage.” Vessels are prohibited from slipping catch unless it due to safety concerns, mechanical failure, or if excess catch of dogfish prevents catch from being pumped aboard the vessel. Vessels with limited access permits are required to report slippage on the daily mackerel VMS catch report and complete a released catch affidavit. Additionally, vessels are subject to slippage consequence measures. Specifically, those vessels are required to move 15 nautical miles following a slippage event due to safety, mechanical failure, or dogfish and terminate the fishing trip following slippage for any other reason.

### **2.3.2 Mackerel Alternative 2: Coverage Target Specified for Industry-Funded Monitoring Program**

Under Mackerel Alternative 2, the MAFMC would specify the details of an industry-funded monitoring program for the mackerel fishery. These details may include, but are not limited to: (1) Level and type of coverage target, (2) rationale for level and type of

coverage, (3) minimum level of coverage necessary to meet coverage goals, (4) consideration of coverage waivers if coverage target cannot be met, (5) process for vessel notification and selection, (6) process for payment of industry cost responsibilities, (7) standards for monitoring service providers, and (8) any other measures necessary to implement the industry-funded monitoring program. Additional NEPA analysis would be required for any subsequent FMP framework adjustment action implementing and/or modifying the specified industry-funded monitoring programs.

The realized coverage level in a given year would be determined by the amount of funding available to cover NMFS cost responsibilities in a given year. The realized coverage for the fishery in a given year would fall somewhere between no additional coverage above SBRM and the specified coverage target.

Mackerel Alternative 2 would allow several sub-options to apply to the mackerel coverage target alternatives. Sub-Options could apply to any of the mackerel alternatives.

- Sub-Option 1 would allow vessels to be issued waivers to exempt them from industry-funded monitoring requirements, for either a trip or the fishing year, if coverage was unavailable due to funding or logistics. Selection of this sub-option preserves the MAFMC's intent to increase monitoring in the mackerel fishery, but would not prevent vessels from participating in the mackerel fishery if monitoring coverage was not available. Should the MAFMC not select Sub-Option 1, then fishing effort would be reduced to match the available level of monitoring (i.e., the fleet would not fish if NMFS does not have funding for the program). Reducing fishing effort to match available monitoring may lack sufficient justification and be inconsistent with National Standards.
- Sub-Option 2 would exempt a wing vessel pair trawling with another vessel from industry-funded monitoring requirements, provided the vessel does not pump or carry any fish onboard.
- Sub-Option 3 would require that industry-funded monitoring requirements expire two years after implementation.
- Sub-Option 4 would require the MAFMC to examine the results of any increased coverage in mackerel fishery two years after implementation, and consider if adjustments to the coverage targets are warranted. Depending on the results and desired actions, subsequent action to adjust the coverage targets could be accomplished via a framework adjustment or an amendment to the MSB FMP, as appropriate.
- Sub-Option 5 would exempt trips that land less than 25 mt of mackerel from industry-funded monitoring requirements.

Omnibus Alternative 2 would include standard monitoring and service provider requirements for industry-funded monitoring, including NEFOP-level observers, at-sea monitors, electronic monitoring, and portside samplers. (See Appendix 2 – Monitoring and Service Provider Requirements for the details of the standard requirements.) If Omnibus



Alternative 2 is not selected by the Councils, service provider requirements for industry-funded monitoring programs would be developed and implemented in individual FMPs.

A monitoring and service provider provision previously only considered under Mackerel Alternative 2 was recommended by the MAFMC in February 2016 to be included in the standard monitoring and service provider requirements in Omnibus Alternative 2. That provision would allow NEFOP-level observers and at-sea monitors to be deployed on the same vessel for more than two consecutive multi-day trips or more than twice in a given month.

In addition to the standard monitoring and service provider requirements specified in Omnibus Alternative 2, Mackerel Alternative 2 would specify that requirements for industry-funded observer and at-sea monitors include a HVF certification for the mackerel fishery. The existing NEFOP HVF certification training program would be available to industry-funded observers and NEFOP would develop a new HVF certification training program for industry-funded at-sea monitors.

Under Mackerel Alternative 2, the process for vessel notification and selection and payment of industry cost responsibilities would be developed during the rulemaking and amendment approval process.

#### ***2.3.2.1 Mackerel Alternative 2.1: NEFOP-Level Coverage on Limited Access Vessels***

Mackerel Alternative 2.1 would require the following levels of NEFOP-level observer coverage on declared mackerel trips (trips landing more than 20,000 lb of mackerel):

- 100% coverage on all limited access vessels using midwater trawl gear,
- 100% coverage on vessels with Tier 1 mackerel permits using small mesh bottom trawl gear,
- 50% coverage on vessels with Tier 2 mackerel permits using small mesh bottom trawl gear, and
- 25% coverage on vessels with Tier 3 mackerel permits using small mesh bottom trawl gear.

NEFOP-level observers would be required to possess a NEFOP certification, including a HVF certifications, and they would collect comprehensive catch data consistent with NEFOP protocols for observer data collected under the SBRM.

Prior to any trip declared into the mackerel fishery, representatives for vessels with limited access mackerel permits using midwater trawl or small mesh bottom trawl would be required to provide notice to NMFS and request a NEFOP-level observer through the pre-trip notification system. If an SBRM observer was not selected to cover that trip, NMFS would notify the vessel representative whether or not NEFOP-level observer coverage must be procured through an industry-funded monitoring service provider. If NMFS informs the vessel representative that NEFOP-level observer coverage is necessary, they would then be required to contact an industry-funded monitoring service provider to

obtain and pay for a NEFOP-level observer to carry on the vessel's next fishing trip. The vessel would be prohibited from fishing for, taking, possessing, or landing in excess of the incidental mackerel trip limit (i.e., 20,000 lb) without carrying an NEFOP-level observer on its next trip. If NMFS informs the vessel representative that NEFOP-level coverage is not necessary on the next trip, NMFS would issue the vessel a NEFOP-level observer coverage waiver.

NEFOP-level observers would collect the following information on mackerel trips:

- Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations);
- Tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends);
- All retained and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition);
- Retained catch on unobserved hauls (species, weight, and disposition);
- Actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling;
- Whole specimens, photos, length information, and biological samples (i.e., scales, otoliths, and/or vertebrae from fish, invertebrates, and incidental takes);
- Information on interactions with protected species, such as sea turtles, marine mammals, and sea birds; and
- Vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

The NEFOP-level observer coverage target (25%, 50%, or 100%) for this alternative would be calculated by combining SBRM and industry-funding monitoring coverage. One way to reach a 25% coverage target in a given year would be to use an estimate of the previous year's SBRM coverage for vessels with limited access mackerel permits (e.g., 15%) combined with industry-funded monitoring (e.g., 10%). Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not carry an SBRM observer and industry-funded observer on the same trip.

The realized observer coverage level for this alternative in a given year would be determined by the amount of Federal funding available to cover NMFS cost responsibilities. The realized observer coverage level would fall anywhere between SBRM coverage and specified coverage target.

If a NEFOP-level observer was not available to cover a mackerel trip selected for coverage (either due to logistics or a lack of funding), that vessel would be prohibited from participating in the mackerel fishery on that trip. Acknowledging that available Federal funding to cover NMFS cost responsibilities may be limited, this alternative would likely reduce the ability of vessels with limited access mackerel permits to participate in the mackerel fishery, unless Sub-Option 1 was selected allowing coverage requirements to be waived.

Under Mackerel Alternative 2.1, all slippage restrictions, reporting requirements, and slippage consequences would apply to vessels with limited access mackerel permits.

**Rationale:** MSB Amendment 14 recommended high levels of NEFOP-level observer coverage on vessels with limited access mackerel permits. The increased coverage was intended to enhance catch estimates of river herring and shad catch in the mackerel fishery and better address and manage bycatch issues in the future. The requirement for 100% NEFOP-level observer coverage was recommended to apply to vessels that used midwater trawl gear and vessels with Tier 1 mackerel permit using small mesh bottom trawl gear because those vessels account for most mackerel landings. Lower coverage levels were recommended for vessels with Tier 2 and Tier 3 mackerel permit, with the rationale that those vessels do not need as much coverage given their lower contribution to landings/effort in the mackerel fishery.

Support for high levels of NEFOP-level observer coverage on limited access mackerel vessels, especially for vessels using midwater trawl gear, was supported by a majority of stakeholders (e.g., groundfish fishing industry, recreational fishery participants, environmental advocates). Those stakeholders, as well as some members of the mackerel industry, believed that high levels of NEFOP-level observer coverage was important for the most active vessels to either confirm or disprove the claims that have been made by many regarding river herring and shad incidental catch in the mackerel fishery.

Slippage restrictions, reporting requirements, and consequences are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Combining SBRM coverage with industry-funded monitoring coverage to achieve the coverage target (25%, 50%, or 100%) is intended to reduce the costs associated with industry-funded monitoring coverage.

#### ***2.3.2.2 Mackerel Alternative 2.2: At-Sea Monitor Coverage on Midwater Trawl Vessels (25%-100%) and Tier 1 Small Mesh Bottom Trawl Vessels (25%-100%)***

Mackerel Alternative 2.2 would require vessels with limited access mackerel permits using midwater trawl gear and vessels with Tier 1 mackerel permits using small mesh bottom trawl gear to carry an at-sea monitor on every declared mackerel trip selected for coverage by NMFS. Vessels would be selected to carry an at-sea monitor by NMFS to meet the at-sea monitor coverage target (25%, 50%, 75%, or 100%) specified in this action. These at-sea monitor coverage requirements only apply to trips landing more than 20,000 lb of mackerel.

Prior to any trip declared into the mackerel fishery, representatives for vessels with limited access mackerel permits using midwater trawl gear and vessels with Tier 1 mackerel permits using small mesh bottom trawl gear would be required to provide notice to NMFS and request an at-sea monitor through the pre-trip notification system. If an SBRM observer was not selected to cover that trip, NMFS would notify the vessel representative whether or not an at-sea monitor must be procured through an industry-funded monitoring service provider. If NMFS informs the vessel representative that at-sea monitoring coverage is necessary, they would then be required to contact an industry-funded monitoring service provider to obtain and pay for an at-sea monitor to carry on the

vessel's next fishing trip. The vessel would be prohibited from fishing for, taking, possessing, or landing any mackerel without carrying an at-sea monitor on its next trip. If NMFS informs the vessel representative that at-sea monitoring coverage is not necessary on the next trip, NMFS would issue the vessel an at-sea monitoring coverage waiver.

At-sea monitors would collect the following information on mackerel trips:

- Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations);
- Tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends);
- All retained and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition);
- Actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling;
- Length data on retained and discarded catch; and
- Vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

Initially, the MAFMC recommended that at-sea monitors only collect data from discarded and not retained catch. The MAFMC recommended that at-sea monitors collect only a limited data set compared to NEFOP-level observers to allow for any possible cost savings associated with reducing training time, gear requirements, and internal support resources necessary to administer an at-sea monitoring program for the mackerel fishery. However, the mackerel fishery only discards a small percentage of its catch, so there was only a minimal gain in information when at-sea monitors only collected data on discarded catch. In April 2016, to increase the data utility of information collected by at-sea monitors, the MAFMC recommended that at-sea monitors collect information on both retained and discarded catch.

The ASM coverage target (25%, 50%, 75%, or 100%) for this alternative would be calculated by combining SBRM and industry-funding monitoring coverage. One way to reach a 25% coverage target in a given year would be to use an estimate of the previous year's SBRM coverage for vessels with limited access permits using midwater trawl gear and vessels with Tier 1 mackerel permits using small mesh bottom trawl gear (e.g., 15%) combined with industry-funded monitoring (e.g., 10%). Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not carry an SBRM observer and industry-funded at-sea monitor on the same trip.

Currently, there are slippage restrictions and reporting requirements when an observer is aboard vessels with limited access mackerel permits. Slippage restrictions and reporting requirements could be extended to vessels with at-sea monitors aboard.

The realized observer coverage level for this alternative in a given year would be determined by the amount of Federal funding available to cover NMFS cost responsibilities. The realized coverage level would fall anywhere between SBRM coverage and the specified at-sea monitoring coverage level on vessels with limited access mackerel permits using

midwater trawl gear and vessels with Tier 1 mackerel permits using small mesh bottom trawl gear.

If an at-sea monitor was not available to cover mackerel trips selected for coverage (either due to logistics or a lack of funding), that vessel would be prohibited from participating in the mackerel fishery on that trip. Acknowledging that available Federal funding to cover NMFS cost responsibilities may be limited, this alternative would likely reduce the ability of vessels with limited access mackerel permits to participate in the mackerel fishery, unless Sub-Option 1 was selected allowing coverage requirements to be waived.

Under Mackerel Alternative 2.2, all slippage restrictions, reporting requirements, and slippage consequences would apply to vessels with limited access mackerel permits using midwater trawl gear and vessels with Tier 1 mackerel permits using small mesh bottom trawl gear.

**Rationale:** In contrast to NEFOP-level observers, at-sea monitors would not collect whole specimens, photos, or biological samples (other than length data) from catch or data on interactions with protected species. The Councils recommended that at-sea monitors collect only a limited data set compared to NEFOP-level observers to allow for maximum cost savings associated with reducing training time, gear requirements, and internal support resources necessary to administer an at-sea monitoring program for the mackerel fishery. (*See Appendix 5 – Analysis of ASM Costs for additional details.*)

Slippage restrictions, reporting requirements, and consequences are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Combining SBRM coverage with industry-funded monitoring coverage to achieve the coverage target (25%, 50%, 75%, or 100%) is intended to reduce the costs associated with industry-funded monitoring coverage.

### ***2.3.2.3 Mackerel Alternative 2.3: Combination Coverage on Midwater Trawl Vessels and Tier 1 Small Mesh Bottom Trawl Vessels***

#### **Tier 1 Small Mesh Bottom Trawl Vessels**

Mackerel Alternative 2.3 would require vessels with Tier 1 mackerel permits and using small mesh bottom trawl gear to carry an at-sea monitor on every declared mackerel trip landing more than 20,000 lb of mackerel and selected for coverage by NMFS. Vessels would be selected to carry an at-sea monitor by NMFS to meet the at-sea monitor coverage target (25%, 50%, 75%, or 100%) that is specified in this action.

Prior to any trip declared into the mackerel fishery, representatives for vessels with Tier 1 mackerel permits using small mesh bottom trawl gear would be required to provide notice to NMFS and request an at-sea monitor through the pre-trip notification system. If an SBRM observer was not selected to cover that trip, NMFS would notify the vessel representative whether or not an at-sea monitor must be procured through an industry-funded monitoring service provider. If NMFS informs the vessel representative that they

needed at-sea monitoring coverage, they would then be required to contact an industry-funded monitoring service provider to obtain and pay for an at-sea monitor to carry on the vessel's next fishing trip. The vessel would be prohibited from fishing for, taking, possessing, or landing mackerel in excess of the incidental mackerel trip limit (20,000 lb) without carrying an at-sea monitor on its next trip. If NMFS informs the vessel representative that at-sea monitoring coverage is not needed on the next trip, NMFS would issue the vessel an at-sea monitoring coverage waiver.

At-sea monitors would collect the following information on mackerel trips:

- Fishing gear information (i.e., size of nets, mesh sizes, and gear configurations);
- Tow-specific information (i.e., depth, water temperature, wave height, and location and time when fishing begins and ends);
- All retained and discarded catch (fish, sharks, crustaceans, invertebrates, and debris) on observed hauls (species, weight, and disposition);
- Actual catch weights whenever possible, or alternatively, weight estimates derived by sub-sampling;
- Length data on retained and discarded catch; and
- Vessel trip costs (i.e., operational costs for trip including food, fuel, oil, and ice).

The ASM coverage target (25%, 50%, 75%, or 100%) for this alternative would be calculated by combining SBRM and industry-funding monitoring coverage. One way to reach a 25% coverage target in a given year would be to use an estimate of the previous year's SBRM coverage for vessels with Tier 1 mackerel permits using small mesh bottom trawl gear (e.g., 15%) combined with industry-funded monitoring (e.g., 10%). Because the coverage target is calculated by combining SBRM and industry-funded monitoring coverage, a vessel would not carry an SBRM observer and industry-funded at-sea monitor on the same trip.

If an at-sea monitor was not available to cover a mackerel trip selected for coverage (either due to logistics or a lack of funding), that vessel would be prohibited from participating in the mackerel fishery on that trip. Acknowledging that available Federal funding to cover NMFS cost responsibilities may be limited, this alternative would likely reduce the ability of vessels with limited access mackerel permits to participate in the mackerel fishery, unless Sub-Option 1 was selected allowing coverage requirements to be waived.

Under Mackerel Alternative 2.3, all slippage restrictions, reporting requirements, and slippage consequences would apply to vessels with Tier 1 mackerel permits using small mesh bottom trawl gear.

**Rationale:** In contrast to NEFOP-level observers, at-sea monitors would not collect whole specimens, photos, or biological samples (other than length data) from catch or data on interactions with protected species. The MAFMC recommended that at-sea monitors collect only a limited data set compared to NEFOP-level observers to allow for any possible cost savings associated with reducing training time, gear requirements, and internal

support resources necessary to administer an at-sea monitoring program for the mackerel fishery. (*See Appendix 5 – Analysis of ASM Costs for additional details.*)

Slippage restrictions, reporting requirements, and consequences are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Combining SBRM coverage with industry-funded monitoring coverage to achieve the coverage target (25%, 50%, 75%, or 100%) is intended to reduce the costs associated with industry-funded monitoring coverage.

### **Midwater Trawl Fleet**

Mackerel Alternative 2.3 would require vessel with limited access mackerel permits using midwater trawl gear to carry an operating EM system on every trip declared into the mackerel fishery landing over 20,000 lb of mackerel and portside sampling of their catch on every declared mackerel trip selected for coverage by NMFS. The intention of the MAFMC would be that all declared mackerel trips by midwater trawl vessels would have some percentage of EM footage sampled (50% or 100%) and some percentage of trips sampled portside (50% or 100%). However, factors such as where catch is landed, ability to access the offload, and infrastructure limitations at certain landing ports, may prevent the program from achieving 100% coverage, even if funding is not limiting.

Prior to any trip declared into the mackerel fishery, representatives for vessels with limited access mackerel permits using midwater trawl gear would be required to have an operational EM system installed aboard their vessel and provide notice to NMFS and request a portside sampler through the pre-trip notification system.

NMFS would notify the vessel representative whether or not portside sampling coverage must be procured through an industry-funded monitoring service provider. If NMFS informs the vessel representative that they needed portside sampling coverage, they would then be required to contact an industry-funded monitoring service provider to obtain and pay for a portside sampler for the vessel's next fishing trip. The vessel would be prohibited from fishing for, taking, possessing, or landing mackerel in excess of the incidental mackerel trip limit (20,000 lb) without portside sampling of its offload on its next trip. If NMFS informs the vessel representative that portside sampling coverage is not needed on its next trip, NMFS would issue the vessel a portside sampling coverage waiver.

Both the EM footage and portside sampling coverage targets (50% or 100%) for this alternative would be calculated independent of and in addition to SBRM coverage. To reach a 50% coverage target in a given year, the rate of EM footage review and portside sampling would both equal 50%, regardless of the amount of SBRM coverage on midwater trawl vessels. Because the coverage target is calculated independent of and in addition to SBRM coverage, a vessel may carry on SBRM observer on the same trip that would be sampled portside.

### Electronic Monitoring

Under Mackerel Alternative 2.3, owners or operators of vessels issued a mackerel limited access permit and using midwater trawl gear would be required to install EM equipment and maintain the equipment on board for the duration of the fishing year. Though the system would have to be installed duration of the fishing year, it would only need to be turned on and recording video footage during declared mackerel trips using midwater trawl gear.

Video footage would be used to confirm retention of catch on midwater trawl trips to ensure that all catch is available to be sampled portside for a given trip. Video footage would be recorded either throughout the duration of the trip or just around haulback. For analysis purposes, haulback would be defined as the time gear sensors document the start of gear retrieval to some set amount of time after the time gear sensors sense the end of gear retrieval, in order to ensure that all catch has been transferred into the hold or discarded. In addition, one wide angle camera may remain on for the duration of the trip to monitor for discard compliance.

While video footage was intended to only initially be used to verify retention of catch for portside sampling, the MAFMC also recommended that EM would be used to verify compliance with slippage restrictions, reporting requirements, and consequence measures. Footage would not initially be used to identify species, nor estimate the amount of catch released if a haul were slipped. The MAFMC may expand the uses of video footage to include species identification or quantification of released catch in the future if footage proves useful for these purposes. Such an expansion would be done via a framework adjustment or amendment, as appropriate.

### *Equipment*

The EM system, installed by a NMFS-approved contractor, would be comprised of video camera(s), recording equipment, and other related equipment with the following components and capabilities:

- Video cameras. Video cameras would need to be mounted to provide a clear, unobstructed, and well illuminated views of the area(s) where the midwater trawl gear is retrieved prior to being placed in the hold. There would need to be a sufficient number of cameras with sufficient resolution for NMFS, the US Coast Guard, and other authorized officers/designees to determine that all catch was brought aboard the vessel after haulback. The EM system must be capable of initiating video recording at the time gear retrieval starts, and record all periods of time when the gear is being retrieved and until catch is placed in the hold or discarded.
- Global Positioning System (GPS) receiver. A GPS receiver would be required to document coordinates, velocity, and heading data.
- Hydraulic and drum rotation sensors. Hydraulic sensors would be required to continuously monitor the hydraulic pressure. Drum rotation sensor would be required to continuously monitor drum rotations.



- EM control box. The system would need to include a control box that receives and stores the raw data provided by the sensors and cameras. The control box would need to contain removable hard drives and sufficient storage systems capability to record data for the full duration of a trip (i.e., the longest expected trip length for the vessel).
- EM systems monitor. A wheelhouse monitor would be necessary to provide a graphical user interface for the vessel operator to monitor: 1) The state and performance of the control box, 2) information on the current date and time synchronized via GPS, 3) GPS coordinates, 4) current hydraulic pressure reading, 5) presence of a data disk, 6) percentage used of the data disk, 7) and video recording status.

NMFS would announce specifics about this equipment list, as well as any additional design requirements for the EM system, during the rulemaking and implementation process. Industry will be responsible for contracting with a NMFS-approved provider for technical and maintenance services.

#### *Data Transfer*

After completing a fishing trip, the vessel representative would be required to mail or transmit the removable EM system hard drive(s) containing all data to NMFS or a NMFS-approved contractor, according to instructions provided by NMFS. The method of transfer that would be allowed under the EM program will be developed during implementation. Prior to departing on a subsequent trip, a vessel representative would be required to install a replacement EM system hard drive(s) to enable data collection and video recording. A vessel representative would be responsible for contacting NMFS or NMFS-approved contractor if they have requested but not received a replacement hard drive(s) and for informing NMFS or NMFS-approved contractor of any lapse in the hard drive management procedures described in the vessel monitoring plan.

#### *Retention Requirements*

Initially, Mackerel Alternative 2.3 would maintain the existing retention requirements for the midwater trawl fleet. Vessels would continue to operate under the regulations and possession limits for any fisheries for which they possess permits. There are also some statutory measures under the ESA and MMPA that dictate retention of protected species.

Under Mackerel Alternative 2.3, all slippage restrictions, reporting requirements, and consequence measures would apply to all midwater trawl vessels with limited access mackerel permits.

#### *Review of EM Video Footage*

Video footage would be sampled at some Council-specified and predetermined percent of review (50% or 100%), and then compared to released catch affidavits, VMS reports

describing slippage events, and/or observer data on slippage. The sampling of video footage would evaluate whether or not catch was discarded. The rate of review may be adjusted by the MAFMC via a framework action, to use the optimum and most cost effective rate to achieve the management goal.

### *Compliance Measures*

The MAFMC may consider alterations to the rates of video footage recording and/or sampling to ensure compliance. For example, if a vessel is found to have undocumented discarding events on more than a specified number of trips during a fishing year, then the MAFMC may adjust the rates of video footage recording and/or sampling.

### *Vessel Monitoring Plans*

Individual Vessel Monitoring Plans (VMPs) would serve as a comprehensive plan for discard documentation, installation and maintenance, protocols for data storage and transfer, and other important information regarding a vessel's specific EM system. Each vessel operator or owner would be responsible for working with NMFS or a NMFS-approved contractor to develop a VMP, and would be required to keep the VMP aboard the vessel at all times. NMFS would specify VMP requirements in the regulations. VMPs may include, but are not limited to, information on the locations of EM system components, contact information for technical support, instructions on how to conduct a pre-trip system test, instructions on how to verify proper system functions, location(s) on deck where fish retrieval should occur to remain in view of the cameras, procedures for how to manage EM system hard drives, catch handling procedures, periodic checks of the monitor during the retrieval of gear to verify proper functioning, and reporting procedures. The VMP should minimize, as much as possible, any impact on the current operating procedures of the vessel, and should help ensure the safety of the crew. NMFS or a NMFS-approved contractor would review VMPs biennially prior to the start of the upcoming fishing year.

### Portside Sampling

Under Mackerel Alternative 2.3, vessels with limited access mackerel permits using midwater trawl gear would be subject to portside sampling requirements for declared mackerel trips selected for coverage by NMFS. Portside sampling would be used to verify the amount and species composition of catch in the mackerel fishery and help track catch against catch caps for river herring and shad. Portside samplers would also collect age and length data.

### *Sampling Design*

The sampling design for portside sampling alternatives would be based on existing portside sampling programs for the mackerel fishery, administered by the Massachusetts Division of Marine Fisheries and Maine Department of Marine Resources, and consistent with NEFOP sampling methodology. Midwater trawl vessels returning from a declared mackerel trip would be sampled portside during the offload. Initially, the level of sampling

for midwater trawl trips would be approximately 50% or 100%. However, the sampling rate may be adjusted by the MAFMC to use the optimum and most cost effective rate to achieve management goals. Such factors as where catch is landed, ability to access the offload, and infrastructure limitations at certain landing ports, may prevent the program from achieving 100% coverage, even if funding is not limiting.

Basket samples would be collected from the vessel's dewatering box at specified intervals throughout the duration of the offload. Basket samples would be sorted and weighed by species and extrapolated based on vessel haul weight to represent the total trip. Actual weights could be verified using the vessel trip report and/or dealer data. Age and length data would be collected consistent with NEFOP sampling methodology.

### *Landing Ports*

Midwater trawl vessels returning from declared mackerel trips would be required to land catch in specific ports. In past years, the midwater trawl fleet has landed catch in Maine (Portland, Rockland, Vinalhaven, Prospect Harbor, Jonesport), New Hampshire (Newington), Massachusetts (Boston, Gloucester, New Bedford), Rhode Island (Point Judith, North Kingston), and New Jersey (Cape May). The list of specific landing ports and the details of offloading requirements in those ports would be developed as part of this amendment. Alternatives that include portside sampling are not intended to restrict the landing and offloading behavior of midwater trawl vessels. However, if certain ports are not suitable for portside sampling, then vessels may not be able to land in those ports on trips that are selected for portside sampling. If portside sampling is selected as a preliminary preferred alternative for the mackerel fishery then NMFS would further evaluate how to enable portside sampling in midwater trawl landing ports.

### *Vessel Responsibilities*

Midwater trawl vessels would be responsible for offloading catch consistent with offloading requirements and contracting with a service provider to arrange a portside sampler to sample catch from declared mackerel trips.

The realized observer coverage level for Mackerel Alternative 2.3 in a given year would be determined by the amount of Federal funding available to cover NMFS cost responsibilities. The realized observer coverage level would fall anywhere between SBRM coverage and the specified coverage target on vessels with Tier 1 mackerel permits using small mesh bottom trawl gear and limited access mackerel permits using midwater trawl gear.

Mackerel Alternative 2.3 would require midwater trawl vessels to carry an operating EM system on every trip declared into the mackerel fishery and portside sampling of catch on every declared mackerel trip selected for coverage by NMFS. If an operating EM system or portside sampler was not available to cover a specific mackerel trip (either due to logistics or a lack of funding), that vessel would be prohibited from participating in the mackerel fishery on that trip. Acknowledging that available Federal funding to cover NMFS cost responsibilities may be limited, this alternative would likely reduce the ability of vessels to

participate in the mackerel fishery, unless Sub-Option 1 was selected allowing coverage requirements to be waived.

As recommended by the MAFMC, Mackerel Alternative 2.3 would have a pre-implementation plan to help the industry understand any new EM and portside monitoring requirements and become compliant with sampling equipment, notification, sampling, and reporting requirements.

**Rationale:** Because the midwater trawl fleet discards only a small percentage of its catch at sea, EM and portside sampling have the potential to be a cost effective way to address monitoring goals for the midwater trawl fleet harvesting mackerel. EM would be used to verify retention of catch on the midwater trawl fleet and portside sampling would be used to verify amount and species composition of landed catch.

The implementation of EM in the mackerel fishery would be based on the ongoing EM exempted fishing permit program for the West Coast whiting fishery that is expected to be transitioned into regulation by 2017. The implementation of portside sampling in the mackerel fishery would be based on the existing portside sampling program for the midwater trawl fleet operated by the Massachusetts Division of Marine Fisheries and Maine Department of Marine Resources.

Slippage restrictions, reporting requirements, and consequences are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Because there is value in comparing information on discarding and catch composition collected by an SBRM observer with data collected by EM and portside sampling, the coverage target for EM and portside sampling is calculated independent of and in addition to SBRM coverage.

#### ***2.3.2.4 Mackerel Alternative 2.4: Electronic Monitoring and Portside Sampling on Midwater Trawl Vessels***

Mackerel Alternative 2.4 would require vessel with limited access mackerel permits using midwater trawl gear to carry an operating EM system on every trip declared into the mackerel fishery landing over 20,000 lb of mackerel and portside sampling of their catch on every declared mackerel trip selected for coverage by NMFS. The intention of the MAFMC would be that all declared mackerel trips by midwater trawl vessels would have some percentage of EM footage sampled (50% or 100%) and some percentage of trips sampled portside (50% or 100%). However, factors such as where catch is landed, ability to access the offload, and infrastructure limitations may prevent the program from achieving 100% coverage, even if funding is not limiting. For complete details of EM and portside sampling, see the description of Mackerel Alternative 2.3

Mackerel Alternative 2.4, similar to Mackerel Alternative 2.3, would vessels with limited access mackerel permits using midwater trawl gear to carry an operating EM system on every trip declared into the mackerel fishery and portside sampling of their catch on every declared mackerel trip selected for coverage by NMFS. If an operative EM system or

portside sampler was not available to cover a specific mackerel trip (either due to logistics or a lack of funding), that vessel would be prohibited from fishing for, taking, possessing, or landing mackerel in excess of the incidental mackerel trip limit (20,000 lb) on that trip. Acknowledging that available Federal funding to cover NMFS cost responsibilities may be limited, this alternative would likely reduce the ability of the vessel to participate in the mackerel fishery, unless Sub-Option 1 was selected allowing coverage requirements to be waived.

Both the EM footage and portside sampling coverage targets (50% or 100%) for this alternative would be calculated independent of and in addition to SBRM coverage. To reach a 50% coverage target in a given year, the rate of EM footage review and portside sampling would both equal 50%, regardless of the amount of SBRM coverage on midwater trawl vessels. Because the coverage target is calculated independent of and in addition to SBRM coverage, a vessel may carry on SBRM observer on that same trip that would be sampled portside.

As recommended by the MAFMC, Mackerel Alternative 2.4 would have a pre-implementation plan to help the industry understand any new EM and portside monitoring requirements and become compliant with the sampling equipment, notification, sampling, and reporting requirements.

Under Mackerel Alternative 2.4, all slippage restrictions, reporting requirements, and consequence measures would apply to all midwater trawl vessels with limited access mackerel permits.

**Rationale:** Because the midwater trawl fleet discards less than only a small percentage of its catch at sea, EM and portside sampling have the potential to be a cost effective way to address monitoring goals for the midwater trawl fleet harvesting mackerel. EM would be used to verify retention of catch on the midwater trawl fleet and portside sampling would be used to verify amount and species composition of landed catch.

The implementation of EM in the mackerel fishery would be based on the ongoing EM exempted fishing permit program for the West Coast whiting fishery that is expected to be transitioned into regulation by 2017. The implementation of portside sampling in the mackerel fishery would be based on the existing portside sampling program for the midwater trawl fleet operated by the Massachusetts Division of Marine Fisheries and Maine Department of Marine Resources.

Slippage restrictions, reporting requirements, and consequences are intended to improve catch monitoring by minimizing discarding events to help ensure that total catch is available for sampling. Because there is value in comparing information on discarding and catch composition collected by an SBRM observer with data collected by EM and portside sampling, the coverage target for EM and portside sampling is calculated independent of and in addition to SBRM coverage.

### 2.3.3 Considered But Rejected Mackerel Alternatives

The alternative specifying NEFOP-level observer coverage on the midwater trawl fleet to obtain a 30% CV on river herring and shad catch was considered but rejected by the MAFMC.

The monitoring of catch and bycatch of river herring and shad in the mackerel fishery was identified as an FMP need in MSB Amendment 14. This alternative was developed from an analysis that evaluated catch of river herring and shad catch in the herring and mackerel fisheries and was designed to complement SBRM monitoring coverage.

This alternative would have focused observer coverage on the midwater trawl fleet because that fleet had caught the majority of river herring and shad (57%) during 2010 to 2013. Based on 2013 data, the percent coverage to achieve a 30% CV on river herring and shad catch by the midwater trawl fleet would have been up to 61%.

The MAFMC recommended this alternative be considered but rejected because it was not considered consistent with the goals of MSB Amendment 14.

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#### **4.3.5 IMPACTS OF MACKEREL COVERAGE TARGET ALTERNATIVES ON HUMAN COMMUNITIES**

Another major consideration when evaluating an industry-funded monitoring program is the cost of the monitoring program. The requirement to pay for monitoring coverage increases operating costs for fishing vessels, which in turn reduces net vessel revenues and overall profitability.

There are two primary approaches for minimizing the cost of monitoring paid by industry. The first approach is to select the most cost effective type of coverage to meet program goals. For example, it may be more cost effective to use electronic monitoring rather than at-sea observers to confirm retention of catch on mackerel vessels.

The second approach to limit costs to industry is to set coverage levels at the lowest level necessary to gather information to meet program goals. For example, it may be possible to sufficiently increase precision around catch estimates for a certain species by setting a coverage target of 50%, rather than a coverage target of 100%.

Table 98 shows the range of costs associated with the different types of monitoring being considered for the mackerel fishery. A detailed description of industry cost responsibilities associated with each of these types of monitoring can be found in Appendix 6 – Monitoring Cost Estimates.

**TABLE 98. MONITORING COST ESTIMATES FOR THE MACKEREL FISHERY**

Types of Monitoring	NMFS Cost	Vessel Cost
NEFOP-Level Observer	\$479 per sea day	\$818 per sea day
At-Sea Monitor	\$530 per sea day	\$710 per sea day
Electronic Monitoring	Year 1: \$36,000 startup plus \$97 per sea day Year 2: \$97 per sea day	Year 1: \$15,000 startup plus \$325 <sup>1</sup> or \$187 <sup>2</sup> per sea day Year 2: \$325 <sup>1</sup> or \$187 <sup>2</sup> per sea day
Portside Sampling	\$479-\$530 per sea day	\$5.12 <sup>1</sup> or \$3.84 <sup>2</sup> per mt
<p>1 – Initial cost assumptions: EM on every vessel, video collected throughout the duration of a trip, 100% video review, and targeting 100% of all trip sampled portside. Additionally, this portside cost estimate includes portside administration costs.</p> <p>2 – Revised cost assumptions: EM on every vessel, video collected only around haulback, 50% video review, and targeting 50% of all trips sampled portside. Additionally, this portside cost estimate no longer includes portside administration costs.</p>		

### Assumptions used to generate estimates of industry cost responsibilities

While the cost of a sea day can vary between service providers, the individual components of a sea day cost are necessary to successfully execute a monitoring program. Because each of these components is essential, in most cases, it is not appropriate to reduce industry's cost responsibilities by arbitrarily removing or adjusting components of the sea day cost.

#### NEFOP-Level Observer Cost Estimate

The \$818 per sea day industry cost responsibility related to NEFOP-level observer coverage is based on sampling costs from October 2012 through May 2014 averaged across 3 service providers. The program elements and activities covered in this cost would



include, but are not limited to, costs to the provider for deployments and sampling (e.g., travel and salary for observer deployments and debriefing), equipment, costs to the provider for observer time and travel to a scheduled deployment that does not sail and was not canceled by the vessel prior to the sail time, and provider overhead.

### At-Sea Monitor Cost Estimate

The \$710 per sea day industry cost responsibility related to a mackerel at-sea monitoring program is based on the current sea day rate for the groundfish at-sea monitoring program. However, mackerel at-sea monitors would be collecting data on discards only. This may reduce training time, gear requirements, and internal support resources necessary to administer an at-sea monitoring program for the mackerel fishery resulting in a lower sea day rate than the groundfish at-sea monitoring program rate. (*See Appendix 5 – Analysis of ASM Costs for additional information.*) In the absence of an estimate specific to the mackerel at-sea monitoring program, the PDT/FMAT determined that using the groundfish at-sea monitoring sea day rate was appropriate, but the actual cost of a mackerel at-sea monitor may be more or less.

**TABLE 99. INDUSTRY COST RESPONSIBILITIES FOR NEFOP-LEVEL OBSERVERS AND AT-SEA MONITORS**

<b>Industry Cost Responsibilities</b>	<b>NEFOP-level observer cost per sea day</b>	<b>At-sea monitoring cost per sea day</b>
Provider costs for deployments and sampling (e.g., travel and salary for observer deployments and debriefing)	Sea day charges paid to providers: \$640 Travel: \$71 Meals: \$22 Other non-sea day charges: \$12	Sea day charge paid to providers: \$561 Travel: \$67 Meals: \$18 Other non-sea day charges: \$14
Equipment, as specified by NMFS, to the extent not provided by NMFS	\$11	
Provider costs for observer time and travel to a scheduled deployment that doesn't sail and was not canceled by the vessel prior to the sail time.	\$1	
Provider overhead and project management costs not included in sea day charges above (e.g., per diem costs for trainees)	Training: \$61	Training: \$50
Provider costs to meet performance standards laid out by a fishery management plan	TBD – won't know these costs until an industry funded observer coverage program is implemented in a fishery	TBD – won't know these costs until an industry funded observer coverage program is implemented in a fishery
<b>Total (not including other costs)</b>	<b>\$818</b>	<b>\$710</b>

### Midwater Trawl Electronic Monitoring Cost Estimate

Because no Federal electronic monitoring program exists for the midwater trawl fleet, industry cost responsibilities associated with an electronic monitoring program for the midwater trawl fleet were difficult to estimate. Electronic monitoring cost estimates include a one-time implementation cost, as well as ongoing annual operational program costs. Cost components include equipment, field services, data services, and program management. The implementation costs associated with EM are summarized in Table 100 and the ongoing costs associated with EM are summarized in Table 101. Additional details on monitoring costs are available in Appendix 6 – Monitoring Cost Estimates.

**TABLE 100. INDUSTRY COST RESPONSIBILITIES FOR ELECTRONIC MONITORING IMPLEMENTATION**

<b>Industry Cost Responsibilities</b>	<b>Electronic Monitoring Implementation Costs Per Vessel</b>
Equipment, including initial purchase and installation of the cameras, associated sensors, integrated GPS, control box, and hard drives	\$9,018
Field Services, including technician's labor and travel associated with the installation of equipment	\$2,952
Program Management, including one-time labor, equipment, facilities, and administrative costs associated with getting the new EM program operational	\$3,493
Total	\$15,463

Initially, the sea day cost for EM was estimated at \$325. In October 2015, the MAFMC requested the PDT/FMAT revise the \$325 per sea day industry cost estimate associated with electronic monitoring. The \$325 cost estimate was likely high because it assumed video was collected for the duration of a trip and 100% of the video was reviewed. The revised cost estimate of \$187 per sea day assumes video collected around haulback only and 50% video review. This revised estimate may be closer to the actual industry cost responsibilities associated with electronic monitoring of midwater trawl trips. The breakdown of these costs is shown in Table 101.

**TABLE 101. INDUSTRY COST RESPONSIBILITIES FOR ONGOING ELECTRONIC MONITORING COSTS**

<b>Industry Cost Responsibilities</b>	<b>Initial Ongoing Electronic Monitoring Costs Per Vessel Per Sea Day<sup>1</sup></b>	<b>Revised Ongoing Electronic Monitoring Costs Per Vessel Per Sea Day<sup>2</sup></b>
Equipment, including annual equipment costs estimated here include spare parts to replace broken or aging equipment, as well as licenses	\$11	\$11

for the use of proprietary software		
Field Services, including labor, travel, and other costs associated with repairs, technical support, and retrieving hard drives from the vessels and shipping them to the service provider for analysis	\$78	\$47
Data Services, including the costs associated with review and analysis of the video, reporting to NMFS, and archiving of the data	\$160	\$52
Program Management, including costs of the day-to-day operations of the service provider for running the EM program	\$77	\$77
<b>Total</b>	<b>\$325</b>	<b>\$187</b>
1 - Initial cost assumptions based on video collected for the duration of a trip and 100% video review.		
2 - Revised cost assumptions based on video collected only around haulback and 50% video review.		

### Midwater Trawl Portside Sampling Cost Estimate

The analysis assumes the cost per amount of fish landed is the most accurate way to represent the potential industry costs for monitoring. Because no Federal portside sampling program exists for the midwater trawl fleet, industry cost responsibilities associated with a portside sampling program for the midwater trawl fleet were difficult to estimate.

The average cost per pound of groundfish landed for the Northeast Multispecies dockside monitoring program ranged from \$0.01 - \$0.12 per pound for all sectors. The average cost per pound landed per trip is inversely related to the average pounds landed – that is, trips that land larger amounts are less expensive to monitor than trips that land smaller amounts. Larger trips are less expensive to monitor because they typically land in principle ports with a dedicated monitor, therefore, there are no additional costs for monitors to travel to offload locations.

Using cost estimates from the Massachusetts Division of Marine Fisheries portside sampling program for the mackerel fishery, the industry cost responsibility associated with portside sampling may be as much as \$5.12 per mt. This cost estimate is likely high as it includes program administration costs as well as sampling costs and was intended to apply to all midwater trawl trips for a target sampling rate of 100%.

In October 2015, the MAFMC requested the PDT/FMAT revise the estimate of the industry cost responsibility associated with portside sampling. The revised cost estimate eliminates portside administration costs and is estimated at \$3.84 per mt. This cost estimate may be closer to the actual industry cost responsibilities associated with portside sampling and is intended to apply to 50% of all midwater trawl trips for target sampling rate of 50%.

Midwater trawl vessels returning from mackerel trips would be required to land catch in specific ports for sampling. The list of specific landing ports and the details of offloading

requirements in those ports would be developed as part of this amendment. Alternatives that include portside sampling are not intended to restrict the landing and offloading behavior of midwater trawl vessels. However, if certain ports are not suitable for portside sampling, then vessel may not be able to land in those ports on trips that are selected for portside sampling.

**TABLE 102. SUMMARY OF ECONOMIC IMPACTS OF MACKEREL COVERAGE TARGET ALTERNATIVES**

Alternatives	Impacts on Fishery Related-Businesses
Mackerel Alternative 1: No Coverage Target Specified For IFM Programs (No Action)	<ul style="list-style-type: none"> <li>• Low positive impact associated with observer coverage allocated by SBRM</li> <li>• Low negative impact associated with no additional monitoring to reduce uncertainty around catch estimates</li> </ul>
Mackerel Alternative 2: Coverage Target Specified For IFM Programs	<ul style="list-style-type: none"> <li>• Negative impact associated with potential reduction in return to owner (RTO)</li> <li>• Negative impact if fishing effort is limited by monitoring availability and mackerel harvest is limited</li> <li>• Low positive impact associated with additional monitoring to reduce uncertainty around catch estimates in the mackerel fishery</li> <li>• Low negative impact associated with no additional monitoring unless available Federal funding can cover NMFS cost responsibilities</li> <li>• Magnitude of impacts associated with additional monitoring would be dependent on the type of information collected, amount of coverage, how coverage is allocated, and amount of available Federal funding</li> <li>• Magnitude of impacts associated with selection of Sub-Options</li> </ul>
Mackerel Alternative 2.1: NEFOP-Level Coverage	<ul style="list-style-type: none"> <li>• Negative impact associated with potential 11.9%-5.1% reduction in RTO</li> <li>• Negative impact associated with potential 6.9%-4.3% reduction in RTO with 25 mt threshold</li> <li>• Negative impact if fishing effort is limited by monitoring availability and mackerel harvest is limited</li> <li>• Low positive impact associated with additional information to reduce uncertainty of catch estimates in the mackerel fishery</li> </ul>
Mackerel Alternative 2.2: ASM Coverage	<ul style="list-style-type: none"> <li>• Negative impact associated with potential 10.3%-1.4% reduction in RTO</li> <li>• Negative impact associated with potential 6.0%-1.4% reduction in RTO with 25 mt threshold</li> <li>• Negative impact if fishing effort is limited by monitoring availability and mackerel harvest is limited</li> <li>• Low positive impact associated with additional information to reduce uncertainty of catch estimates in the mackerel fishery</li> </ul>

Mackerel Alternative 2.3: Combination Coverage	<ul style="list-style-type: none"> <li>• Negative impact associated with potential 10.3%-1.4% reduction in RTO</li> <li>• Negative impact associated with potential 16.4%*-1.4% reduction in RTO with 25 mt threshold</li> <li>• Negative impact if fishing effort is limited by monitoring availability and mackerel harvest is limited</li> <li>• Low positive impact associated with additional information to reduce uncertainty of catch estimates in the mackerel fishery</li> </ul>
Mackerel Alternative 2.4: EM and Portside Sampling on Midwater Trawl Vessels	<ul style="list-style-type: none"> <li>• Negative impact associated with potential 8.3%*-1.8% reduction in RTO</li> <li>• Negative impact associated with potential 7.0%*-1.6% reduction in RTO with 25 mt threshold</li> <li>• Negative impact if fishing effort is limited by monitoring availability and mackerel harvest is limited</li> <li>• Low positive impact associated with additional information to reduce uncertainty around catch estimates in the mackerel fishery</li> </ul>
* Reflects RTO from Year 2 of Mackerel Alternative 2.4	

The previous analysis of economic impacts of mackerel coverage target alternatives on the mackerel industry was based on trip cost data collected by NEFOP and showed the economic impact of the alternatives on partial vessel net revenues (gross revenues less certain trip costs). Because NEFOP only collects a limited amount of cost data, industry participants expressed concern that an analysis of net revenues underestimated vessel costs. In response, Jason Didden, staff of the MAFMC, offered to coordinate a survey of herring and mackerel vessels to collect more detailed cost information.

The survey requested information from vessel owners on total trip costs in 2014. The cost survey collected information on variable costs; payments to crew; the cost of repairs, maintenance, upgrades; and fixed costs. These data were used to update the impact analyses. To profile vessels, data were averaged across vessel types, by vessel characteristics, and primary species caught. The cost profiles of vessels, as adjusted by the estimated industry cost responsibilities of each mackerel coverage target alternative, were used to describe the economic impact on mackerel vessels. Economic impacts are described at an annual level. Surveys were sent to approximately 18 vessel owners (representing about 26 vessels) in the herring and/or mackerel fisheries. Surveys were sent in May 2015 and information was submitted for 16 of the 26 vessels. A copy of the survey is included in Appendix 7.

Analysis of the economic impact of industry-funded monitoring mackerel coverage target alternatives on fishery-related businesses compared industry cost responsibilities to 2014 mackerel vessel returns-to owner (RTO). RTO is calculated by subtracting fixed and operational costs from gross revenue (Table 1) and was used rather than net revenues to more accurately reflect income from fishing trips. RTO is similar to net income from a financial income statement. Other financial statement approaches, such as a balance sheet or a cash flow statement, are not used. These approaches consider other financial aspects of a business, such as total assets and liabilities and the ability to cover expenses within a particular time frame. Principal payments on loans, which matter from a balance sheet and

cash flow perspective, are not typically used in the calculation of RTO/net income. Depreciation of capital assets is typically part of a RTO/net income calculation. In this analysis, depreciation of vessel improvements is included but the depreciation of the vessel is not included because that information was not collected in the survey.

**TABLE 103. SUMMARY OF TOTAL TRIP COSTS FOR HERRING AND MACKEREL VESSELS IN 2014**

<b>Cost Category</b>	<b>Description</b>	<b>Average Percent of 2014 Gross Revenue for Herring and Mackerel Vessels</b>	<b>Average Percent of 2014 Gross Revenue for Squid Vessels</b>
<b>Variable Costs</b>	Annual fuel, oil, food, water, ice, carrier vessel, communication, fishing supplies, crew supplies, and catch handling costs	25%	35%
<b>Crew Share</b>	Total annual payments to crew	28%	26%
<b>Repair, Maintenance, Upgrades, Haulout (RMUH)</b>	Annual cost of repairs to engines, deck equipment, machinery, hull, fishing gear, electronics, processing equipment, refrigeration, safety equipment, upgrades and haulout Because these costs vary considerably from year to year and are typically spread out over several years, only a portion of these costs were applied to 2014 revenue	13%	11%
<b>Fixed Costs</b>	Annual mooring, dockage, permits and licenses, insurance, quota and DAS lease, crew benefits, vessel monitoring, workshop and storage, office, vehicle, travel, association, professional, interest, taxes, and non-crew labor costs Note: depreciation expense of the vessel is not included in fixed costs.	19%	21%
<b>Return to Owner</b>	Gross revenue less variable, crew share, RMUH, and fixed costs	15%	7%

The MAFMC is considering four types of industry-funded monitoring for the mackerel fishery, including NEFOP-level observers, at-sea monitors, EM, and portside sampling coverage. NEFOP-level and at-sea monitoring coverage would function independently, but EM and portside are intended to be used together.

Prior to any trip declared into the mackerel fishery, vessel representatives would be required contact NMFS and request monitoring coverage. If an SBRM observer was not selected to cover that trip, NMFS would notify the vessel representative whether

monitoring coverage must be procured through an industry-funded monitoring service provider. For the purposes of this analysis, however, it is assumed that there would be no SBRM coverage of trips. Therefore, the economic impacts of industry-funded monitoring cost alternatives described in this section may be an overestimate of actual costs.

### **Summary of Economic Analyses**

In general, the economic analyses evaluated two groups of vessels, one group was paired midwater trawl vessels and the second group included single midwater trawl vessels and small mesh bottom trawl vessels. The single midwater trawl vessels were combined with small mesh bottom trawl vessels to avoid data confidentiality violations.

Sea day costs are similar across Mackerel Alternatives 2.1, 2.2, and 2.3 for all vessel types. However, median at-sea monitoring costs as a percent of RTO are about twice as high for single midwater trawl and Tier 1 small mesh bottom trawl vessels (combined) as they are for paired midwater trawl vessels.

Median EM and portside monitoring costs as a percent of RTO in Year 2 under Mackerel Alternatives 2.3 and 2.4 for single midwater trawl vessels are about twice as high than for paired midwater trawl vessels at the 20,000 lb threshold and four times as high at the 25 mt threshold.

Mackerel revenue comprises a smaller portion of total revenue for vessels participating in the mackerel fishery than herring revenue does for vessels participating in the herring fishery. Therefore, revenue from other fisheries would contribute more significantly to covering industry-funded monitoring costs in the mackerel fishery than revenue from other fisheries would be covering industry-funded monitoring costs in the herring fishery. Meaning that if vessels wanted to continue to declare mackerel trips, they may need to use revenue from other fisheries to pay the industry-funded monitoring costs associated with the mackerel fishery. For all participants in the mackerel fishery, the average percentage of revenue that comes from the mackerel fishery never exceeded 75% in 2014. Additionally, average mackerel revenue from single midwater trawl vessels is about 20% lower than average mackerel revenue from paired midwater trawl vessels. For this reason, single midwater trawl vessel would likely rely more on revenue from other fisheries to cover industry-funded monitoring costs in the mackerel fishery than paired midwater trawl vessels.

Another method for accounting for these differential impacts on vessels using revenue from other fisheries to cover monitoring costs in the mackerel fishery would be to apportion the overall RTO to the different fisheries and then reduce the mackerel RTO by the monitoring cost. However, to properly apportion RTO to fisheries, much more detailed cost data is required. If data were available on a trip basis, costs that are specific to the fishery pursued on that trip could be assigned. Fuel is a good example of this type of cost. However, the trip related cost data used in the RTO analysis is at an annual level. Even with highly detailed cost information there are still costs that do not vary by trip, such as insurance costs. It is unclear in this instance what method should be used to apportion

these costs. For these reasons, mackerel as a percentage of revenue, rather than mackerel RTO, is shown in the following tables to evaluate impacts on vessels using revenue from other fisheries to cover monitoring costs in the mackerel fishery.

Exempting trips that land less than 25 mt of mackerel (Mackerel Alternative 2 Sub-Option 5) reduces monitoring costs more for Mackerel Alternatives 2.1 and 2.2 (about 30%) than for Mackerel Alternatives 2.3 and 2.4 (about 23%).

Monitoring costs associated with EM and portside sampling are similar to the costs associated with at-sea monitoring in Year 1 for paired midwater trawl vessels, but EM and portside sampling costs are 14% less than at-sea monitoring costs in Year 2 for paired midwater trawl vessels at EM of \$325/day and portside of \$5.12/mt. For EM at \$187/day and 50% portside coverage at \$3.84/mt the monitoring costs are 60% less. For single midwater trawl and small mesh bottom trawl vessels, the monitoring costs associated with EM and portside are about half of the at-sea monitoring costs in Year 1 and about a quarter of the at-sea monitoring costs in Year 2.

Initial industry cost assumptions for Mackerel Alternative 2.4 estimated \$325 per sea day for electronic monitoring (cameras on every midwater trawl vessel, video collected for the duration of the trip, 100% video review) and \$5.12 per mt for portside sampling (administration and sampling cost) on close to 100% of trips. Revised industry cost assumptions for Mackerel Alternative 2.4 estimated \$187 per sea day for electronic monitoring (cameras on every midwater trawl vessel, video collected around haulback, 50% video review) and \$3.84 per mt for portside sampling (only sampling costs) on 50% of trips. Using the revised cost assumptions rather than the initial cost assumption for Mackerel Alternative 2.4 reduces total industry monitoring costs by 52% (\$45,812 to \$21,796) in Year 2, at the 20,000 lb threshold, for paired midwater trawl vessels and reduces costs by 55% (\$34,421 to \$15,364) in Year 2, at the 20,000 lb threshold, for single midwater trawl vessels.

Many of the vessels that would be impacted by industry-funded monitoring costs in the mackerel fishery would also be impacted by industry-funded monitoring costs in the herring fishery. For example, all the vessels impacted by Mackerel Alternative 2.1 would also be impacted by Herring Alternative 2.1 (100% NEFOP-level observer coverage on Herring Category A and B vessels).

The tables and box plot figures (“box plots”) on the following pages provide summarized economic data for each of the mackerel coverage target alternatives. The economic impact on vessels associated with paying for monitoring coverage is described as a percentage of RTO for each mackerel coverage target alternative in the following figures. The tables provide the mean and median number of sea days per vessel that would result from each of the alternatives, as well as the mean and median RTO that would ultimately be reduced by the industry-funded monitoring costs. Additionally, fleet level effort, revenue, and monitoring cost information for each mackerel coverage target alternative are also provided. Additional economic analysis is available in Appendix 9.



#### ***4.3.5.1 Impacts of Mackerel Alternatives 1 and 2 on Fishery-Related Businesses***

Mackerel Alternative 1 would not specify a coverage target for an industry-funded monitoring program in the MSB FMP. Monitoring for mackerel vessels would be allocated according to SBRM. If there was Federal funding available after SBRM coverage requirements were met, additional monitoring for the mackerel fishery would be evaluated on a case-by-case basis. Under Mackerel Alternative 1, additional costs to vessels participating in the mackerel fishery associated with monitoring coverage, if there were any, would be evaluated on a case-by-case basis.

In recent years, observer coverage for the mackerel fishery has largely been allocated as part of the SBRM. The SBRM is the combination of sampling design, data collection procedures, and analyses used to estimate bycatch in multiple fisheries. The SBRM provides a structured approach for evaluating the effectiveness of the allocation of fisheries observer effort across multiple fisheries to monitor a large number of species. Although management measures are typically developed and implemented on an FMP-by-FMP basis, from the perspective of developing a bycatch reporting system, there is overlap among the FMPs and the fisheries that occur in New England and the Mid-Atlantic that could result in redundant and wasteful requirements if each FMP is addressed independently.

Currently, it is unknown if the mackerel stock is overfished or if overfishing is occurring. There is concern about the mackerel fishery and indications of reduced productivity related to low catches in recent years (TRAC 2010). Possible explanations include: (1) mackerel have moved away from traditional fishing grounds (as has occurred in Europe), (2) environmental conditions have resulted in a less productive or less fishable stock, or (3) the stock is overfished. A combination of these factors could also be possible. In recent years, the fleet has not been able to harvest the ACL or ACTs. Selection of Mackerel Alternative 1 will not likely affect the setting of mackerel harvest specifications, but it may affect the ability of the mackerel fishery to harvest mackerel. If less monitoring (when compared to Mackerel Alternative 2) results in the catch cap for river herring and shad limiting effort in the mackerel fishery.

Under Mackerel Alternative 2, the MAFMC would specify the details of an industry-funded monitoring program for the MSB FMP. These details may include, but are not limited to: (1) Level and type of coverage target, (2) rationale for level and type of coverage, (3) minimum level of coverage necessary to meet coverage goals, (4) consideration of coverage waivers if coverage target cannot be met, (5) process for vessel notification and selection, (6) process for payment of industry cost responsibilities, (7) standards for monitoring service providers, and (8) any other measures necessary to implement the industry-funded monitoring program. Additional NEPA analysis would be required for any subsequent FMP framework adjustment action implementing and/or modifying the specified industry-funded monitoring programs.

Mackerel Alternative 2 is intended to allow for increased monitoring in the mackerel fishery by specifying coverage targets, above and beyond SBRM (Mackerel Alternative 1), for industry-funded monitoring. The realized coverage level in a given year would be

determined by the target coverage level and the amount of funding available to cover NMFS cost responsibilities in that year and would fall somewhere between no additional coverage above SBRM (Mackerel Alternative 1) and the specified coverage target (Mackerel Alternatives 2.1-2.4).

If Federal funding is available to cover NMFS cost responsibilities associated with industry-funded monitoring in the mackerel fishery, Mackerel Alternative 2 may have both positive and negative economic impacts on vessels participating in the mackerel fishery.

Indirect positive impacts on mackerel vessels associated with Mackerel Alternative 2 may result from increased monitoring helping reduce variability around catch and bycatch estimates in the mackerel fishery leading to additional harvesting opportunities. If increased monitoring reduces the variability in the catch of river herring and shad tracked against catch caps, mackerel vessels may benefit from increased stability in the fishery.

Direct negative impacts on mackerel vessels associated with Mackerel Alternative 2 would likely result from reduced RTO after paying for monitoring coverage. The magnitude of the economic impact associated with paying for monitoring coverage would vary by mackerel coverage target alternative (Mackerel Alternatives 2.1-2.4). While the full extent of positive and negative impacts to mackerel vessels may be difficult to quantify under Mackerel Alternative 2, the impacts may not be realized under Mackerel Alternative 1.

If Federal funding is not available to cover NMFS cost responsibilities associated with industry-funded monitoring in the mackerel fishery, fishing effort may be reduced under Mackerel Alternative 2 to match available levels of monitoring coverage. If fishing effort is reduced to match available monitoring levels, mackerel vessels may be less able to harvest mackerel. This direct negative economic impact associated with Mackerel Alternative 2 would be less likely to be realized under Mackerel Alternative 1.

Mackerel Alternative 2 would allow several sub-options to apply to the industry-funded monitoring alternatives. Sub-Option 1 would allow vessels to be issued waivers to exempt them from industry-funded monitoring requirements, for either a trip or the fishing year, if coverage was unavailable due to funding or logistics. Selection of this sub-option preserves the MAFMC's intent to increase monitoring in the mackerel fishery, but would not prevent vessels from participating in the mackerel fishery if monitoring coverage was not available. Should the MAFMC not select Sub-Option 1, then any industry-funded monitoring requirements established in this amendment would have the potential to reduce effort in the mackerel fishery. Reducing fishing effort to match available monitoring may lack sufficient justification and be inconsistent with National Standards. Sub-Option 2 would exempt a wing vessel pair trawling with another vessel from industry-funded monitoring requirements, provided the vessel does not carry any fish. Sub-Option 3 would require that industry-funded monitoring requirements expire two years after implementation. Sub-Option 4 would require the MAFMC to examine the results of any increased coverage in the mackerel fishery two years after implementation, and consider if adjustments to the coverage targets are warranted. Depending on the results and desired actions, subsequent action to adjust the coverage targets could be accomplished via specifications, a framework

adjustment, or an amendment to the MSB FMP, as appropriate. Lastly, Sub-Option 5 would exempt trips that land less than 25 mt of mackerel from industry-funded monitoring requirements.

If selection of the sub-options under Mackerel Alternative 2 minimizes the likelihood of positive or negative economic impacts on mackerel vessels, then the economic impacts associated with the sub-options may be reduced and/or similar to impacts under Mackerel Alternative 1. Additionally, under Mackerel Alternative 2, because the 25 mt threshold differs from the triggers used to determine which trips count against catch caps for river herring and shad (20,000 lb of mackerel), the data generated by selecting Sub-Option 5 may bias (either higher or lower) the catch tracked against catch caps when compared to not selecting Sub-Option 5.

Both Mackerel Alternative 1 and Mackerel Alternative 2 would require compliance with slippage restrictions, reporting requirements, and consequence measures. These measures are intended to improve catch monitoring by minimizing discarding. Because these measures apply to both Mackerel Alternatives 1 and 2, the cost of complying with these requirements may be similar under Mackerel Alternatives 1 and 2, unless monitoring coverage is substantially higher under Mackerel Alternative 2. In that case, the cost of complying with these requirements may be higher under Mackerel Alternative 2.

Impacts under Mackerel Alternative 2 assume that the future behavior of fishery participants will be similar to that in past years, when in reality fishery participants are likely to engage in a range of mitigation behaviors to reduce the economic impact associated with industry-funded monitoring. For example, vessels that have historically participated in many fisheries may stop fishing for mackerel and only participate in fisheries that do not have industry-funded monitoring requirements. However, if a vessel does not have the ability to participate in other fisheries, it may not be able to mitigate the impacts of industry-funded monitoring in that way. At this time, it is not possible to predict what, if any, mitigation behaviors may be used by mackerel fishery participants.

### **Coverage Target Alternatives**

Mackerel Alternative 2 would specify a level and type of industry-funded monitoring for the mackerel fishery. The types of industry-funded monitoring considered by the MAFMC for the mackerel fishery include: NEFOP-level observers, at-sea monitors, and electronic monitoring and portside sampling. Monitoring alternatives allocate coverage by fleet or permit category.

Under Mackerel Alternative 2, the amount, quality, and cost of information collected as part of an industry-funded monitoring would vary with the type of coverage target alternative specified for the mackerel fishery. Economic impacts on vessels participating in the mackerel fishery associated with specific coverage target alternatives (Mackerel Alternatives 2.1-2.4) are discussed in the following section.

### **Monitoring and Service Provider Requirements**

Mackerel Alternative 2 would specify that requirements for industry-funded observers and at-sea monitors include a HVF certification for the mackerel fishery. The HVF certification was developed in order to more effectively train certified NEFOP observers in high volume catch sampling and documentation. HVF certification allows observers to cover any of the fisheries that pump catch, typically the mid-water trawl and purse seine fleets. This certification was developed to prepare observers for changes in the regulations and new requirements that were under consideration in MSB Amendment 14.

Observers in the mackerel fishery are currently required to possess a HVF certification under Mackerel Alternative 1 and both observers and at-sea monitors would be required to possess a HVF certification under Mackerel Alternative 2. Mackerel vessels do not pay for observer training under Mackerel Alternative 1, but vessels would be responsible for additional observer and at-sea monitor training costs under Mackerel Alternative 2. Therefore, the economic impact on mackerel vessels of a HVF certification requirement under Mackerel Alternative 2 would be more negative than under Mackerel Alternative 1.

Under Mackerel Alternative 2, the process for vessel notification and selection and payment of industry cost responsibilities would be developed during the rulemaking and amendment approval process.

The direct economic impacts on mackerel vessels would be more negative under Mackerel Alternative 2 than under Mackerel Alternative 1 because vessels would be paying for additional monitoring coverage. To the extent that increased information on mackerel catch has indirect economic impacts on mackerel vessels under Mackerel Alternative 2, those indirect impacts may not be realized under Mackerel Alternative 1.

#### ***4.3.5.2 Impacts of Mackerel Coverage Target Alternatives 2.1- 2.4 on Fishery-Related Businesses***

Mackerel Alternatives 2.1-2.4 are intended to allow for increased monitoring in the mackerel fishery by specifying coverage targets, above and beyond SBRM, for industry-funded monitoring. If Federal funding is available to cover NMFS cost responsibilities associated with industry-funded monitoring in the mackerel fishery, Mackerel Alternative 2 may have both positive and negative economic impacts on vessels participating in the mackerel fishery.

While the positive and negative economic impacts on mackerel vessels may be difficult to quantify under Mackerel Alternatives 2.1-2.4, the impacts would be less likely to be realized under Mackerel Alternative 1.

The magnitude of positive and negative economic impacts on mackerel vessels is expected to vary with the monitoring coverage target specified and the realized coverage level in a given year. The realized coverage level in a given year would be largely driven by the amount of funding available to cover NMFS cost responsibilities in that year and would fall

somewhere between no additional coverage above SBRM (Mackerel Alternative 1) and the specified monitoring coverage target (Mackerel Alternatives 2.1-2.4).

Mackerel Alternatives 2.1-2.4 differ by (1) the type of information collected, (2) the specified amount of coverage, and (3) how coverage is allocated. Both the type of information collected and the amount of monitoring coverage will have a direct economic impact on vessels paying for monitoring coverage in the mackerel fishery.

Vessel, dealer, and SBRM data are used to track retained and discarded catch of mackerel as well as river herring and shad. These data are also used to track catch of other not-target species and catch of protected species.

The mackerel fishery is managed with a catch cap for river herring and shad. If the catch cap is harvested, effort in the mackerel fishery is restricted.

Mackerel Alternatives 2.1 would specify NEFOP-level observer coverage, Mackerel Alternatives 2.2 would specify at-sea monitor coverage, Mackerel Alternative 2.3 would specify at-sea monitor coverage as well as EM and portside sampling coverage, and Mackerel Alternative 2.4 would specify EM and portside sampling coverage.

The industry cost responsibility associated with NEFOP-level observer coverage is the most expensive (\$818 per sea day) followed by at-sea monitor coverage (\$717 per sea day), and EM (\$187-\$325 per sea day) and portside sampling (\$3.84-\$5.12 per mt).

The following table describes the potential reduction to RTO associated with paying for monitoring coverage across mackerel coverage target alternatives. Shaded cells in the following table indicate when the potential reduction to RTO associated with pay for monitoring coverage exceeds 10%. Additional background and summary information can be found in tables and box plots displayed starting on page 334.

**TABLE 104. POTENTIAL REDUCTION TO RETURN-TO-OWNER FOR MACKEREL COVERAGE TARGET ALTERNATIVES 2.1 – 2.4**

Alternative	Gear Type	Paired MWT		Single MWT and SMBT (T1)	
	Median potential reduction to RTO from coverage	≥20k lb	> 25 MT	≥20k lb	> 25 MT
2.1	100% NEFOP-level	5.1%	4.3%	11.9%	6.9%
2.2 and 2.3	100% ASM	4.4%	3.7%	10.3%	6.0%
	75% ASM	3.3%	2.8%	7.9%	6.0%
	50% ASM	2.3%	2.0%	5.2%	5.3%
	25% ASM	1.4%	1.4%	3.1%	3.1%
		Paired MWT		Single MWT	
2.3 and 2.4	EM/Portside Year 1 <sup>1</sup>	10.7%	10.1%	22.6%	35.1%

EM/Portside Year 2 <sup>1</sup>	3.8%	3.7%	8.3%	16.4%
EM/Portside Year 1 <sup>2</sup>	9.1%	8.2%	18.3%	25.7%
EM/Portside Year 2 <sup>2</sup>	1.8%	1.6%	3.8%	7.0%

1 – Initial cost assumptions based on video collected for the duration of a trip, 100% video review, and including portside administration costs. This cost would apply to 100% of trips.  
2 – Revised cost assumptions based on video collected only around haulback, 50% video review, and not including portside administration costs. This cost would apply to 50% of trips.

In general, the negative economic impact on mackerel vessels of paying for monitoring coverage (as measures by the potential reduction in the RTO) is greatest with Mackerel Alternatives 2.3 and 2.4 (Year 2), followed by Mackerel Alternatives 2.1 and 2.2. These impacts are influenced by the type of information collected and amount of coverage specified.

Both NEFOP-level observer coverage and at-sea monitoring coverage would provide species composition data on retained and discarded catch, while portside sampling coverage would provide species composition data on retained catch. NEFOP-level observers and at-sea monitors can estimate amounts of discards. EM cannot estimate the amount of discards, but EM can verify retention of catch.

Because discarding in the mackerel fishery is minimal, Alternatives that increase the amount of information on retained and discarded catch (Mackerel Alternatives 2.1, 2.2, and 2.3) will likely have the same likelihood of affecting the data tracked against catch caps than alternatives that increase the amount of information on just retained catch (Mackerel Alternative 2.4). Increased monitoring of river herring and shad catch may help reduce variability in estimates of catch that is tracked against catch caps, when that variability may have otherwise led to effort restrictions in the mackerel fishery. Conversely, additional monitoring may illustrate higher than expected catch of river herring and shad, resulting in catch caps that are fully harvested earlier than expected and reduced opportunities to harvest mackerel. Increased information to help track catch against catch caps may help allow more opportunity to harvest mackerel or it may curtail the harvest of mackerel by the mackerel fishery.

Mackerel Alternatives 2.1, 2.2, and 2.3 allow some aspect of monitoring coverage to range between 25% and 100%, while Mackerel Alternative 2.4 allows monitoring coverage to range between 50% and 100%. The economic impact on mackerel vessels of paying for higher levels of monitoring coverage would be more negative than paying for lower levels of monitoring. Therefore, alternatives that specify higher coverage rates may have a more negative direct impact on mackerel vessels paying for monitoring coverage than alternatives with lower coverage rates.

While high levels of monitoring are not always necessary to address a monitoring goal, because the MAFMC is interested in increasing monitoring to improve the accuracy of catch estimates, in particular the ability to track catch against catch caps, more monitoring could be more effective than less monitoring. Additionally, because the catch of river herring and shad is highly variable, both spatially and temporally, increased monitoring for those

species would be more effective than less monitoring. To the extent that increased monitoring helps reduce the variability of data tracked against catch caps and helps increase the likelihood that vessels can harvest mackerel, specifying a higher coverage target may have more indirect positive economic impacts on mackerel vessels than specifying a lower coverage target.

Mackerel Alternatives 2.1 – 2.4 primarily would allocate monitoring coverage by vessel permit category. The extent to which the allocation of industry-funded coverage is consistent SBRM fishing fleet will determine how the resulting data can be used. Unless vessel permit category is equivalent to fishing fleet, the resulting information from the mackerel alternatives may have limited utility. The additional information on catch and bycatch estimates in the mackerel fishery obtained via Mackerel Alternatives 2.1 – 2.4 could be used for tracking catch against ACLs and catch caps, but it is unlikely that those data could be used to estimate discards for stock assessments. Any indirect economic benefits for mackerel vessels related to data utility would be similar across alternatives.

The coverage targets for NEFOP-level observer and at-sea monitoring coverage would be calculated by combining SBRM and industry-funding monitoring coverage. One way to achieve this combined coverage target would be to use an estimate of the previous year's SBRM coverage for mackerel vessels (e.g., 15%) would be combined with industry-funded monitoring (e.g., 85%) to reach a 100% target coverage level. In contrast, the coverage targets for both EM and portside sampling would be calculated independent of and in addition SBRM coverage. For example, to reach a 50% coverage target in a given year, the rate of EM footage review and portside sampling would both equal 50%, regardless of the amount of SBRM coverage on midwater trawl vessels. Alternatives that specify NEFOP-level observer or at-sea monitoring coverage may have less of a direct negative economic impact on mackerel vessels than alternatives that specify EM or portside sampling coverage, even if the same coverage target is selected, because vessels would not be paying for the SBRM coverage.

The realized coverage level in a given year would be determined by the amount of funding available to cover NMFS cost responsibilities in that year. If coverage is not available (either due to logistics or a lack of funding) for a specific trip, Mackerel Alternatives 2.1-2.4 specify that the vessels would be prohibited from participating in the mackerel fishery on that trip. The selection of Mackerel Alternative 2 - Sub-Option 1 would enable coverage requirements to be waived on a specific trip to allow vessels to continue participating in the mackerel fishery, even if monitoring coverage is not available. Should fishing effort be limited by the availability of monitoring coverage, such that mackerel harvest is limited, there is the potential for additional negative economic impacts on mackerel vessels. The selection of Mackerel Alternative 2 - Sub-Option 1 would enable monitoring coverage requirements to be waived on a specific trip, allowing a vessel to continue participating in the mackerel fishery, even if monitoring coverage is not available.

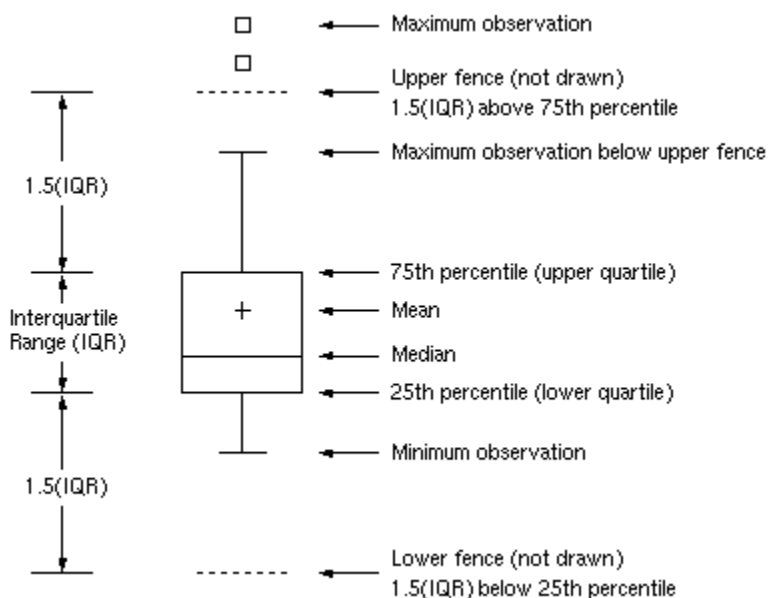
Indirect positive impacts on mackerel vessels associated with Mackerel Alternative 2 may result from increased monitoring helping to reduce variability around catch and bycatch estimates in the mackerel fishery leading to additional harvesting opportunities. If

increased monitoring reduces the variability in the catch of river herring and shad tracked against the catch cap, mackerel vessels may be less likely to be constrained by the catch cap.

Direct negative impacts on mackerel vessels associated with Mackerel Alternative 2 would likely result from reduced RTO after paying for monitoring coverage. The magnitude of the economic impact associated with paying for monitoring coverage would vary with mackerel coverage target alternative (Mackerel Alternatives 2.1-2.4). If increased monitoring results in the river herring and shad catch cap being harvested more often than expected, an indirect negative impact on mackerel vessels may be that the harvest of mackerel is constrained. While the full extent of positive and negative impacts to mackerel vessels may be difficult to quantify under Mackerel Alternative 2, the impacts may not be realized under Mackerel Alternative 1.

In summary, the direct economic impacts on mackerel vessels associated with Mackerel Alternatives 2.1-2.4 are negative. The negative impacts result from reductions in RTO related to paying for monitoring coverage and possible reductions in fishing effort to match monitoring availability, and vary in magnitude by alternative. An indirect positive impact would result if increased monitoring decreased the uncertainty around river herring and shad catch such that it was less likely that mackerel harvest was constrained by catch caps. An indirect negative impact would result if increased monitoring showed higher than expected catch of river herring and shad such that it was more likely that mackerel harvest would be inappropriately constrained by catch caps.

The following box plots show of the distribution of monitoring costs and the distribution of monitoring costs as a percent of a vessel's RTO. Box plots are a useful tool to show how data are distributed. The following schematic shows what the various pieces of a box plot show regarding the distribution of data.



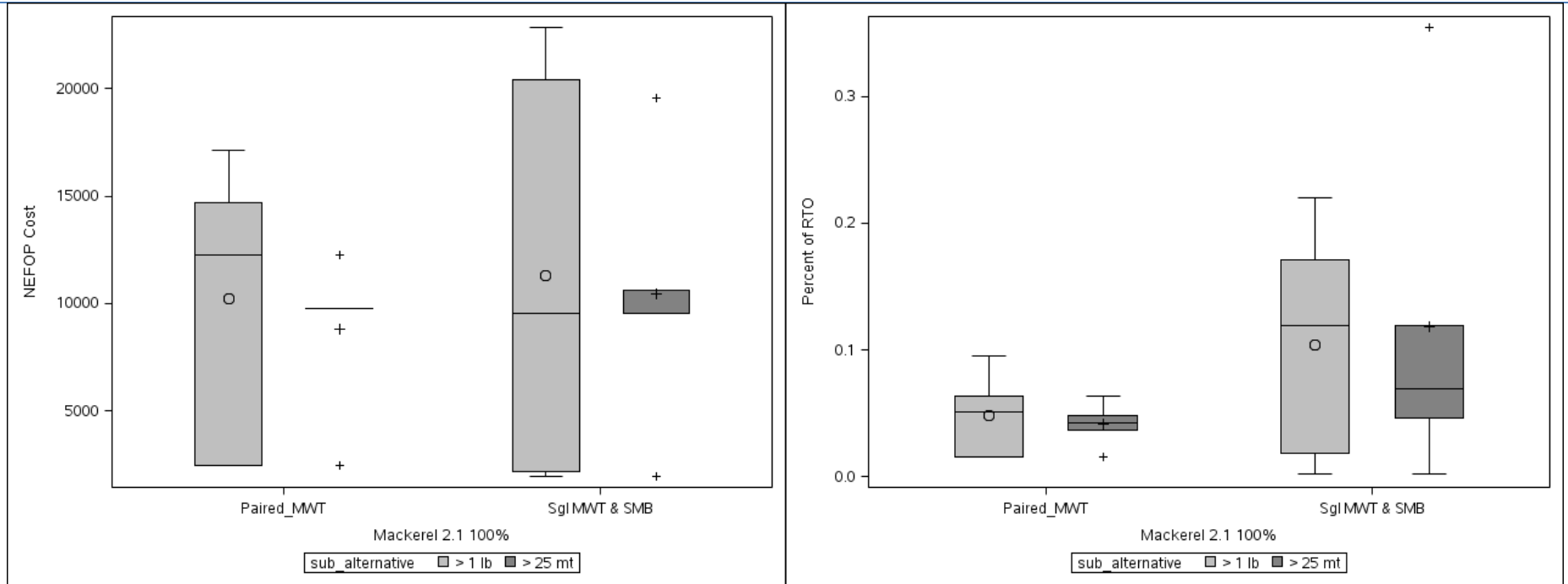


When examining the box plots, it is important to note the differences between mean and median values by gear type and by alternatives, as well as the differences in the variability of values by these criteria. For example, in the first figure (Mackerel Alternative 2.1) there is a wider range of costs for single midwater and small mesh bottom trawl vessels than for paired midwater trawl vessels, as represented by the length of the rectangle. Further, the difference between alternatives for both vessel categories shows that the mean and median values are lower under the 25 mt threshold (Sub-Option 5) but also that the likely range of NEFOP costs are much narrower.

**TABLE 105. MACKEREL ALTERNATIVE 2.1 & 2.2 – ANNUAL AVERAGE PER VESSEL**

	Paired MWT		Single MWT & SMBT (T1)	
	> 20k lb	> 25 mt	> 20k lb	> 25 mt
Mean RTO	\$204,514	\$213,005	\$245,704	\$304,352
Median RTO	\$195,500	\$228,943	\$121,026	\$152,773
Mean Sea Days (100%)	13	11	14	13
Median Sea Days (100%)	15	12	12	13
Mean Sea Days (75%)	10	8	11	11
Median Sea Days (75%)	11	9	9	10
Mean Sea Days (50%)	7	6	9	9
Median Sea Days (50%)	8	6	6	7
Mean Sea Days (25%)	5	4	7	7
Median Sea Days (25%)	5	4	4	6

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**FIGURE 16. MACKEREL ALTERNATIVE 2.1 100% NEFOP COST AND PERCENT OF RTO**

Figure 16 describes the approximate costs that applicable vessels with various gear types would incur annually from Alternative 2.1, which would require 100% coverage by NEFOP-level observers on vessels with limited access mackerel permits (includes vessels that use midwater trawl and small mesh bottom trawl gear). The MAFMC included thresholds of >20,000 lb (light grey) and > 25 mt (55,115 lb) (darker grey) for trips that would require monitoring – a 25 mt threshold would reduce the number of trips that had to be monitored and thus reduce costs.

Since this type of figure is used often in this document, additional detail on how to interpret the figure is provided to serve as a guide for interpreting other similar figures. All costs are based on the fleets operating as they did in 2014, and are derived from the number of days that they fished in 2014 on trips when they landed either 20,000 lb of mackerel or 25 mt of mackerel (the two thresholds being considered that would trigger monitoring). The line in the bar is the median (half of vessels would have higher or lower costs than the median cost) and the “o” or “+” within the bar shows the mean (average). Where the mean and median do not align there is some degree of skewedness to the data (generally if the mean is higher than the median there are a few unusually high values and if the median is higher than the mean there are a few unusually low values). When the median and mean are substantially different the median is more illustrative of the typical monitoring costs for vessels, so the median is the focus of this analysis.

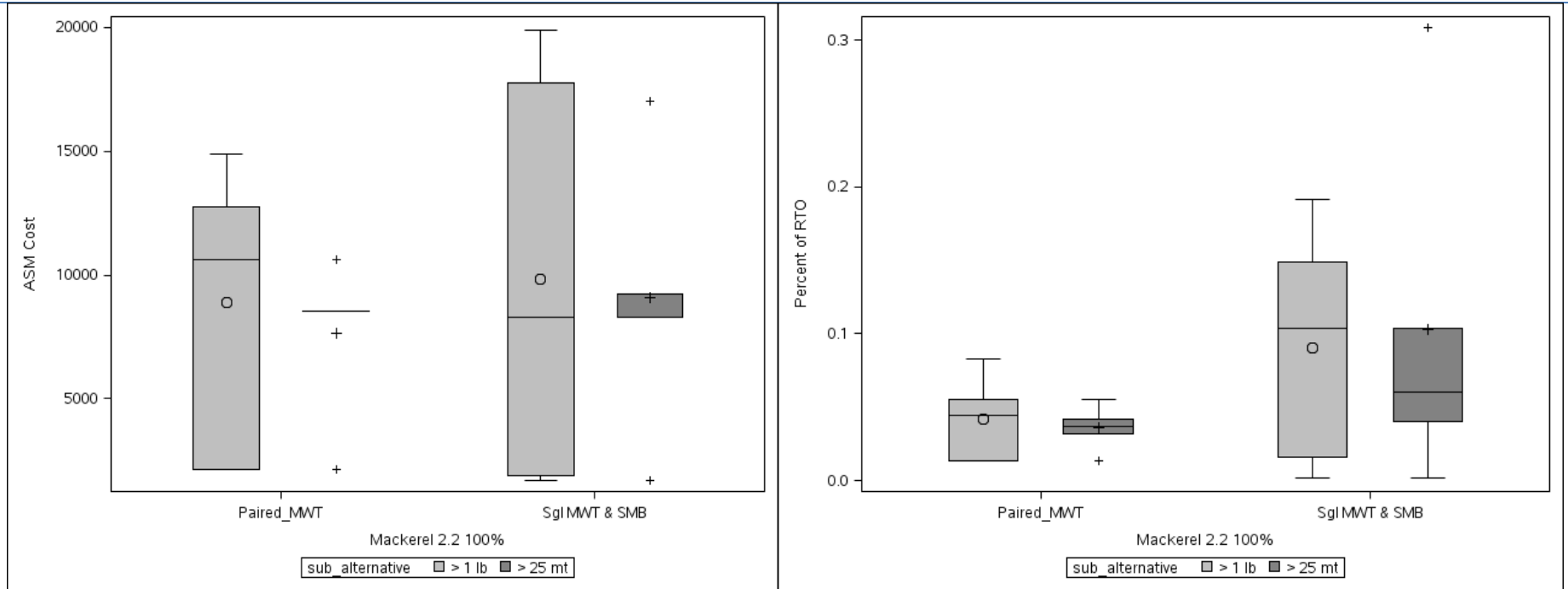
The shaded bars show where 50% of the data are (the “interquartile range”) and the whiskers show the range of values that lie within 1.5 times the interquartile percentile range. Together, the bars and whiskers illustrate whether the data are tightly grouped or highly variable (here highly variable would mean that some vessels would have high costs and some vessels would have low costs). An “o” or “+” outside the whiskers shows an extreme outlier. For example, there is a high outlier data point with the percent of RTO for single midwater trawl and small mesh bottom trawl vessels at a 25 mt threshold for monitoring.

For Mackerel Alternative 2.1 NEFOP costs, paired midwater trawl vessels are slightly more impacted than single midwater trawl and small mesh bottom trawl vessels at the 20,000 lb mackerel threshold, and are comparable at the 25 mt threshold. At the 20,000 lb threshold, there was skewedness in opposite directions for paired midwater trawl vessels (skewed low) and single midwater trawl and small mesh bottom trawl vessels (skewed high), indicating that the NEFOP monitoring costs for vessels may be similar. Median costs for the gear types at the 20,000 lb of mackerel threshold (light grey bars) are approximately \$12,000 for paired midwater trawl vessels, and \$10,000 for small mesh bottom trawl and single midwater trawl vessels. Recall the median is the point at which half of the vessels would pay more and half would pay less than that amount, and that wide bars and long whiskers indicate a wider range of costs/impacts across vessels. The lack of shaded bars and whiskers seen in portions of this plot stems from the small number of applicable trips represented in this analysis. For example, the plot representing NEFOP costs for paired midwater trawl vessels at the 25 mt threshold comprises only four trips, and thus lacks any bars or whiskers.

Costs are generally lower when a 25 mt threshold is used since not as many trips trigger a monitoring requirement. For the analysis of the 25 mt threshold, some vessels had no qualifying trips and drop out of the analysis, so even if the medians/averages stay similar the total fleet costs may still substantially decline). If a 25 mt threshold is used (darker grey bars), median costs are approximately \$10,000 for paired midwater trawl vessels and \$11,000 for small mesh bottom trawl and single midwater trawl vessels.

For Mackerel Alternative 2.1 costs as a percent of RTO, single midwater trawl and small mesh bottom trawl vessels are more impacted than paired midwater trawl vessels at both the 20,000 lb and 25 mt threshold. For the 20,000 lb threshold, RTO for paired midwater trawl vessels was approximately 5.1%, while RTO for single midwater trawl and small mesh bottom trawl vessels was around 11.9%. At the 25 mt threshold, RTO for paired midwater trawl vessels was approximately 4.3%, while RTO for single midwater trawl and small mesh bottom trawl vessels was 6.9%. The lack of small shaded bars and lack of whiskers seen in portions of this plot stems from the small number of applicable trips represented in this analysis. For example, the plot representing percent of RTO for paired midwater trawl vessels at the 25 mt threshold comprises only four trips, and thus has a very small bar with no lower whiskers.

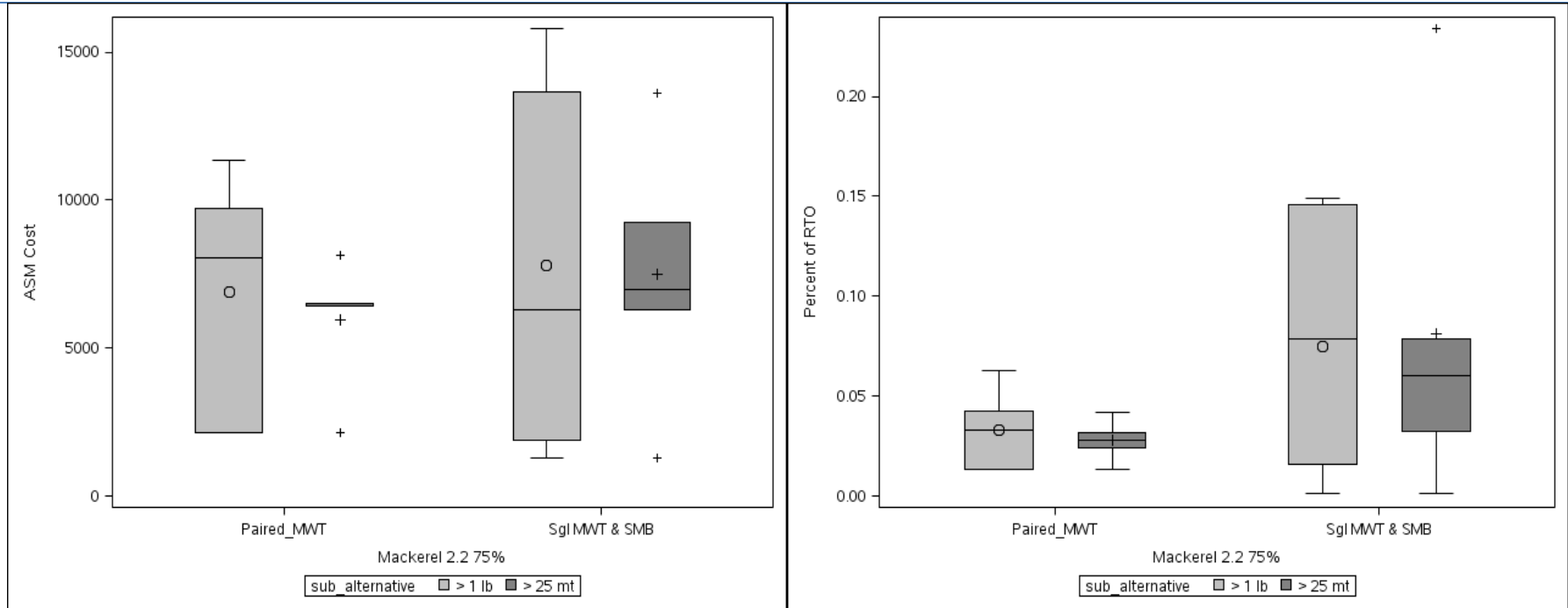
In implementation, since vessels would have to declare their intent to fish for mackerel and the monitoring would be triggered based on that declaration of intent, costs may be higher if vessels want the option to fish for mackerel on more days than they actually caught mackerel in 2014.



**FIGURE 17. MACKEREL ALTERNATIVE 2.2 100% ASM COST AND PERCENT OF RTO**

ASM costs for paired midwater trawl vessels are slightly more impacted than single midwater trawl and small mesh bottom trawl vessels at the 20,000 lb mackerel threshold, and are comparable at the 25 mt threshold. At the 20,000 lb threshold, there was skewedness in opposite directions for paired midwater trawl vessels (skewed low) and single midwater trawl and small mesh bottom trawl vessels (skewed high), indicating that the ASM monitoring costs for vessels may be more similar than indicated by the median. Median costs for the gear types at the 20,000 lb of mackerel threshold (light grey bars) are approximately \$11,000 for paired midwater trawl vessels, and \$8,000 for small mesh bottom trawl and single midwater trawl vessels. If a 25 mt threshold is used (darker grey bars), median costs are approximately \$8,500 for paired midwater trawl vessels and \$9,000 for small mesh bottom trawl and single midwater trawl vessels.

Percent of RTO for single midwater trawl and small mesh bottom trawl vessels is higher for paired midwater trawl vessels at both the 20,000 lb and 25 mt thresholds. For the 20,000 lb threshold, RTO for paired midwater trawl vessels was approximately 4.4%, while RTO for single midwater trawl and small mesh bottom trawl vessels was around 10.3%. At the 25 mt threshold, RTO for paired midwater trawl vessels was approximately 3.7%, while RTO for single midwater trawl and small mesh bottom trawl vessels was 6.0%.

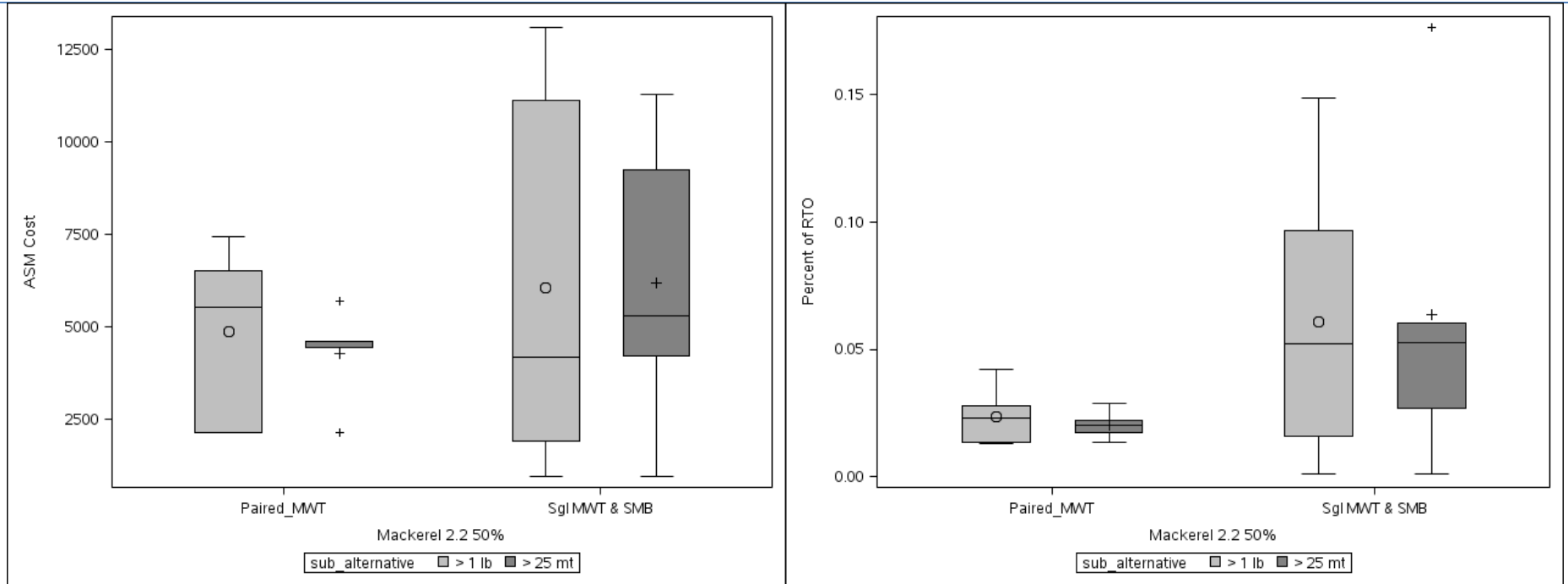


**FIGURE 18. MACKEREL ALTERNATIVE 2.2 75% ASM COST AND PERCENT OF RTO**

ASM costs (75%) for paired midwater trawl vessels are slightly higher than for single midwater trawl and small mesh bottom trawl vessels at the 20,000 lb mackerel threshold, and are comparable at the 25 mt threshold. At the 20,000 lb threshold, there was skewedness in opposite directions for paired midwater trawl vessels (skewed low) and single midwater trawl and small mesh bottom trawl vessels (skewed high), indicating that the ASM monitoring costs for vessels may be more similar than indicated by the median. Median costs for the gear types at the 20,000 lb mackerel threshold (light grey bars) are approximately \$8,000 for paired midwater trawl vessels, and \$6,000 for small mesh bottom trawl and single midwater trawl vessels. If a 25 mt threshold is used (darker grey bars), median costs are approximately \$6,000 for paired midwater trawl vessels, and \$7,000 for small mesh bottom trawl and single midwater trawl vessels.

Percent of RTO for single midwater trawl and small mesh bottom trawl vessels is higher for paired midwater trawl vessels at both the 20,000 lb and 25 mt thresholds. For the 20,000 lb threshold, RTO for paired midwater trawl vessels was approximately 3.3%, while RTO for single midwater trawl and small mesh bottom trawl vessels was around 7.9%. At the 25 mt threshold, RTO for paired midwater trawl vessels was approximately 2.8%, while RTO for single midwater trawl and small mesh bottom trawl vessels was 6.0%.

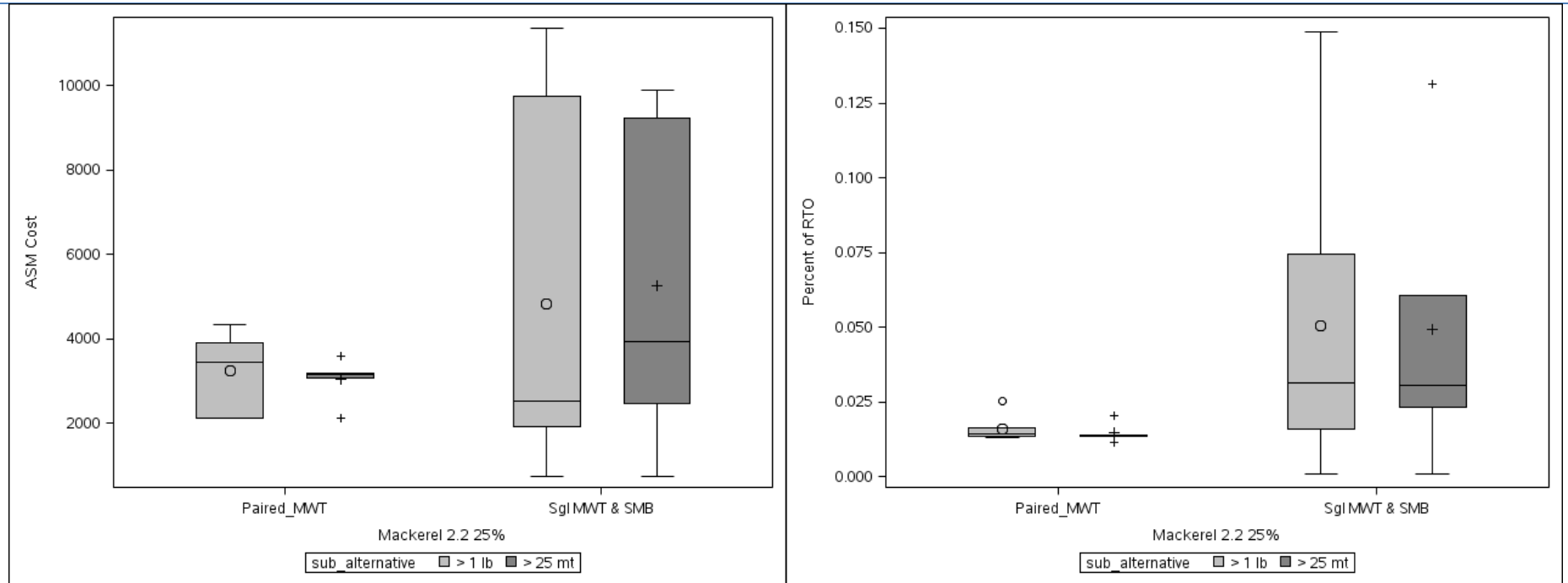
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**FIGURE 19. MACKEREL ALTERNATIVE 2.2 50% ASM COST AND PERCENT OF RTO**

ASM costs (50%) for paired midwater trawl vessels are slightly higher than for single midwater trawl and small mesh bottom trawl vessels at the 20,000 lb mackerel threshold, and are slightly lower at the 25 mt threshold. At the 20,000 lb threshold, there was skewedness in opposite directions for paired midwater trawl vessels (skewed low) and single midwater trawl and small mesh bottom trawl vessels (skewed high), indicating that the NEFOP monitoring costs for vessels may be more similar than indicated by the median. Median costs for the gear types at the 20,000 lb mackerel threshold (light grey bars) are approximately \$6,000 for paired midwater trawl vessels, and \$4,000 for single midwater trawl and small mesh bottom trawl vessels. If a 25 mt threshold is used (darker grey bars), median costs are approximately \$5,000 for paired midwater trawl vessels, and \$5,000 for single midwater trawl and small mesh bottom trawl vessels.

Percent of RTO for single midwater trawl and small mesh bottom trawl vessels is more impacted than paired midwater trawl vessels at both the 20,000 lb and 25 mt thresholds. For the 20,000 lb threshold, RTO for paired midwater trawl vessels was approximately 2.3%, while RTO for single midwater trawl and small mesh bottom trawl vessels was around 5.2%. At the 25 mt threshold, RTO for paired midwater trawl vessels was approximately 2.0%, while RTO for single midwater trawl and small mesh bottom trawl vessels was 5.3%.



**FIGURE 20. MACKEREL ALTERNATIVE 2.2 25% ASM COST AND PERCENT OF RTO**

ASM costs (25%) for paired midwater trawl vessels are slightly higher than for single midwater trawl and small mesh bottom trawl vessels at the 20,000 lb mackerel threshold, and are slightly lower at the 25 mt threshold. At the 20,000 lb threshold, there was skewedness in opposite directions for paired midwater trawl vessels (skewed low) and single midwater trawl and small mesh bottom trawl vessels (skewed high), indicating that the ASM monitoring costs for vessels may be more similar than indicated by the median. Median costs for the gear types at the 20,000 lb mackerel threshold (light grey bars) are approximately \$3,500 for paired midwater trawl vessels, and \$2,500 for single midwater trawl and small mesh bottom trawl vessels. If a 25 mt threshold is used (darker grey bars), median costs are approximately \$3,000 for paired midwater trawl vessels, and \$4,000 for single midwater trawl and small mesh bottom trawl vessels.

Percent of RTO for single midwater trawl and small mesh bottom trawl vessels is more impacted than paired midwater trawl vessels at both the 20,000 lb and 25 mt thresholds. For the 20,000 lb threshold, RTO for paired midwater trawl vessels was approximately 1.4%, while RTO for single midwater trawl and small mesh bottom trawl vessels was around 3.1%. At the 25 mt threshold, RTO for paired midwater trawl vessels was approximately 1.4%, while RTO for single midwater trawl and small mesh bottom trawl vessels was 3.1%.

**TABLE 106. MACKEREL ALTERNATIVE 2.1 AND 2.2 – ANNUAL FLEET LEVEL SUMMARY**

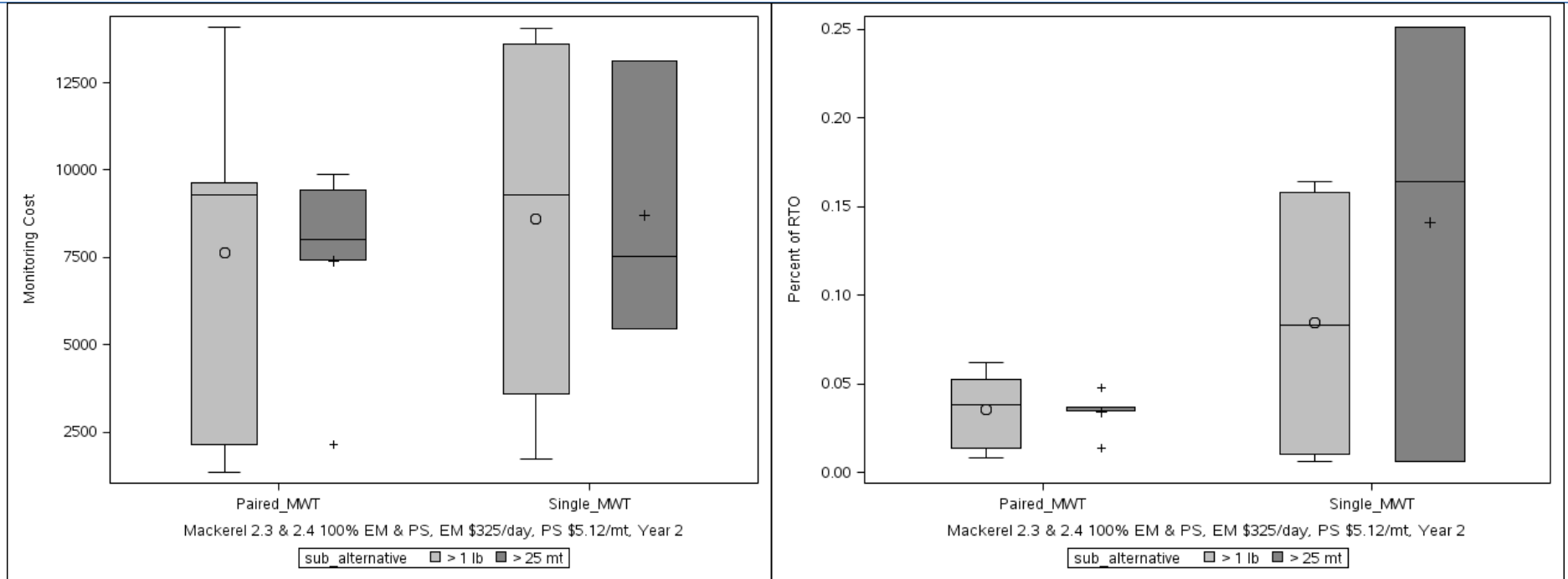
Fleet Level	Paired MWT ≥ 20k LB	Paired MWT > 25 MT	Single MWT & SMBT ≥ 20k LB	Single MWT & SMBT > 25 MT
Number of Vessels	6	5	7	5
Days at Sea	75	54	97	64
Total NEFOP Cost at 100%	\$61,200	\$44,064	\$78,926	\$52,257
Total ASM Cost at 100%	\$53,250	\$38,340	\$68,673	\$45,468
Total Revenue	\$1.5M	\$1.3M	\$2.4M	\$2.0M
% Revenue Herring	18.8%	15.4%	28.9%	23.8%
% Revenue Mackerel	80.9%	84.4%	35.7%	41.4%
% Revenue Squid	-		3.9%	0.2%
<i>Data shown by trips harvesting ≥ 20,000 lb of mackerel and &gt; 25 mt of mackerel</i>				

**TABLE 107. MACKEREL ALTERNATIVE 2.3 & 2.4 – ANNUAL AVERAGE PER VESSEL FOR MWT VESSELS ONLY (AT: 100% EM AT \$325 PER DAY, 100% PS AT \$5.12 PER MT AND AT: 100% EM AT \$187 PER DAY, 50% PS AT \$3.84 PER MT)**

	Paired MWT		Single MWT	
	> 20k lb	> 25 mt	> 20k lb	> 25 mt
Mean RTO	\$204,514	\$213,005	\$282,398	\$315,247
Median RTO	\$195,500	\$228,943	\$106,891	\$80,070
Mean EM Days (100%)	13	11	10	9
Median EM Days (100%)	15	12	7	12



## Industry-Funded Monitoring Omnibus Amendment

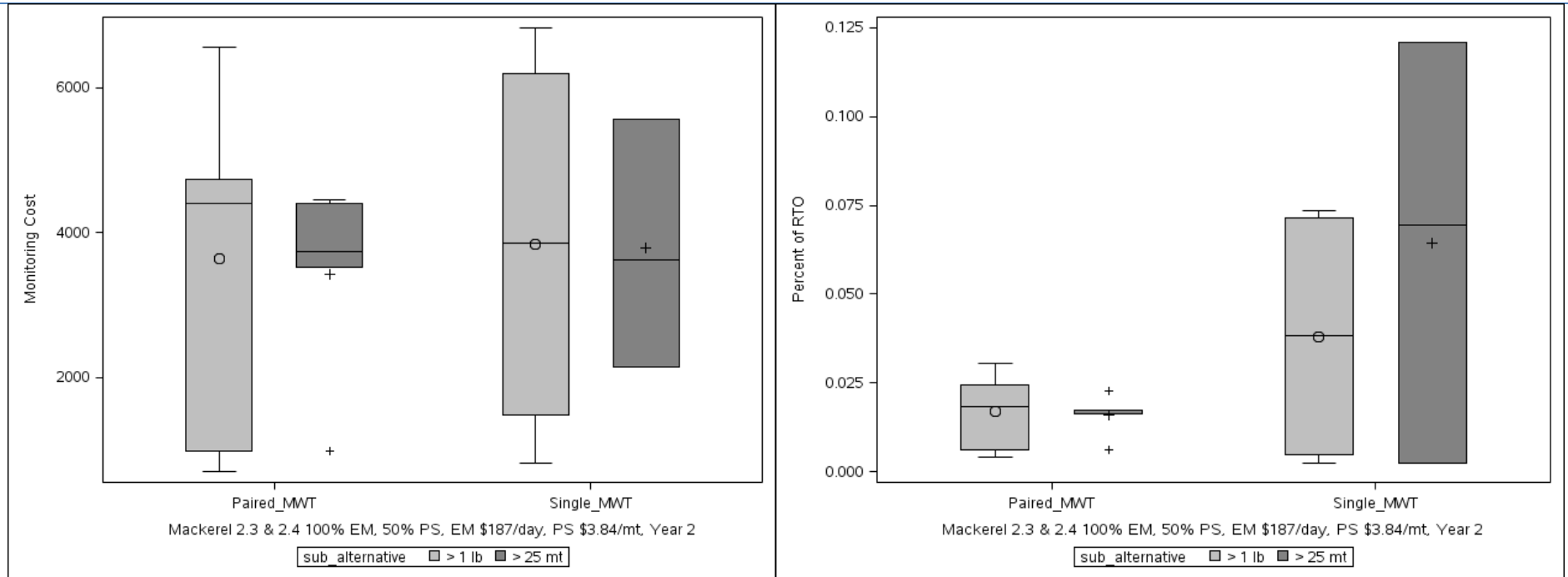


**FIGURE 21. MACKEREL ALTERNATIVES 2.3 AND 2.4 100% EM AND PORTSIDE COST AND PERCENT OF RTO**

100% EM and portside monitoring costs are approximately equal for paired midwater trawl vessels and single midwater trawl and small mesh bottom trawl vessels at both the 20,000 lb mackerel threshold and the 25 mt threshold. At the 20,000 lb threshold, all vessel types skewed lower, but distribution of costs within the interquartile range was more even about the median in single midwater trawl and small mesh bottom trawl vessels. This indicates that a substantial range exists for midwater trawl vessels in the highest quartile, while single midwater trawl and small mesh bottom trawl vessel costs are more evenly distributed about the median. Median costs for the gear types at the 20,000 lb of mackerel threshold (light grey bars) was approximately \$9,000 for paired midwater trawl vessels and for single midwater trawl and small mesh bottom trawl vessels. If a 25 mt threshold is used (darker grey bars), median costs are approximately \$8,000 for paired midwater trawl vessels, and \$7,500 for single midwater trawl and small mesh bottom trawl vessels.

Percent of RTO for single midwater trawl and small mesh bottom trawl vessels is substantially greater than for paired midwater trawl vessels at both the 20,000 lb and 25 mt thresholds. For the 20,000 lb threshold, RTO for paired midwater trawl vessels was approximately 3.8%, while RTO for single midwater trawl and small mesh bottom trawl vessels was around 8.3%. At the 25 mt threshold, RTO for paired midwater trawl vessels was approximately 3.7%, while RTO for single midwater trawl and small mesh bottom trawl vessels was 16.4%.

## Industry-Funded Monitoring Omnibus Amendment



**FIGURE 22. MACKEREL ALTERNATIVES 2.3 AND 2.4 50% EM AND PORTSIDE COST AND PERCENT OF RTO**

50% EM and portside monitoring costs are slightly greater for paired midwater trawl vessels than single midwater trawl and small mesh bottom trawl vessels at the 20,000 lb mackerel threshold, and are approximately equal at the 25 mt threshold. At the 20,000 lb threshold, paired midwater trawl vessels skewed lower, indicating that most paired midwater trawl vessels have monitoring costs above the average, while single midwater trawl and small mesh bottom trawl vessel costs are more evenly distributed about the median. Median costs for the gear types at the 20,000 lb of mackerel threshold (light grey bars) were approximately \$4,500 for paired midwater trawl vessels and \$4,000 for single midwater trawl and small mesh bottom trawl vessels. If a 25 mt threshold is used (darker grey bars), median costs are approximately \$4,000 for paired midwater trawl vessels and \$3,500 for single midwater trawl and small mesh bottom trawl vessels.

Percent of RTO for single midwater trawl and small mesh bottom trawl vessels is substantially greater than for paired midwater trawl vessels at both the 20,000 lb and 25 mt thresholds. For the 20,000 lb threshold, RTO for paired midwater trawl vessels was approximately 1.8%, while RTO for single midwater trawl and small mesh bottom trawl vessels was around 3.8%. At the 25 mt threshold, RTO for paired midwater trawl vessels was approximately 1.6%, while RTO single midwater trawl and small mesh bottom trawl vessels was 7.0%.

**TABLE 108. MACKEREL ALTERNATIVE 2.3 & 2.4 – ANNUAL FLEET LEVEL SUMMARY (MWT VESSELS ONLY)**

Fleet Level	Paired MWT ≥ 20k LB	Paired MWT > 25 MT	Single MWT ≥ 20k LB	Single MWT > 25 MT
Number of Vessels	6		4	
Days at Sea	75		42	
Total Monitoring Cost (100% EM at \$325/day, 100% PS at \$5.12/mt, year 2)	\$45,812	\$36,898	\$34,421	\$26,122
Total Monitoring Cost (100% EM at \$187/day, 50% PS at \$3.84/mt, year 2)	\$21,796	17,112	\$15,364	\$11,340
Total Revenue	\$1.4M		\$1.2M	
% Revenue Herring	18.8%		51.8%	
% Revenue Mackerel	81.0%		48.0%	
% Revenue Squid	-		-	
<i>Data shown by trips harvesting ≥ 20k lb of herring and &gt; 25 mt of herring</i>				

### 4.3.6 ATLANTIC MACKEREL ALTERNATIVES

**TABLE 109. SUMMARY OF OVERALL IMPACTS ASSOCIATED WITH MACKEREL COVERAGE TARGET ALTERNATIVES**

<b>Alternatives</b>	<b>Mackerel Resource</b>	<b>Non-Target Species</b>	<b>Protected Species</b>	<b>Physical Environment</b>	<b>Fishery-Related Businesses</b>
Mackerel Alternative 1: No Coverage Target Specified For IFM Programs (No Action)	Low Positive	Low Positive	Low Positive	Negligible	Low Positive
Mackerel Alternative 2: Coverage Target Specified For IFM Programs	Low Positive	Low Positive	Low Positive	Negligible	Negative
Mackerel Alternative 2.1: NEFOP-Level Coverage on Midwater Trawl Vessels and Tier 1-3 SMBT Vessels	Low Positive	Low Positive	Low Positive	Negligible	Negative
Mackerel Alternative 2.2: ASM Coverage on Midwater Trawl Vessels and Tier 1 SMBT Vessels	Low Positive	Low Positive	Low Positive	Negligible	Negative
Mackerel Alternative 2.3: Combination Coverage on Midwater Trawl Vessels and Tier 1 SMBT Vessels	Low Positive	Low Positive	Low Positive	Negligible	Negative
Mackerel Alternative 2.4: EM and Portside Sampling Midwater Trawl Vessels	Low Positive	Low Positive	Low Positive	Negligible	Negative

# **Industry-Funded Monitoring Omnibus Amendment**

*Supplement to the Draft  
Environmental Assessment*

**Mid-Atlantic Fishery Management Council  
May 2016**

**Prepared by NOAA's National Marine Fisheries Service**

## 1.1 OBSERVER COVERAGE IN 2015

The table below describes Northeast Fisheries Observer Program (NEFOP) coverage by gear type. Revisions to the Standardized Bycatch Reporting Methodology (SBRM) in April 2015 affected how funding is used to allocate observer coverage. Therefore, the level of observer coverage during 2015 may be more indicative of future observer coverage levels than observer coverage levels from previous years.

### 2015 Midwater Trawl<sup>1</sup>, Purse Seine<sup>2</sup>, and Small Mesh Bottom Trawl<sup>3</sup> Observer Coverage Rates

Gear	Observer Coverage <sup>4</sup>
Midwater Trawl	4.7%
Purse Seine	2.5%
Small Mesh Bottom Trawl	9.1%

Source: DMIS and ODBS databases as of 2016-05-21

<sup>1</sup>Midwater Trawl: Includes both single and paired midwater trawl gears

<sup>2</sup>Purse Seine: Includes all purse seine gears (including tuna)

<sup>3</sup>Small Mesh Bottom Trawl: Includes bottom trawl gear w/codend mesh size less than 5.5" excluding bottom otter twin trawl, scallop and shrimp trawl trips

<sup>4</sup>Includes observer trips w/at least 1 observed haul divided by VTR trips reporting kept catch

## 1.2 MONITORING CATCH CAPS IN THE MACKEREL FISHERY

The proposed observer coverage levels in the Atlantic mackerel fishery described in Mackerel Alternative 1 of the Industry-Funded Monitoring (IFM) Omnibus Amendment was evaluated with regard to its impact on River Herring/Shad (RHS) Catch Cap catch estimate precision. Fishing years (FY) 2014-2015 were included in the analysis because they were the only years when the catch cap was effective. The FY2015 data for these catch caps are not finalized, and should be considered preliminary. Mackerel discards were not evaluated.

The Atlantic mackerel fishery currently has a single RHS catch cap that covers all trips landing greater than 20,000 pounds of mackerel regardless of gear or area. Atlantic Mackerel, Squid, and Butterfish Amendment 14 implemented the RHS Catch Cap and was effective on April 4, 2014, for all of fishing year 2014 (January-December).

Catch cap estimates in the Atlantic mackerel fishery are comprised of both incidental kept and discard components. Current quota monitoring methodology for the catch cap employs the cumulative method to extrapolate incidental catch (kept and discard) to the fleet based on a ratio estimator (incidental catch divided by total catch) derived from Northeast Fisheries Observer Program (NEFOP) data. Only observed trips are used to derive the ratio estimator. Fleet kept all (KALL) is obtained from vessel trip

reports (VTR) and dealer data, which provides effort information (gear and area) and landings information respectively. Actual observed incidental catch amounts are used in lieu of estimated incidental catch amounts whenever possible.

This analysis uses the same data sources as quota monitoring. However, this analysis focuses strictly on the precision of the incidental catch ratio estimator in the catch cap, and does not incorporate the replacement of actual observed values for estimated incidental catch based on the ratio estimator (described above). Furthermore, this analysis is constrained to trips that count towards the catch cap (e.g., trip must land >20,000 pounds of mackerel). Trips that would not be counted against the catch cap are not included in this analysis. The coefficient of variation (CV), defined for this analysis as the ratio of the standard error of total catch (incidental kept and discards), was used to quantify the precision of the estimated catch. The CV is sensitive to sample size. In a finite population the CV will converge to zero as the sample size approaches the population size. The total fishing trips within a stratum is considered finite, therefore as sampling coverage approaches 100%, the CV will converge to zero for that stratum. The CV analysis follows the guidelines detailed by the SBRM and uses the trip as the sampling unit. Only observed trips (trips with at least one observed haul) and trips reporting kept catch on their VTR were used in the CV analysis. This distinction is important to understand when interpreting observer coverage rates (referred to below as “realized” observer coverage) because in the paired midwater trawl fishery it is not uncommon for wing vessels to carry observers but not carry any catch. These trips would not be reflected in the observer coverage rates described in this analysis. Furthermore, trips that did not yield any observed hauls are excluded from this analysis.

The At-Sea Monitor (ASM) as defined by the IFM Amendment will collect both retained and discarded catch composition in a manner consistent with existing NEFOP protocols. Therefore it is assumed that there will be no difference in the catch composition data collected by NEFOP observers and ASMs under Mackerel Alternatives 2.1 and 2.2.

Due to the structure of Alternatives 2.1-2.4, along with the very limited amount of data available for the Mackerel RHS Catch Cap, it was infeasible to simulate the potential impacts of these alternatives. Instead a summary analysis of 2014 and 2015 was performed to describe the CVs observed in those fishing years as well as a general fleet profile of the vessels covered by the Mackerel RHS Catch Cap.

Table 1 and Figure 1 summarize the CV calculated according to SBRM methodology as well as the realized observer coverage for the catch cap during the years when the catch cap was in place. For each year, the CV and the realized observer coverage in italics are shown in Table 1. The Mackerel RHS Catch Cap exhibited variable CVs between 2014 and 2015 and showed a decline in both observer coverage and CV in 2015. Given the limited time-series it is difficult to infer a trend. However, it is important to note the very small number of trips that were observed in 2015. Table 1 and Figure 1 characterize the history of catch cap estimate precision produced from NEFOP coverage (Mackerel Alternative 1).

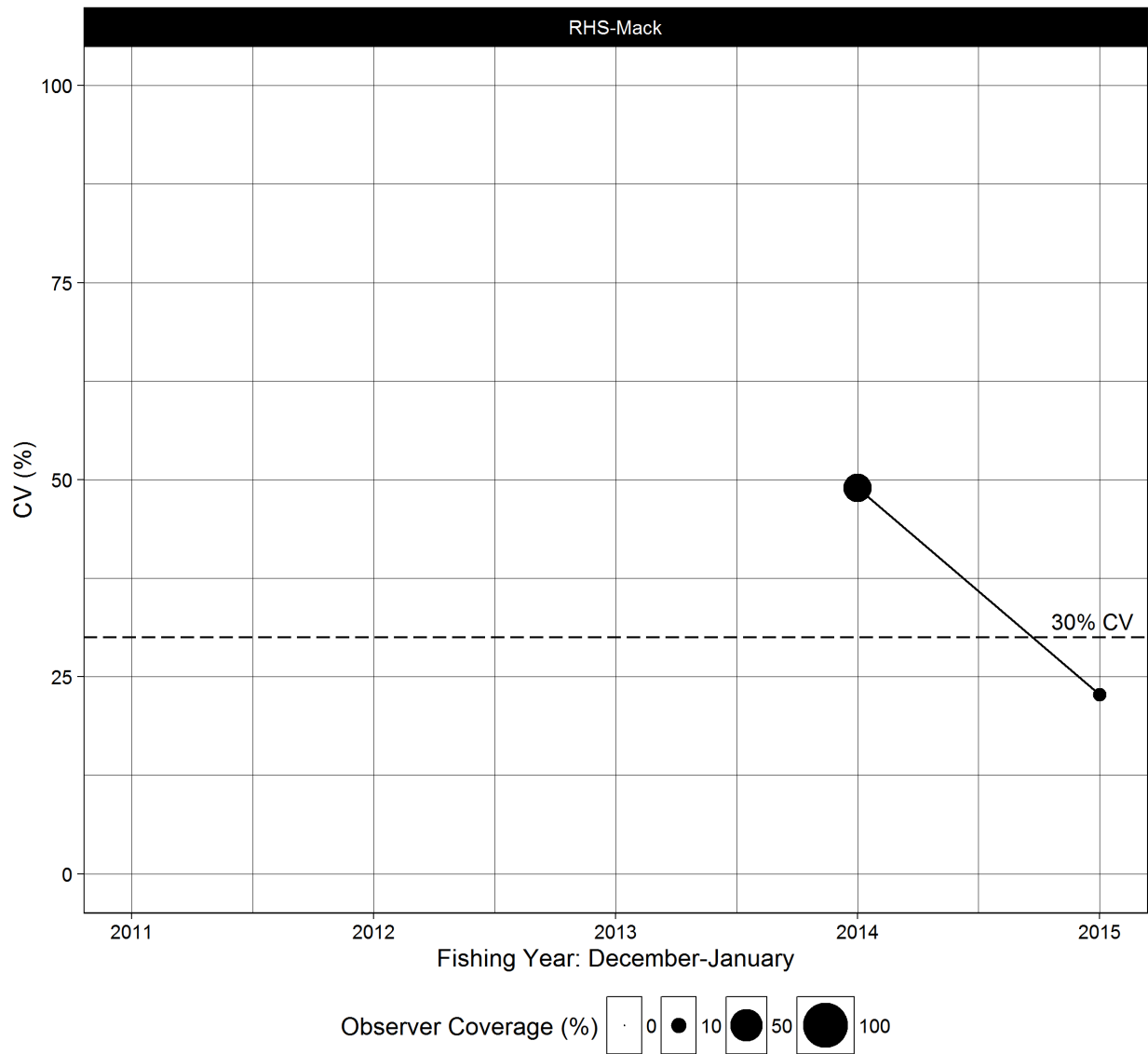
### **TABLE 1. MACKEREL RHS CATCH CAP CV AND OBSERVER COVERAGE, 2014-2015**

Catch Cap	Fishing Year <sup>1</sup> : CV (Observer Coverage)	
	2014	2015 <sup>3</sup>
RHS-Mackerel	48.9% (37.8%)	22.7% (7.3%) <sup>3</sup>

Source: GARFO Quota Monitoring Database as of 5/22/2016

<sup>1</sup>Catch cap fishing year: river herring/shad = calendar year; haddock = May-April

<sup>3</sup>Fishing Year 2015 data are PRELIMINARY

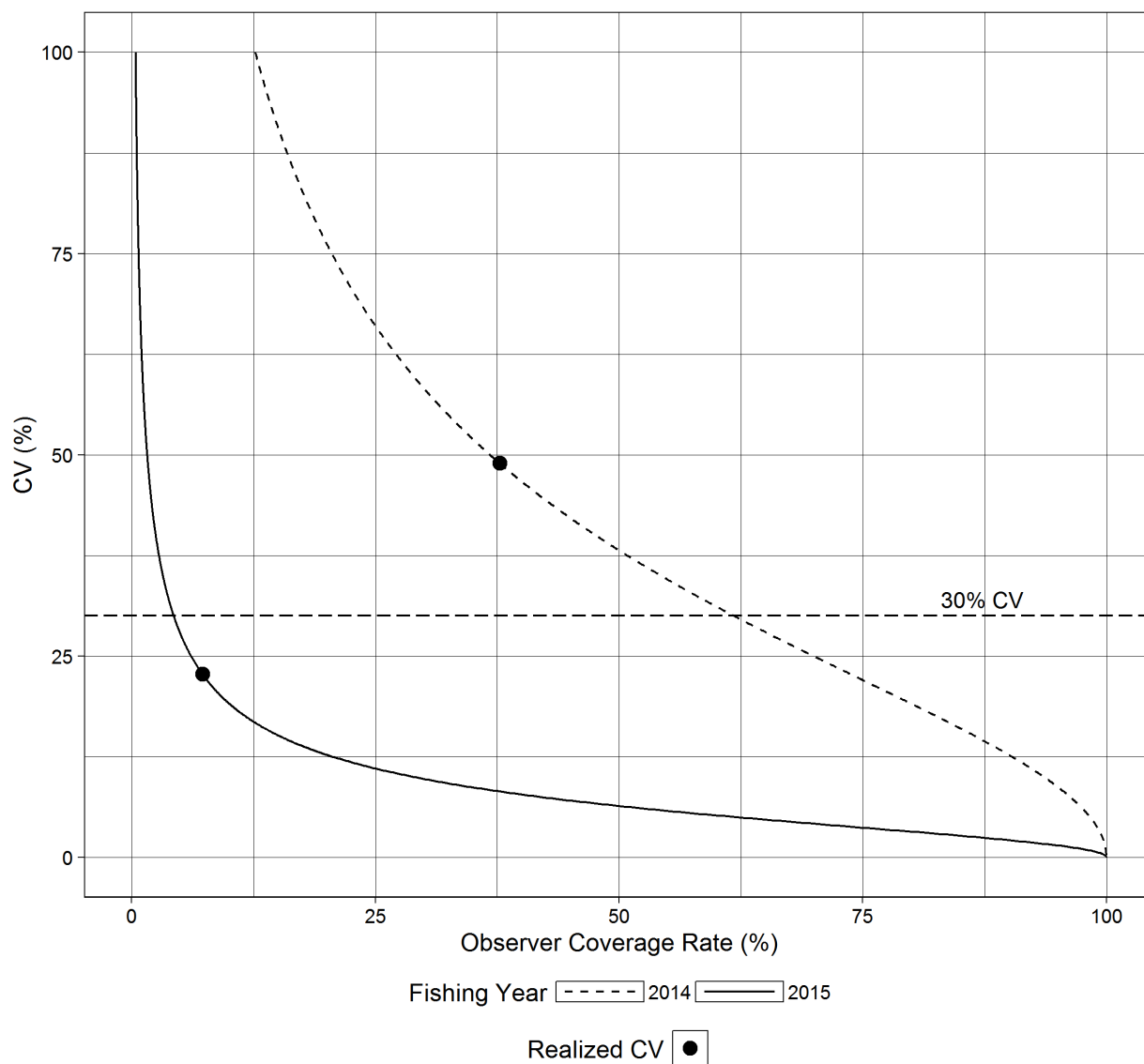


**FIGURE 1. MACKEREL RHS CATCH CAP CV AND OBSERVER COVERAGE (DOT SIZE) IN RELATION TO A 30% CV.**

Figure 2 details a CV curve calculated according to SBRM methodology across varying coverage levels in relation to a 30% CV. This curve is solely based on observer data within 2014 and 2015 and influenced



by how observer coverage was assigned for each particular year and does not describe the potential impacts of Mackerel Alternatives 2.1-2.4.



**FIGURE 2. 2014-2015 DERIVED CV CURVE FOR MACKEREL RHS CATCH CAP BASED ON SBRM SAMPLE SIZE ANALYSIS METHODOLOGY, WITH REALIZED CV FOR THE CATCH CAP YEAR (BLACK DOT)**

Mackerel RHS Catch Cap trips between 2014 and 2015 were comprised of both midwater and bottom trawl vessels. On average, 84% of Mackerel RHS Catch Cap trips between 2014 and 2015 were conducted by Tier 1 Midwater Trawl vessels. Out of those trips, 76% of them landed greater than 25 mt. Overall, the amount effort in the Mackerel RHS Catch Cap was low in 2014-2015, and therefore CV behavior could change if effort increases in the future.

### 1.3 MONITORING CATCH CAPS IN THE HERRING FISHERY

The proposed observer coverage levels in the Atlantic herring fishery described in Herring Alternatives 2.1 and 2.2 of the IFM Omnibus Amendment were evaluated with regard to their impact on Haddock and RHS Catch Cap catch estimate precision. Only fishing years (FY) when catch caps were implemented were included in the analysis. The Haddock Catch Cap analysis includes 2011-2015 fishing and the RHS Catch Cap analysis includes 2014-2015 fishing years. The FY2015 data for these catch caps are not finalized, and should be considered preliminary. Herring discards were not evaluated. Herring discards are generally a small component of the overall herring catch. Herring discards are estimated by extrapolating discards from observed hauls only. In recent years, herring discards have accounted for well less than 1% of the total herring catch.

The Atlantic herring fishery currently has six catch caps: (1) Haddock: Georges Bank (GB) Midwater Trawl, (2) Haddock: Gulf of Maine (GOM) Midwater Trawl, (3) RHS: Cape Cod (CC) Midwater Trawl, (4) RHS: GOM Midwater Trawl, (5) RHS: Southern New England (SNE) Bottom Trawl, and (6) SNE Midwater Trawl. The GB and GOM Haddock Catch Caps were implemented through Groundfish Framework 46 in 2011, which separated the previous existing Haddock Catch Cap into GB and GOM stock areas and adjusted the estimation methodology to the current extrapolation method. Herring Framework Adjustment 3 implemented RHS Catch Caps for 2014-2015 that were effective on December 4, 2014. The Haddock Catch Caps operate on a May-April Fishing Year, while the RHS Catch Caps operate on a January-December Fishing Year. For RHS Catch Caps, trips landing greater than 6,600 pounds of herring are counted against an individual catch cap, depending on the gear and area of the trip. For Haddock Catch Caps, all midwater trawl trips in GB and GOM are counted against the catch caps.

Catch cap estimates in the Atlantic herring fishery are comprised of both incidental kept and discard components. Current quota monitoring methodology for these catch caps employs the cumulative method to extrapolate incidental catch (kept and discard) to the fleet based on a ratio estimator (incidental catch divided by total catch) derived from NEFOP data. Only observed trips are used to derive the ratio estimator. Fleet kept all (KALL) is obtained from VTR and dealer data, which provides effort information (gear and area) and landings information respectively. Actual observed incidental catch amounts are used in lieu of estimated incidental catch amounts whenever possible.

This analysis uses the same data sources as quota monitoring. However, this analysis focuses strictly on the precision of the incidental catch ratio estimator in each catch cap, and does not incorporate the replacement of actual observed values for estimated incidental catch based on the ratio estimator (described above). Furthermore, this analysis is constrained to trips that count towards a specific catch cap (e.g., RHS cap trips must land >6,600 pounds of herring regardless of gear). Trips that would not count against a catch cap are not included in this analysis. The CV, defined for this analysis as the ratio of the standard error of total catch (incidental kept and discards), was used to quantify the precision of the estimated catch. The CV is sensitive to sample size. In a finite population, the CV will converge to zero as the sample size approaches the population size. The total fishing trips within a stratum is considered finite, therefore, as sampling coverage approaches 100%, the CV will converge to zero for

that stratum. The CV analysis follows the guidelines detailed by the SBRM and uses the trip as the sampling unit. Only observed trips (trips with at least one observed haul) and trips reporting kept catch on their VTR were used in the CV analysis. This distinction is important to understand when interpreting observer coverage rates (referred to below as “realized” observer coverage) because in the paired midwater trawl fishery it is not uncommon for wing vessels to carry observers but not carry any catch. These trips would not be reflected in the observer coverage rates described in this analysis. Furthermore, trips that did not yield any observed hauls are excluded from this analysis.

The At-Sea Monitor (ASM) as defined by the IFM Amendment will collect both retained and discarded catch composition in a manner consistent with existing NEFOP protocols. Therefore it is assumed that there will be no difference in the catch composition data collected by NEFOP observers and ASMs under Herring Alternatives 2.1 and 2.2. This analysis uses NEFOP data as a proxy for potential future ASM coverage estimate simulations. Also, observer and ASM coverage targets proposed in the IFM Amendment are additive, so simulated CV estimates based on proposed coverage targets assume both SBRM and IFM coverage will contribute to the target.

Table 2 and Figure 3 summarize the CV calculated according to SBRM methodology as well as the realized observer coverage for each catch cap during the years when catch caps were in place. For each year and catch cap, the CV and the realized observer coverage in italics are shown in Table 2. Although there is no defined CV target, a 30% CV was provided for context. The GB Haddock Catch Cap remained below a CV of 30% for all years except for 2015, while the GOM haddock had a CV of 0% for all years because no GOM haddock catch was observed. The RHS Catch Cap CVs are more variable, but it is difficult to infer a trend based on the limited data. Table 2 and Figure 3 characterize the history of catch cap estimate precision produced from NEFOP coverage (Herring Alternative 1). It must be noted that due to the implementation of RHS catch caps in late 2014, most of the 2014 effort was not subject to the RHS Catch Cap. Furthermore, the 2015 GB Haddock Catch Cap was closed in October, effectively truncating the May-April fishing year.

**TABLE 2. HERRING CATCH CAP CV AND OBSERVER COVERAGE, 2011-2015**

Catch Cap Fishery	Fishing Year <sup>1</sup> : CV (Observer Coverage)				
	2011	2012	2013	2014	2015 <sup>3</sup>
Haddock: GB Midwater Trawl	17.6% ( <i>41.7%</i> )	12.3% ( <i>62.9%</i> )	21.3% ( <i>35.6%</i> )	20.5% ( <i>27.2%</i> )	61.4% ( <i>4.9%</i> )**
Haddock: GOM Midwater Trawl	0.0% ( <i>30.4%</i> )	0.0% ( <i>29.2%</i> )	0.0% ( <i>34.8%</i> )	0.0% ( <i>46.3%</i> )	0.0% ( <i>8.6%</i> )
Herring-RHS: CC Midwater Trawl				36.2% ( <i>48.0%</i> )*	81.4% ( <i>10.1%</i> )
Herring-RHS: GOM Midwater Trawl				37.3% ( <i>50.0%</i> )*	94.8% ( <i>8.7%</i> )
Herring-RHS: SNE Bottom Trawl				28.4% ( <i>17.4%</i> )*	24.5% ( <i>15.0%</i> )
Herring-RHS: SNE Midwater Trawl				70.2% ( <i>3.4%</i> )*	11.8% ( <i>2.3%</i> )

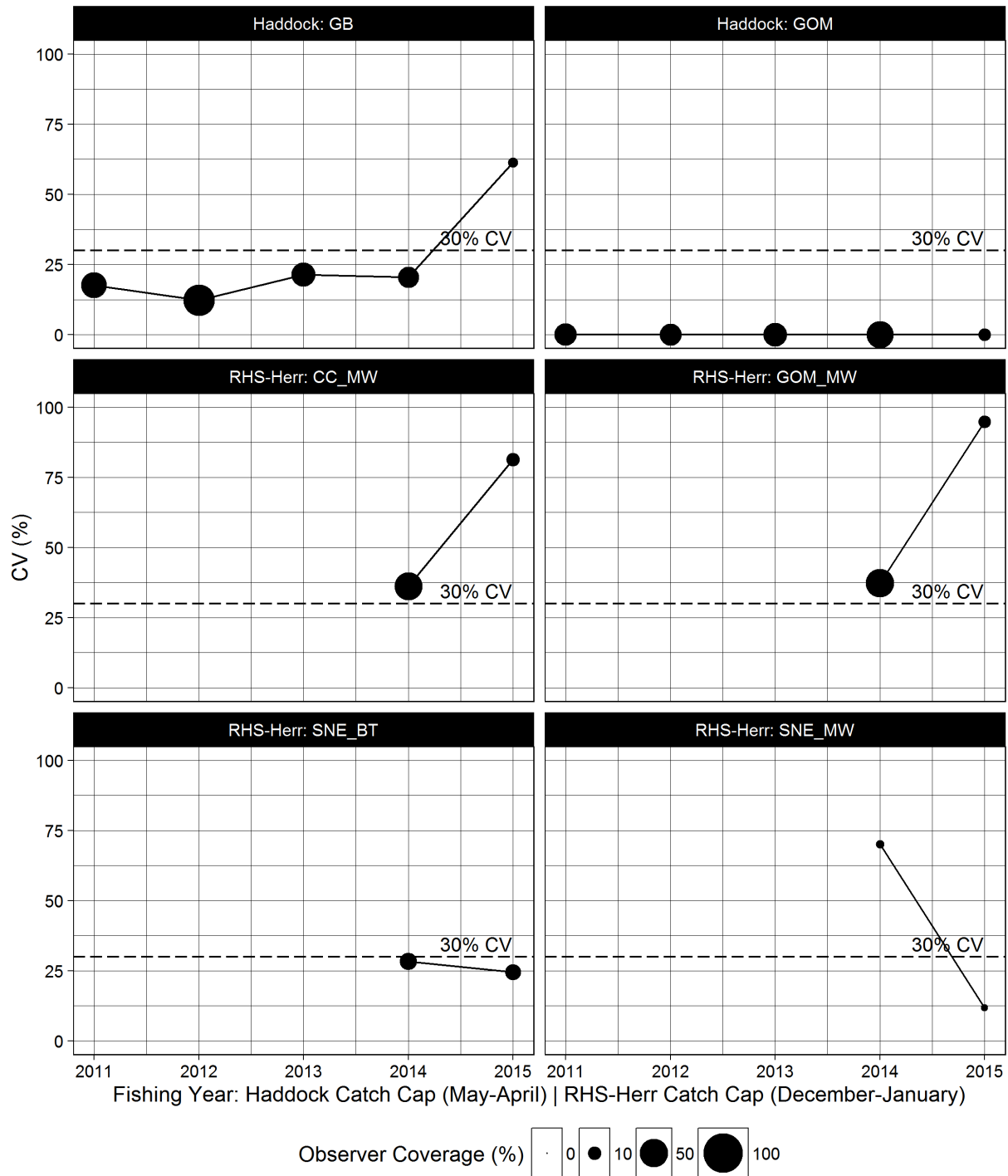
Source: GARFO Quota Monitoring Database as of 5/22/2016

<sup>1</sup>Catch cap fishing year: river herring/shad = calendar year; haddock = May-April

<sup>3</sup>Fishing Year 2015 data are PRELIMINARY

\*2014 Herring RHS fishing year partially covered by RHS Catch Caps which was implemented on December, 4 2014

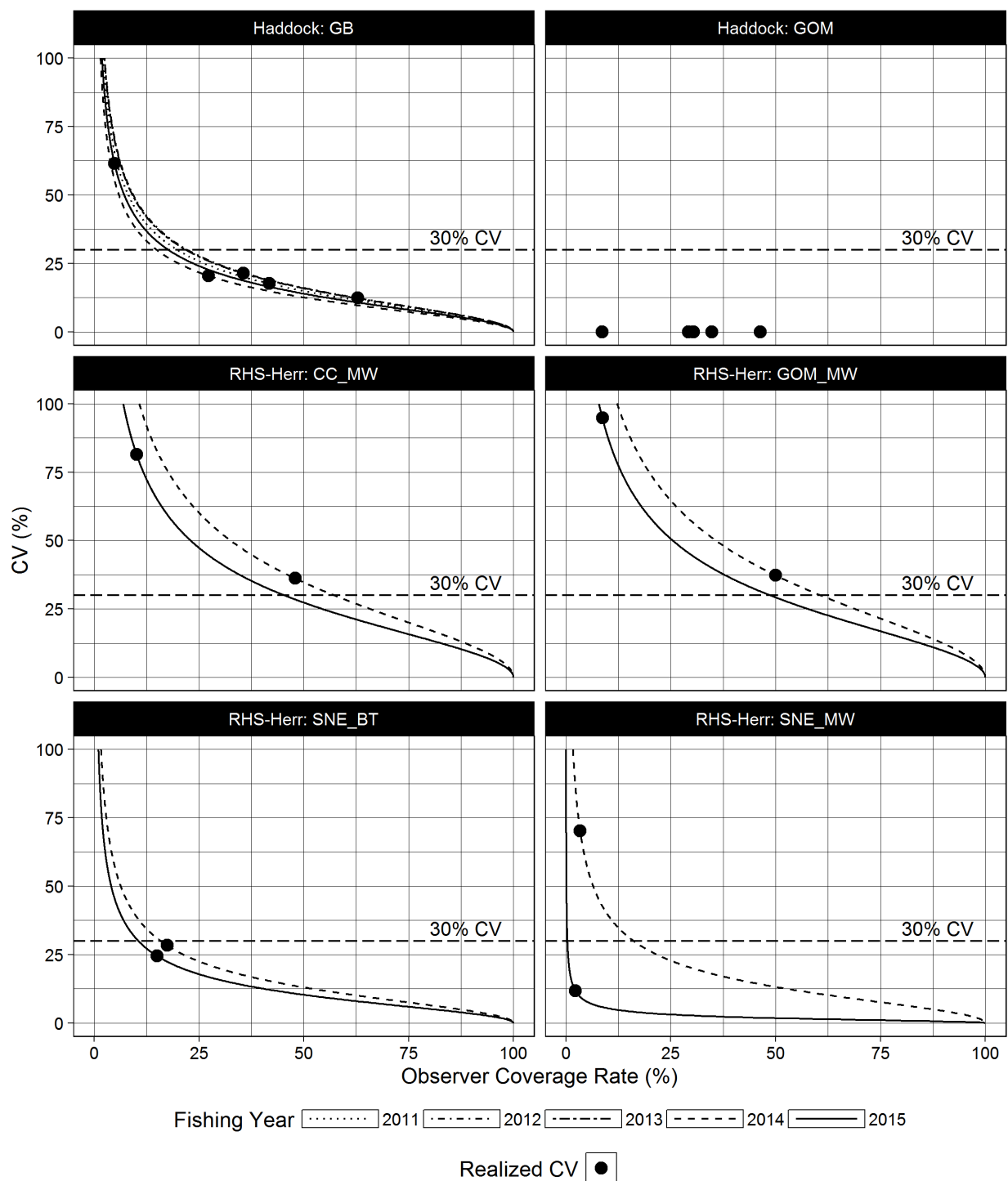
\*\*2015 GB Haddock fishing year truncated due to the closure of the GB Haddock AM Area on October 22, 2015



**FIGURE 3. HERRING CATCH CAP CV AND OBSERVER COVERAGE (DOT SIZE) IN RELATION TO A 30% CV.**

Figure 4 details CV curves calculated according to SBRM methodology across varying coverage levels in relation to a 30% CV. These curves are solely based on observer data within each catch cap and year

and are estimated on those data and how observer coverage was assigned for that particular year and does not describe the potential impacts of Alternative 2.1-2.2.



**FIGURE 4. 2011-2015 DERIVED CV CURVE FOR EACH CATCH CAP BASED ON SBRM SAMPLE SIZE ANALYSIS METHODOLOGY, WITH REALIZED CV FOR EACH CATCH CAP YEAR (BLACK DOT)**

Due to the structure of Herring Alternatives 2.1 and 2.2, and how coverage is being selectively assigned based on gear, permit, category, and a 25 mt landings threshold, estimated CVs based on proposed coverage levels could not be estimated formulaically according to SBRM, and instead required simulation based on resampling of observed trips. Simulations were performed for each catch cap and year and based on NEFOP observer data. Proposed coverage levels were simulated by resampling the required amount of observer trips to obtain the target coverage level based on the effort profile for a particular catch cap and year. Herring Alternatives 2.1 and 2.2 focus IFM coverage on Category A/B herring vessels. Due to this, simulated increasing coverage was confined to Category A/B vessel trips until 100% of those trips were simulated as observed. Observed non-category A/B herring vessel trips were assumed to be SBRM coverage and were fully resampled in each simulation without increasing coverage. Within each simulation, a CV was calculated for the catch cap based on the specified coverage level. This process was repeated 1,000 times for each proposed coverage level, which yielded a distribution of simulated CVs. Table 3 summarizes the mean CV from those distributions for each proposed coverage level, and Table 4 provides the simulated results if a 25 mt trip exemption existed. This process was repeated for each catch cap and year.

Due to the amount of observer data available within each catch cap different approaches were taken in order to obtain a minimum sampling pool. Haddock Catch Cap strata yielded higher numbers of observed trips within each year allowing for simulation of observed trips within each fishing year, observer data from multiple fishing years were not grouped. However, due to the GB Haddock AM closure in 2015 a small number ( $n < 10$ ) of observed trips were simulated. The RHS Catch Cap strata yielded smaller amounts of observed trips and needed to be combined across 2014 and 2015 into a single resampling group that was used to simulate 2014 and 2015 based on their respective effort profiles (total trips in strata for each year). Even after grouping 2014 and 2015, the RHS SNE Midwater Trawl Catch Cap had a small number ( $n < 10$ ) of trips to simulate. The RHS SNE Bottom Trawl Catch Cap also suffered from a small number of observed trips to simulate from when the 25 mt trip exemption was applied (this was not the case when the 25 mt trip exemption was removed).

For catch caps where all of the effort is comprised of Category A/B herring vessels, the CV should converge to zero in 100% coverage scenarios. This was the case for all catch caps confined to midwater trawl trips except for RHS SNE Midwater Trawl, which includes non-Category A/B vessels. The effect of mixed permit categories in RHS SNE Midwater Trawl Catch Cap is that proposed IFM coverage will not cover all trips in that catch cap at 100% coverage of Category A/B vessels and results in the CV not converging to zero. The effect is more pronounced in the RHS SNE Bottom Trawl Catch Cap where on average 38% of 2014-2015 trips were by non-Category A/B vessels.

The 25 mt trip exemption has a similar effect as the Category A/B permit IFM coverage criteria because it allows for a certain number of trips within each catch cap to go unobserved and therefore impacts the simulated CV. This effect is demonstrated in Table 4 and impacts all catch caps (GOM Haddock is not impacted because the CV is always zero due to no observed incidental haddock catch). The effect is much more pronounced in catch caps comprised of trips that yield smaller catches. The effect is very small in the GB Haddock Catch Cap where there trips tend to be consistently above 25 mt compared to the RHS Catch Caps where trip catches are either small or more variable.

**Table 3. Alternative 2.2: Simulated mean CV at 25%, 50%, 75% and 100% ASM coverage**

Catch Cap	Fishing Year <sup>1</sup>	Simulated Mean CV (%)			
		25% Coverage	50% Coverage	75% Coverage	100% Coverage
Haddock: GB Midwater Trawl	2011	25.8%	14.8%	8.6%	0.0%
	2012	24.2%	14.9%	8.8%	0.0%
	2013	26.4%	15.5%	9.1%	0.0%
	2014	21.7%	12.5%	7.2%	0.0%
	2015 <sup>3**</sup>	22.7%	13.1%	7.5%	0.0%
Haddock: GOM Midwater Trawl	2011	0.0%	0.0%	0.0%	0.0%
	2012	0.0%	0.0%	0.0%	0.0%
	2013	0.0%	0.0%	0.0%	0.0%
	2014*	0.0%	0.0%	0.0%	0.0%
	2015 <sup>3**</sup>	0.0%	0.0%	0.0%	0.0%
Herring-RHS: CC Midwater Trawl	2014*	63.2%	39.5%	22.7%	0.0%
	2015 <sup>3</sup>	62.4%	41.8%	24.9%	0.0%
Herring-RHS: GOM Midwater Trawl	2014*	64.3%	39.1%	22.8%	0.0%
	2015 <sup>3</sup>	61.1%	35.3%	20.8%	0.0%
Herring-RHS: SNE Bottom Trawl	2014*	24.1%	17.3%	13.2%	9.8%
	2015 <sup>3</sup>	28.0%	18.6%	13.3%	9.2%
Herring-RHS: SNE Midwater Trawl	2014*	23.0%	13.6%	8.5%	3.9%
	2015 <sup>3</sup>	22.7%	13.1%	7.5%	0.0%

Source: GARFO Quota Monitoring Database as of 5/22/2016

<sup>1</sup>Catch cap fishing year: river herring/shad = calendar year; haddock = May-April

<sup>3</sup>Fishing Year 2015 data are PRELIMINARY

\*2014 Herring RHS fishing year partially covered by RHS Catch Caps which was implemented on December, 4 2014

\*\*2015 GB Haddock fishing year truncated due to the closure of the GB Haddock AM Area on October 22, 2015

**Table 4. Alternative 2.2: Simulated mean CV at 25%, 50%, 75% and 100% ASM coverage with 25 mt trip exemption**

Catch Cap	Fishing Year <sup>1</sup>	Simulated Mean CV (%)			
		25% Coverage	50% Coverage	75% Coverage	100% Coverage
Haddock: GB Midwater Trawl	2011	25.4%	15.0%	8.9%	2.4%
	2012	24.8%	15.4%	9.7%	4.0%
	2013	26.1%	15.5%	9.3%	2.2%
	2014	22.2%	12.9%	7.6%	2.2%
	2015 <sup>3**</sup>	23.1%	13.5%	8.1%	2.7%
Haddock: GOM Midwater Trawl	2011	0.0%	0.0%	0.0%	0.0%
	2012	0.0%	0.0%	0.0%	0.0%
	2013	0.0%	0.0%	0.0%	0.0%
	2014*	0.0%	0.0%	0.0%	0.0%
	2015 <sup>3**</sup>	0.0%	0.0%	0.0%	0.0%
Herring-RHS: CC Midwater Trawl	2014*	61.9%	39.7%	23.4%	4.5%
	2015 <sup>3</sup>	63.7%	42.0%	24.2%	5.0%
Herring-RHS: GOM Midwater Trawl	2014*	62.8%	41.8%	25.8%	11.5%
	2015 <sup>3</sup>	63.6%	39.8%	25.0%	13.4%
Herring-RHS: SNE Bottom Trawl	2014*	24.2%	17.5%	14.1%	11.5%
	2015 <sup>3</sup>	24.8%	19.3%	15.4%	12.6%
Herring-RHS: SNE Midwater Trawl	2014*	32.5%	21.7%	16.2%	12.4%
	2015 <sup>3</sup>	34.3%	22.1%	15.9%	11.5%

Source: GARFO Quota Monitoring Database as of 5/22/2016

<sup>1</sup>Catch cap fishing year: river herring/shad = calendar year; haddock = May-April

<sup>3</sup>Fishing Year 2015 data are PRELIMINARY

\*2014 Herring RHS fishing year partially covered by RHS Catch Caps which was implemented on December 4, 2014

\*\*2015 GB Haddock fishing year truncated due to the closure of the GB Haddock AM Area on October 22, 2015

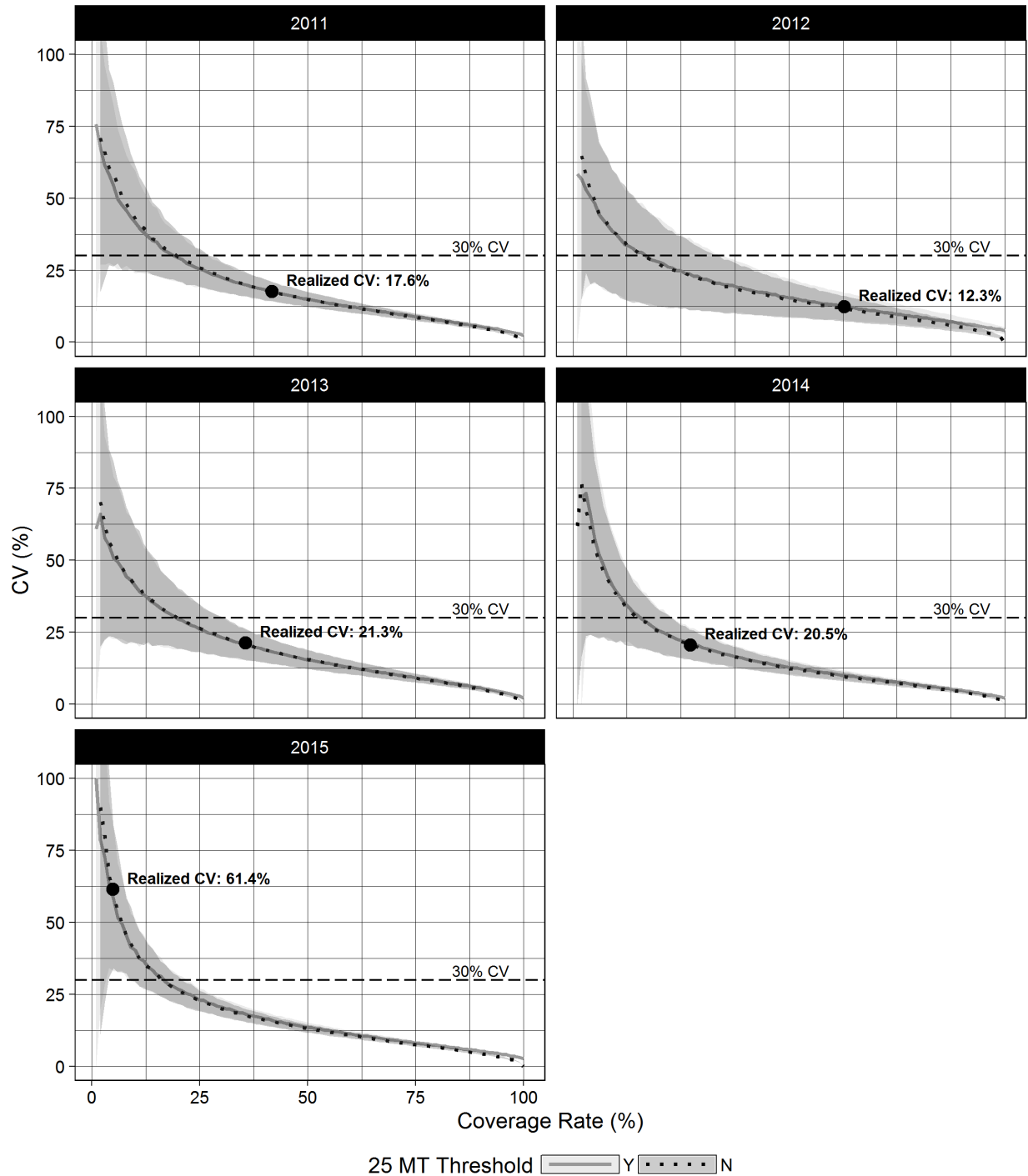
Figures 5 and 6 detail the simulation results by year and catch cap. The dotted line represents the mean simulated CV based on increasing Category A/B vessel coverage, while the solid line indicates the same simulation with the 25 mt trip exemption applied. The grey area around the solid and dashed lines represents the two standard error envelope around the mean simulated CV. It is important to understand that these are simulated CVs, therefore by their nature there is a range of resulting CVs for each coverage rate. The variability of the simulated CV (expressed by the standard error) is related to the variability of the underlying incidental catch data. The overlap (black dots on Figures 5 and 6) between the realized CV for these catch caps and the range of simulated CVs is a good indicator of that variability. All realized CVs fell within +/- 2 standard errors of the mean simulated CV, which implies the simulation is reasonable within that margin of error. For catch caps, the realized CV does not closely track the mean simulated CV. This effect is likely due to underlying variability in incidental catch data and/or small numbers of observed trips. The simulated GOM Haddock CV Catch Cap was not shown because no haddock catch was observed from 2011-2015.

**Overall, the GB Haddock Catch Cap, RHS SNE Bottom Trawl, and RHS SNE Midwater Trawl catch caps yielded a mean simulated CV < 30% for all simulated years at or below a 25% coverage rate.**

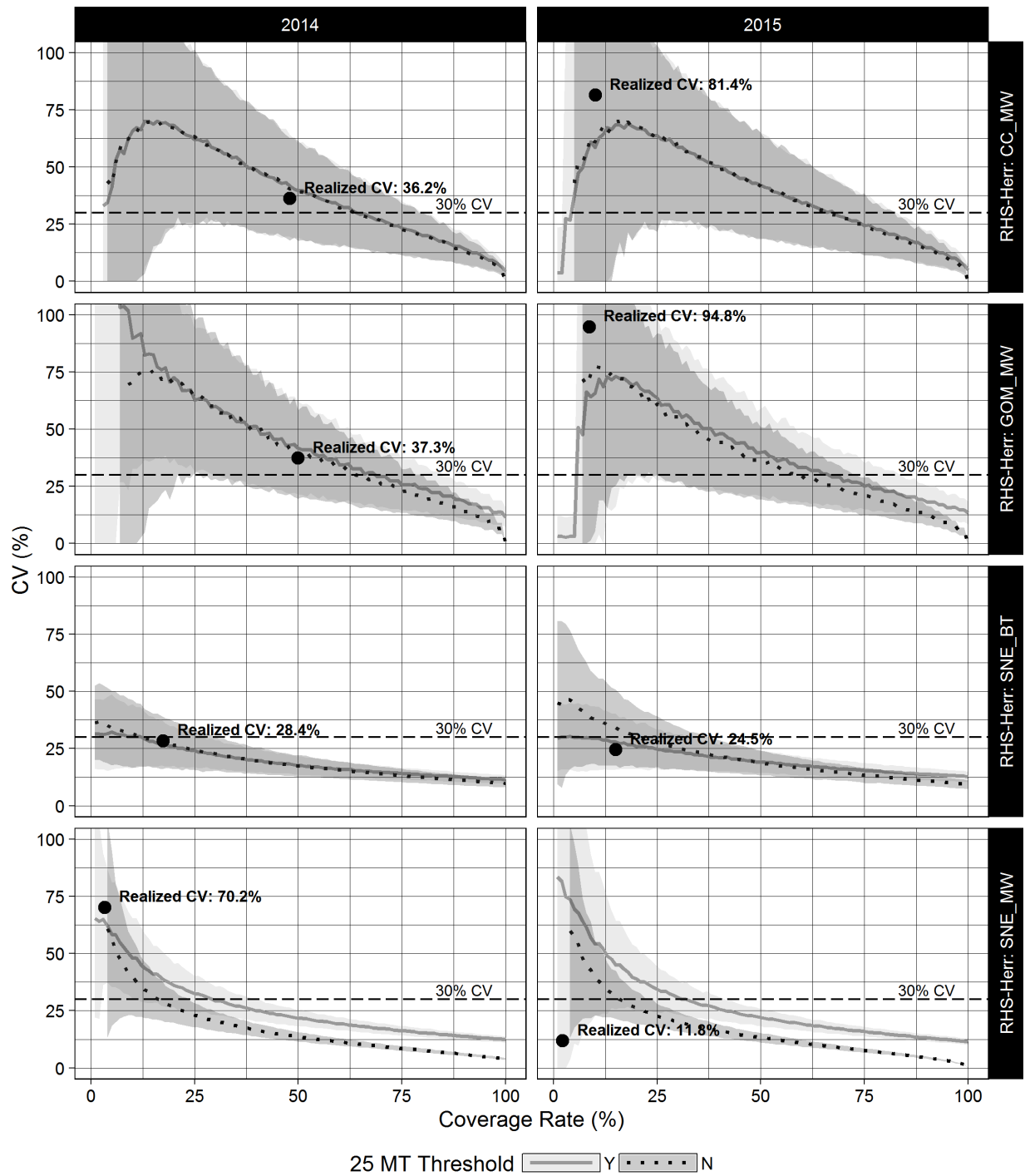
The performance was nearly identical under the 25 mt trip exemption option with the exception of RHS SNE Midwater Trawl Catch Cap, which shows the simulated mean CV slightly increase above 30%. RHS CC Midwater Trawl and RHS GOM Midwater Trawl Catch Caps were the only catch caps that clearly did not reduce below 30% at a 25% observer coverage rate. Given the broad range in the simulated CV for these caps (wide standard error envelope) it is difficult to draw strong conclusions from these results. Furthermore the relatively short (2 years) worth of data available from the RHS Catch Caps adds to this difficulty.

The simulated CV results must be interpreted as an estimate of what may happen in the future based on existing information. The simulations were based on past fishing behavior and observed incidental catch from within the catch caps. Therefore, they may not hold if either factor changes in the future.





**FIGURE 5. 2011-2015 SIMULATED GB HADDOCK CATCH CAP MEAN CV (+/- 2 STANDARD ERRORS) IN RESPONSE TO INCREASING OBSERVER COVERAGE ON CATEGORY A/B HERRING VESSELS, WITH REALIZED CV FOR EACH FISHING YEAR (BLACK DOT). INCLUDES 25 MT TRIP EXEMPTION OPTION.**



**FIGURE 6. 2014-2015 SIMULATED RHS CATCH CAP MEAN CV (+/- 2 STANDARD ERRORS) IN RESPONSE TO INCREASING OBSERVER COVERAGE ON CATEGORY A/B HERRING VESSELS, WITH REALIZED CV FOR EACH FISHING YEAR (BLACK DOT). INCLUDES 25 MT TRIP EXEMPTION OPTION.**



**Mid-Atlantic Fishery Management Council**

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Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman

Christopher M. Moore, Ph.D., Executive Director

## **M E M O R A N D U M**

**DATE:** May 31, 2016

**TO:** Council

**FROM:** Jessica Coakley and José Montañez, Staff

**SUBJECT:** Atlantic Surfclam and Ocean Quahog Specifications for 2017 and 2018

Atlantic surfclam and ocean quahog specifications expire at the end of 2016. Staff recommend specifications be set for 2 years (2017-2018) to ensure there is no lapse in management measures through 2018. The following materials are enclosed for the Council to consider when setting 2017 and 2018 specifications for Atlantic surfclam and ocean quahog:

- 1) Report of the May 2016 SSC Meeting (available under Tab 2)
- 2) Atlantic Surfclam and Ocean Quahog Fishery Performance Report
- 3) Atlantic Surfclam Staff Recommendation Memo to Chris Moore
- 4) Ocean Quahog Staff Recommendation Memo to Chris Moore
- 5) Atlantic Surfclam Fishery Information Document
- 6) Ocean Quahog Fishery Information Document
- 7) Report on Estimated Proportion of Undersized Surfclam Landings for 2015



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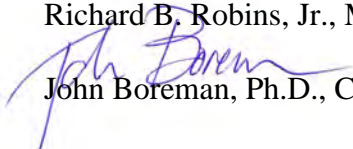
Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman

Christopher M. Moore, Ph.D., Executive Director

# MEMORANDUM

**DATE:** 1 June 2016

**TO:** Richard B. Robins, Jr., MAFMC Chairman

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

**SUBJECT:** Report of the May 2016 SSC Meeting

The SSC met in Baltimore, MD, on 25-26 May 2016 for the main purpose of developing multi-year ABC recommendations for Surfclams and Ocean Quahogs, and reviewing data updates to determine if the SSC's ABC recommendations for the squids, mackerel, and butterfish should be changed. The SSC also continued discussion of criteria for assigning coefficients of variation for OFLs, and providing input during the Council's re-examination of its risk policy for setting ABCs. The final meeting agenda is attached (Attachment 1).

A total of 12 SSC members were in attendance on May 25<sup>th</sup> and 10 on May 26<sup>th</sup>, which constituted a quorum for both days (Attachment 2). Also in attendance were scientists from the NEFSC (NMFS Northeast Fisheries Science Center) by phone, staff from the Council, and representatives from the fishing industry and the general public. Documents cited in this report can be accessed via the MAFMC SSC website (<http://www.mafmc.org/ssc-meetings/2016/may-25-26>).

## Surfclams

Jessica Coakley (MAFMC staff) reviewed the most recent survey and catch data provided by the NEFSC and the fishery performance report prepared by the Advisory Panel, with assistance from Dan Hennen (NEFSC staff). The current ABC specifications for Surfclams expire at the end of the 2016 fishing year, so the SSC is being requested to develop new specifications for the 2017 and 2018 fishing years. A new benchmark assessment is expected later this year.

The SSC's responses to the Council's terms of reference (ToRs, *in italics*) for Surfclams are as follows:

*For Surfclam, the SSC will provide a written report that identifies the following for fishing years 2017-2018:*

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

The SSC considered this stock to be characterized by an “SSC-modified OFL probability distribution” in line with its designation in 2013 (old Level 3).

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

Owing to the lack of a new stock assessment, the SSC used the same method that was used in 2013 to estimate the catch in weight for the 2017 and 2018 fishing years. The relevant levels are:

2017	<b>69,925 mt</b>	P(overfishing) = 50%
2018	<b>70,102 mt</b>	P(overfishing) = 50%

3) *The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock.*

The SSC determined the ABC by using the Council’s risk policy:

2017	<b>44,469 mt</b>	P(overfishing) = 29%
2018	<b>45,524 mt</b>	P(overfishing) = 30%

The SSC noted that it is continuing to use an OFL CV = 100% for its projections based on estimates derived from an assessment that employed data only up to and including 2011. Some additional caution that may be necessary because of this extended projection period. However, this is offset by survey evidence of average or above average recruitment in the southern regions, the fact that the quota has not been fully harvested in each year, and generally low exploitation rates.

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

The data for the most recent assessment included data up to and including 2011; therefore, the lack of an assessment that uses the most recent data is an important source of uncertainty. The SSC notes that a new assessment is expected to undergo peer review in July 2016 and, if accepted, should provide the basis for specifications when the SSC next reviews this species in May 2017. Additionally, the principal sources of uncertainty from the 2013 determination still apply:

- a. The  $F = M$  foundation for establishing OFL;
- b. Estimates of  $M$  used in the assessment;
- c. The scales at which regional replenishment occurs and the potential impact of localized depletion;
- d. Absolute biomass is not known, and biomasses are currently scaled to presumed abundance in 1999 to develop reference points (because the 1999 biomass is assumed to serve as a proxy for carrying capacity ( $K$ ) of the stock); and
- e. Uncertainty in the fishing mortality rates ( $F$ ), as identified by the SARC external review panel (Houde, et al. 2013). In particular, the comparison of catch to the scaled abundance (see point c above) introduces unquantified uncertainty in estimates of  $F$ . Also, incidental mortality estimates, which are used, in part, to generate fishing mortality rates are poorly described and are not current.

5) *Ecosystem considerations accounted for in the stock assessment, and any additional ecosystem*

*considerations that the SSC took into account in selecting the ABC, including the basis for those additional considerations.*

No specific, additional ecosystem considerations were provided to the SSC to include in developing the recommended ABC. The SSC notes that increasing regional temperatures are likely to impact the distribution and abundance of this species. The SSC also notes that ecosystem considerations are included in the terms of reference for the new benchmark assessment: ToR 3 addresses changes in Surfclam habitat quality related to climate change and other factors, and ToR 4 addresses a possible change in depth of Surfclams over time and its impact on vital rates.

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

The SSC notes that the ToRs for the upcoming benchmark assessment encapsulate the committee's concerns relative to research and monitoring recommendations.

*7) The materials considered in reaching its recommendations.*

- 2016 Surfclam and Ocean Quahog AP Fishery Performance Report
- A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf by Hare JA, Morrison WE, Nelson MW, Stachura MM, Teeters EJ, Griffis RB, et al. (2016)
- MAFMC Staff Memo from Jessica Coakley to Chris Moore, dated 6 May 2016
- 2016 Surfclam AP Information Document
- 2016 Surfclam Data Update
- Estimated Proportion of Undersized Surfclam Landings for 2015
- SAW 56 Summary Report
- SAW 56 Assessment Report
- SAW 56 Panelist Report

These documents can be accessed via the SSC's website (<http://www.mafmc.org/ssc-meetings/2016/may-25-26>).

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

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

## **Ocean Quahogs**

As with Surfclams, Jessica Coakley (MAFMC staff) reviewed the most recent survey and catch data provided by the NEFSC and the fishery performance report prepared by the Advisory Panel, with assistance from Dan Hennen (NEFSC staff). The current ABC specifications for Ocean Quahog also expire at the end of the 2016 fishing year, so the SSC is being requested to develop new specifications for the 2017 and 2018 fishing years. A new benchmark assessment is expected in 2017.

The SSC's responses to the Council's terms of reference (ToRs, *in italics*) for Ocean Quahogs are as follows:

*For Ocean Quahog, the SSC will provide a written report that identifies the following for fishing years*

2017-2018:

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

Owing to the lack of a more recent assessment, the SSC followed precedent and confirmed its previous evaluation of this stock as one for which “OFL cannot be specified with current state of knowledge.”

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

The SSC deemed that it lacked credible information on which to calculate an OFL.

3) *The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock.*

The SSC recommends setting an ABC for the 2017 and 2018 fishing years that maintains *status quo*. The recommended ABC in each year is **26,100 mt** – a direct extension of the level of ABC that has been in operation since 2014.

The SSC notes its expectations expressed in 2013 – that catches would remain relatively constant. The SSC also notes that a new assessment is expected in February 2017, the results of which, if accepted, should be available for SSC’s May 2017 meeting at which it can reconsider specification of ABC for the 2018 fishing year.

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

The SSC reiterates its concerns noted in its 2013 report. The SSC also encourages that information from the SCeMFis program on levels of recruitment be brought forward for consideration by the SAW/SARC working group and SSC.

Principal concerns in 2013 were:

- The fishing mortality rate reference point was deemed non-credible because species to which Ocean Quahog was compared were not appropriate;
- 40-year forecasts were provided in the previous assessment report and should be continued;
- Mechanisms for low recent recruitments are not known – could be either a result of underlying stock productivity or a consequence of life history of a long lived-species; and
- The nature of historical recruitments is poorly known.

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

No specific, additional considerations are included in the SSC’s recommended ABC. The SSC recommends that the upcoming assessment should follow the ecosystem considerations included in the Surfclam assessment and other habitat-related factors that may be relevant.

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

The SSC noted these areas in its 2013 report – and they are reiterated here with added notes in brackets:

- Development of credible management reference points remains a high priority. [The recent publication of a management strategy evaluation by Hennen (NAJFM – 2015) is step in this direction.]
- Reliability of estimates of stock biomass should be evaluated.
- Progress on developing age-length keys would be helpful for the assessment and for understanding recruitment patterns. [The SSC notes that the results from the SCeMFIS program may help in this regard.]
- Improved understanding of age-specific reproductive values would be of help in understanding the stock’s resilience. For example, are the older and much larger females as important contributors to the spawning potential as they are for some long-lived fishes?
- Quantification of habitat-specific productivity would be important – both in terms providing robust vital rate estimates and also ensuring sustainable patterns of exploitation.
- Impacts of climate variability on long-term productivity and spatial distribution of the stock and of the fishery.

7) The materials considered in reaching its recommendations.

- 2016 Surfclam and Ocean Quahog AP Fishery Performance Report
- A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf by Hare JA, Morrison WE, Nelson MW, Stachura MM, Teeters EJ, Griffis RB, et al. (2016)
- MAFMC Staff Memo from Jessica Coakley to Chris Moore, dated 9 May 2016
- 2016 Ocean Quahog AP Information Document
- 2016 Ocean Quahog Data Update
- Stock Assessment Update for Ocean Quahogs through 2011

These documents can be accessed via the SSC’s website (<http://www.mafmc.org/ssc-meetings/2016/may-25-26>). The SSC also referenced the following journal article:

Hennen, D. R. 2015. How should we harvest an animal that can live for centuries? *North American Journal of Fisheries Management* 35:512–527, 2015

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

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

## **Mackerel, Squids, and Butterfish**

For Atlantic Mackerel, Longfin Squid, *Illex* squid, and Butterfish, the SSC was asked to review their ABC recommendations for the 2017 fishing year to determine if they needed to be changed based on new evidence. Atlantic Mackerel are in year three of three-year specifications, and the squids and Butterfish are in year two of three-year specs. Jason Didden (MAFMC staff) and staff from the Northeast Fisheries Science Center (Kiersten Curti for Atlantic Mackerel, Lisa Hendrickson for the squids, and Chuck Adams for Butterfish) walked the SSC through the latest survey and catch data, as



well as the fishery performance reports developed by the MSB Advisory Panel. Documents considered during the SSC deliberations are accessible via the SSC website (<http://www.mafmc.org/ssc-meetings/2016/may-25-26>) and include the MAFMC staff memo containing ABC recommendations, MAFMC staff's fishery information updates, catch and survey updates from the NEFSC, the combined fishery performance report, the most recent Canadian assessment and TRAC assessments for Atlantic Mackerel, and other informational materials. **For all four species, the SSC determined that the available information did not support changing the ABC recommendations for fishing year 2017.** However, the SSC did note some concerns about the status of Atlantic Mackerel and the squids.

For Atlantic Mackerel, the SSC continues to be concerned about the absence of large fish in the survey area of US and Canadian waters. The SSC appreciated inclusion of the catch-by-area charts in the information provided by the NEFSC, and encouraged development of analogous charts for all species managed by the MAFMC. Since the implementation of annual catch limits in 2011, total catch of Atlantic Mackerel has been less than 40% of the annual ABCs, with the exception of 2015 where catch was approximately 51% of the ABC. Indices-at-age derived from the most recent (spring 2015) bottom trawl survey are predominately fish aged 1 to 3, similar to the age distribution observed in 2009 and 2011; no fish aged six or older were captured in the survey. In the past, these pulses of recruitment did not result in capture of older fish in later years. The SSC was informed that the Canadians are planning to do an assessment of mackerel in the coming year; the SSC encouraged development of a combined US/Canada joint assessment for Atlantic mackerel as part of the TRAC (Trans-Boundary Assessment Committee) process. However, Kiersten Curti informed the committee that recent talks with Canada indicated reluctance by the Canadians to conduct a joint TRAC-type assessment.

The SSC noted that the mean body weight of both squid species captured in the NEFSC bottom trawl survey is still declining. This continues to be a cause for concern that has been attributed to environmental factors, primarily water temperature.<sup>1</sup> The SSC asked if the smaller size of the squids was a limiting factor in the squid fishery; Jeff Kaelin will check and respond.

## CV Subgroup Report

Sarah Gaichas walked the SSC through her summary notes of her discussions with NEFSC stock assessment scientists regarding approaches to estimating the coefficient of variation (CV) for the overfishing limit (OFL), a key step in the development of ABC recommendations that invokes the Council's risk policy. The SSC then had a broader discussion of how to proceed regarding OFL CV estimation for both the short term and in the longer term.

The SSC made three general recommendations:

1. Historical forecast error is worth exploring as a short-term solution to establish an OFL CV based on assessments. This information could be requested within the assessment process, and would be available ideally whenever SSC is making recommendations.
  - a. The most useful OFL CVs would be developed from separate distributions for forecasts one, two, and three or more years out.

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<sup>1</sup> Dawe, E. G., L. C. Hendrickson, E. B. Colburne, K. F. Drinkwater, and M. A. Showell. 2007. Ocean climate effects on the relative abundance of short-finned (*Illex illecebrosus*) and long-finned (*Loligo pealeii*) squid in the Northwest Atlantic Ocean. *Fish. Oceanogr.* 16 (4): 303–316.

- b. Estimation would be done by looking across previous actual assessment documents, and not just using retrospective patterns within the current assessment. The number of assessments included would generally require going back as far as possible without getting to models and/or data sets that differ radically from the current situation.
    - c. Discussion of basic protocols within the subcommittee and with assessment scientists will be necessary; e.g., when are assessments too different to include in the analyses?
  2. Move ahead with more formal dialogue with the NEFSC to address the larger issue of estimating uncertainty in the OFL: how to develop criteria for “bins” of OFL CV by life history, data quality, assessment characteristics, and what an assessment able to estimate a satisfactory OFL CV directly actually looks like.
    - a. This dialogue could take the form of a 1-2 day workshop, possibly associated with an SSC winter meeting, and possibly convened in Woods Hole.
    - b. The Subgroup needs to develop clear objectives and a work plan before scheduling any workshop.
  3. Investigate coordination with the NEFMC SSC on risk policy, and how to ensure that requests made of NEFSC assessment scientists were efficiently coordinated between Councils.

The SSC had a related discussion of the MAFMC Risk Policy. The OFL CV Subgroup (Sarah Gaichas, Olaf Jensen, Tom Miller, Brian Rothschild, and Mike Wilberg, with the addition of Paul Rago and David Tomberlin) will assist the Council with analyses of the current risk policy and potential alternative components. Performance of the current risk policy (including selected OFL CV levels) could be addressed alongside alternative configurations of the risk policy that might include changes to P\* (probability of overfishing) values, species-specific control rules, or other measures to control interannual variability of ABCs. A management strategy evaluation could address this, but it would be a long-term project and best coordinated with the longer-term collaborative approach to address OFL CV (see point 2 above).

A broader approach to risk policy looking beyond single species approaches to stewardship and management was suggested. This may need the SSC and Monitoring Committee working together, and addressing it would require adding economic and social sciences expertise to the OFL CV Subgroup. Questions to investigate could include:

- When setting ABC for one species, what are ecological and economic outcomes for other species?
- What have been the consequences of our decisions, beyond impacts on the stock? Evaluating this requires better performance measures for economic and social objectives.
- What is being given up throughout the fishery? What other choices will be available given a specific ABC for one species? What are impacts to other fisheries?
- What is the consequence overall of choosing an ABC?
- How might new National Standard 1 and 2 Guidelines influence with the risk policy?

## **Council’s ACL/AM Omnibus Framework**

Rich Seagraves updated the SSC on an action recently taken by the Council to initiate a review of its risk policy and ABC control rule framework, which were implemented as a result of the 2007 MSA Reauthorization. MAFMC staff is currently developing a set of alternatives to the risk policy for consideration by the Council, including different control rules based on different life histories or species groups, a potential increase to a maximum P\* of 45%, and the shape of the risk tolerance response

curve. The Council is also considering building in inertia to ABC recommendations to minimize inter-annual variability in catch (i.e., restrict inter-annual changes in to ABC to some percentage). In addition, the Council would like to see a more formalized treatment for species with assessments in the data poor category; staff recommends working with the SSC's CV Subgroup and the Council's Executive Committee to accomplish this task. The Council is also considering convening an external panel to provide an independent peer review of the current system. Finally, the Council is interested in determining how the risk policy has performed over the past five years (which could be determined via a management strategy evaluation) and is seeking ways to improve that performance.

During the ensuing discussion, the SSC noted that recent reductions in ABCs were not the result of decisions made about the CV of OFL by the SSC (i.e., they were not due to the selection of CVs input into ABC control rule framework). For example, recent changes in the ABC for summer flounder were the result of changes in stock biomass from the recent assessment update. [The MAFMC SSC is one of the few SSCs actually facing the probability question instead of using *ad hoc* methods.] This is a difficult scientific question and it is probably impossible to get a direct analytical estimate from stock assessments. While the Council welcomed the reduction in the OFL CV from 100% to 60% for some of the species, their concerns relate to the lack of objective criteria to establish the CV about OFL for a given stock assessment. The SSC shares these concerns, which is the basis for establishment of the CV Subgroup.

In terms of maintaining stability of annual catch limits, there is a tension between maximizing yield and maintaining stable catch streams. The Council's desire to place limits on the maximum change in ABC from year to year is largely driven by social and economic considerations. Establishing boundary conditions for acceptable volatility in catch vs risk to populations is not a scientific matter but rather a policy one driven by social and economic considerations. The main objective should be to reduce the volatility in ABCs and avoid chasing assessment noise, while following the rules during standard assessment updates.

In terms of outcomes, the Council and SSC need to consider the consequences of decisions based on the current risk policy and ABC control rule framework. This evaluation should extend beyond the biological impacts on the stock and should include critically important social and economic performance measures as well. On a related issue, the SSC noted that there is an artificial separation between ABC and ACL/TAC considerations - the SSC has never looked at the latter part. The Council should consider ways to address this separation and re-evaluate the SSC's role relative to the role of the Monitoring Committees.

The SSC also noted that the CV Subgroup is currently establishing criteria to bin the CVs for MAFMC stock assessments. The uncertainty associated with the different sources of data that drive the overall OFL CV needs to be more fully explored (see the preceding section of this report). The current risk policy implies a different temporal trajectory of the population in response to the control rule, which does not vary by species. It is critical that an empirical basis is established for specification of the CV for each Mid-Atlantic stock assessment (the stock's life history could be a basis).

Staff will report back to the Council on this discussion and proceed with the plan to engage the SSC through the CV Subgroup in an evaluation of the current system, and consider modifications to the risk policy and ABC framework (with external peer review of any proposed changes).

cc: SSC Members, Lee Anderson, Chris Moore, Rich Seagraves, José Montañez, Jason Didden, Jessica Coakley, Dan Hennen, Kiersten Curti, Lisa Hendrickson, Chuck Adams

Mid-Atlantic Fishery Management Council  
Scientific and Statistical Committee Meeting  
25-26 May 2016

Final Agenda

Wednesday May 25, 2016

- 1:00 pm Recommend surfclam and ocean quahog ABC specifications (2017-2018)
- 3:30 pm CV Subgroup Report
- 5:00 pm Adjourn

Thursday May 26, 2016

- 8:30 am Review 2017 Atlantic mackerel, long-finned squid, Illex, and butterfish ABC specifications
- 10:00 am Other business - Council's ACL/AM Omnibus Framework
- 11:00 am Adjourn

MAFMC Scientific and Statistical Committee  
25-26 May 2016 Meeting  
Baltimore, MD

<u>Name</u>	<u>Affiliation</u>
<i>SSC Members in Attendance:</i>	
John Boreman (SSC Chairman)	NC State University
Tom Miller (SSC Vice-Chair, 5/25 only)	University of Maryland - CBL
David Tomberlin	NMFS Office of Science and Technology
Doug Lipton	NMFS
Mark Holliday	NMFS (Retired)
Mike Frisk (5/25 only)	Stony Brook University
Sarah Gaichas	NMFS Northeast Fisheries Science Center
Ed Houde	University of Maryland – CBL
Wendy Gabriel	NMFS Northeast Fisheries Science Center
Olaf Jensen	Rutgers University
Paul Rago	NMFS (retired)
Rob Latour	VIMS
 <i>Others in attendance:</i>	
Rich Seagraves	MAFMC staff
Jessica Coakley (5/25 only)	MAFMC staff
José Montañez (5/25 only)	MAFMC staff
Jason Didden (5/26 only)	MAFMC staff
Dan Hennen (by phone, 5/25 only)	NMFS Northeast Fisheries Science Center
Lisa Hendrickson (by phone, 5/26 only)	NMFS Northeast Fisheries Science Center
Chuck Adams (by phone, 5/26 only)	NMFS Northeast Fisheries Science Center
Kiersten Curti (by phone, 5/26 only)	NMFS Northeast Fisheries Science Center
Dave Wallace (5/25 only)	Wallace and Associates
Jeff Kaelin	Lund's Seafood and MAFMC member
Tom Alspach	SCOQ Advisory Panel member
Purcie Bennett-Nickerson (5/26 only)	Pew Charitable Trust
Greg DiDomenico (5/26 only)	GSSA

**Mid-Atlantic Fishery Management Council (MAFMC; Council)**  
**Surfclam and Ocean Quahog Fishery Performance Report (FPR)**  
**May 2016**

The Council's Surfclam and Ocean Quahog Advisory Panel met on May 2, 2016 via webinar and in-person at the Council office to review 2016 data updates to the surfclam and ocean quahog fishery information documents and revise the fishery performance report based on advisor perspectives on these fisheries.

*Council Advisors:* Thomas Alspach, Thomas Dameron, Peter Himckak, Samuel Martin, Joseph Myers, David Wallace.

*Public:* Thomas Hoff, Michael LaVecchia, Peter Hughes, Purcie Bennet-Nickerson.

*Staff and Scientific and Statistical Committee:* John Boreman (SSC), Mark Holliday (SSC), Thomas Miller (SSC), Doug Lipton (SSC), Jessica Coakley (Staff), José Montañez (Staff), Doug Potts (GARFO Staff).

**Surfclam and Ocean Quahog**

**Critical Issues**

- The most critical current challenge to the surfclam and ocean quahog fishery is the New England Council's Omnibus Habitat Amendment which has the potential to ban bottom tending mobile gear (including clam dredges) from high energy sand environments where the surfclam and ocean quahogs fishery is the only fishery being prosecuted. This action has the potential impact on the spatial distribution of the fishery, which will result in biological impacts as well as social and economic impacts. It also impacts the Mid-Atlantic Council's ability to manage its jurisdictional fishery for surfclam and ocean quahogs. The industry needs the support of the Council and NMFS in addressing these concerns. As an update to the above, the industry has been engaged in an industry funded effort to examine additional databases (NMFS clam survey data) to examine spatially where industry fishing activity with hydraulic clam gear could occur. The intent is to use this information to identify discrete areas within proposed closures where clam fishing could occur without impacting groundfish habitat.

**Market Issues**

- For surfclams and ocean quahogs, there are occasional landings in Ocean City, MD. It used to be significant but is no longer. Cape May and Wildwood, NJ are no longer significant. Most of the fleet is fishing out of Pt. Pleasant and Atlantic City, NJ, Oceanview, NY, Hyannis, MA (surfclams only), and New Bedford, MA. Vessels have been moving North and shifting effort. For more details, see the Surfclam and Quahog Information Documents.

- For Maine quahogs, the quahogs have increased to sizes larger than the preferred small size for the market, which explains the decline in the catch rates and prices for Maine quahogs. There is a

suggestion that there is another bed of small clams that has been found, but that is not reflected in the catch.

- A major reason clam plants have been closed over the last 20 years has been wastewater. Two plants recently had permits coming due and closed because of the wastewater requirement and capital investments needed to meet permit limits.

- Another reason for recent consolidation has been the cost of fuel prices and the distance needed to travel to harvest clams - which cascades through the vessel, processors, ports, etc., and has put greater economy on scale and location. Vessel discharge permits will be additional costs, and will affect both vessels and docks. Vessels that have ballast tanks are required to have a vessel discard permit for those vessels greater than 79 ft. Fuel prices have declined giving some relief to industry participants. Commercial Fishing vessels have also been given a 3 year exemption to the Vessel Discharge Permit regulations.

- The cost of complying regulatory function has increased. Prior to 1990, there were already great regulatory costs (e.g., Clean Water Act, Clean Air Act, and other fisheries related regulations). Since the individual transferrable quota (ITQ) went into place to the present, the regulatory function has increased substantially (e.g., coast guard, habitat requirements, bycatch species (marine mammals), etc.) and the cost of staying up to date and following the regulatory requirements (complexity and number) is expanding. The Cost Recovery Amendment is going through rulemaking, and will include recovery of incremental costs for management of the ITQ fisheries. Cost associated with the onboard paralytic shellfish poisoning (PSP) protocol for vessels fishing on Georges Bank includes testing costs, training of personnel, and further testing when clams are brought to shore.

- Vessels built after July 2013 will need to be "classed", and then subsequently kept in that class by inspections, which created significant cost considerations. U.S.C.G. regulations written, under review and soon to go into effect will require training, or demonstration of knowledge and competency, for all individuals in charge of commercial clam vessels operating in federal waters. Current regulations require new commercial fishing vessels, built after July 1, 2013, that are 79 feet or greater in length to be assigned a load line. Regulations require new commercial fishing vessels, built after July 1, 2013, that are at least 79 feet overall in length and will operate in federal waters to meet survey and classification requirements. Commercial fishing vessels built to class requirements before July 1, 2013 must remain in class. Certain commercial fishing vessels that undergo a major conversion will be required to comply with an "alternate safety compliance program" yet to be developed for both load line and construction standards requirements.

- The push to comply with global food safety requirements/initiatives and sustainability certification lead to additional costs. The global food safety ratings are being required by buyers, and if not satisfied could lead to buyers choosing not to use specific suppliers. The Marine Fisheries Advisory Committee (MAFAC) has recommended that NOAA Fisheries use their inspection service to develop sustainability certifications for US seafood similar to the Marine Stewardship Council (MSC) and other independent groups. The surfclam and ocean quahog fisheries are presently under review for MSC certification for Federal surfclam and non-Maine

ocean quahogs; the final report should be available soon with possible certification by the end of the summer.

- The seafood imported into the US needs to be compliant with hazard analysis and critical control points (HACCP) but may not have to meet the third party audits, which makes the domestic seafood more expensive. During a recertification process, it becomes more stringent than the initial certification ("keep raising the bar"); the facility could be found not compliant.

- Increasing foreign imports and foreign competition puts a constraint on price, and the price cannot be increased to absorb all the additional costs and still be competitive in the market place. The limit in demand for clams in the market is driven by many market factors including foreign seafood competition, other products in the marketplace (chicken, etc.), shifting toward healthier market products (e.g., clam sushi, etc. versus a fried or cream based product), and competition with other ingredients, as clams typically are not a center of the plate product. The overall retail market has been steady to a slight decline.

- If just comparing landed value of surfclams and ocean quahogs to landed value of other fish seafood products, you would tend to underestimate the total economic value of that fishery. There is limited information on the multipliers for this industry. There is a large multiplier from the shucking plant to further processing. A study is being conducted to examine these factors in more detail.

### ***Environmental and Ecological Issues***

- Many species (including surfclams and ocean quahogs) are moving toward the poles or into deeper waters. This movement is temperature driven. Historically, about half the quota for quahogs used to be taken in the area off the Southern area. The surfclams are increasing in these Southern areas, possibly because of the faster growth rates for surfclams settling when compared to quahogs. Some of the Southern beds that used to be quahog beds now have surfclam recruitments.

- The natural shift in the stocks distribution northwards has driven the movement of the fishery. For more details, see the Surfclam Information Document.

- The issue of bottom tending mobile gear impacts on habitat will continue to be a concern. The environmental community is focused on these issues and there has been a push for increased closures as a tool to reduce habitat impacts. Many of the approaches used are not always based on the best available information to describe impacts and possible approaches. The spatial area for the fishery is small and the gear impacts are considered to be minimal and temporary in nature, due to the high energy sand environments.

- Three positive aspects to support the sustainability of the surfclam and ocean quahog resources include, 1) the opening of Georges Bank has mitigated some of the prior concerns by providing access to more, larger clams and alleviating some of the fishing pressure from the Southern areas, 2) there are ongoing discussions and research projects examining how best to protect small clam areas and increase productivity of the surfclam and quahog stocks (Science Center for Marine Fisheries; SCeMFiS), and 3) compliance with the MSC certification process on an ongoing basis.



### ***Management Issues & Management Induced Effort Shifts***

- The Mid-Atlantic Council needs to be more involved in habitat issues (and other issues) that are being proposed through the New England Council process. Many gear or fishery closures are being proposed for species such as groundfish, that will impact surfclam, ocean quahog, and other fisheries (e.g., Georges Bank, Great South Channel, Nantucket Shoals, etc.). The Council now has additional seats on the Habitat Committee to better engage with the New England Council on issues that affect surfclams and ocean quahogs. Advisors urge the Mid-Atlantic Council to appoint members from states that are most engaged and knowledgeable about these fisheries. For industry, keeping up to date and being proactive about what is being proposed is an additional cost. Small fishermen are less able to afford to send people to meetings to stay engaged on the issues.
- Advisors ask the MAFMC to provide the Bureau of Ocean Energy Management (BOEM) all relevant data on surfclam and ocean quahog habitat and highlight the devastating effect a BP like disaster would have on our fishery if oil and gas leases were given out in the waters to the south [in Mid-Atlantic] that are now under consideration.
- The clam industry is concerned about the wind farm leasing process and any mitigation procedures that are undeveloped at this point. The industry wants opportunities to engage on wind array siting relative to the most productive clam fishing beds. BOEM has sold wind energy lease areas off of NJ that correspond with historically important surfclam harvest areas. Industry coordinated the work of Toni Chute (NOAA) and Brian Hooker (BOEM) to produce GIS mapping layers of US Atlantic Coast Surfclam Landings between 1985 - 2014 by 10 minute square and 5 year time periods as a tool to mitigate the wind energy siting consequences to the fishery. This interactive tool can be found at: <http://arcg.is/1ONVCyL>

### ***General Fishing Trends***

- Effort is moving northward because the catch rates are higher, resulting in a smaller footprint from dredging activity on habitat. For more details, see the Surfclam and Quahog Information Documents.
- The larger vessels will be accessing Georges Bank, because of the distances traveled and effects of weather. Nantucket Shoals is a smaller boat fishery.
- The larger surfclam vessels going to Georges Bank has taken pressure off some of the nearshore areas, and Southern areas.
- The landings per unit effort (LPUE) may not be indicative of abundance because it only reflects the fishing occurring in a few ten minute squares. The Stock Assessment Review Committee (SARC) panel recommended a more detailed analysis be undertaken on LPUE, and did not make definitive conclusions about the utility of LPUE as an index of abundance. The advisors noted that the LPUE's in the 1970's and 1980's were lower, then increased, and then decreased again. The Advisors were concerned that some of the figures in the CRD13-04 did not include these longer time series showing those initial lower levels. These longer time series figures are in the final assessment report.

- The LPUE has leveled off in recent years. The increases on Georges Bank offset the reduction in LPUE for the areas off NJ for the large clams to use for fried clams.

- 3 vessels are working on Georges Bank for surfclams. When transiting vessels are under time constraints because of product quality, so the 2 smaller vessels (which are slower) stay in the same area while the larger vessels steams further to the east.

- Industry have voluntarily implemented closed areas for small surfclams to maximize use of the resource. The program began about 6 months ago. The Science Center for Marine Fisheries (SCeMFiS) is doing the survey and sampling for the area (annually). Processors and boat owners agreed to close a significant area off Ocean City, MD, and an area off Point Pleasant, NJ (250 square miles). It is being monitored using VMS and associated geo-fencing, and there is an agreed penalty schedule for fishing in the area.

### ***OY***

- The industry was comfortable with a maximum OY of 3.4 mil bushels for surfclams in terms of production. For ocean quahogs a maximum OY of 6 million bushels is reasonable in terms of production. Landings for quahogs have been below the OY range because of demand for quahogs.

### ***Other Issues***

- The group would like to see *status quo* quotas for the upcoming fishing years; the stability in the quota translates into stability in the fishery and market.

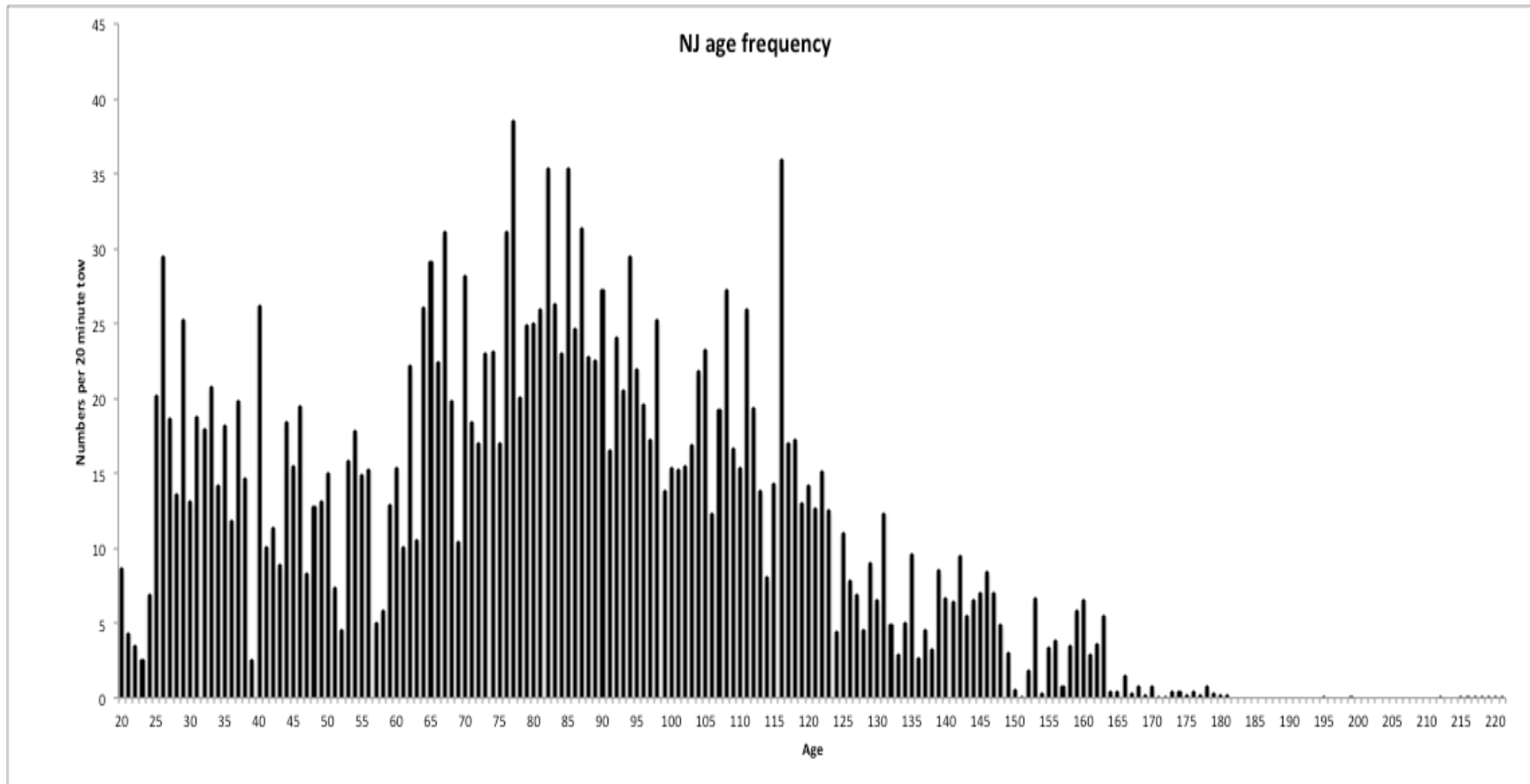
- The clam fishery is the first fishery doing electronic reporting on a per vessel and trip basis (“e-Clams”). It is still being evaluated and tested by NMFS, so both paper and electronic logs are being used and matched. The information should be available in more real time once implemented.

- The new SCeMFiS is industry and National Science Foundation (NSF) supported and has several ongoing and recently completed research projects:

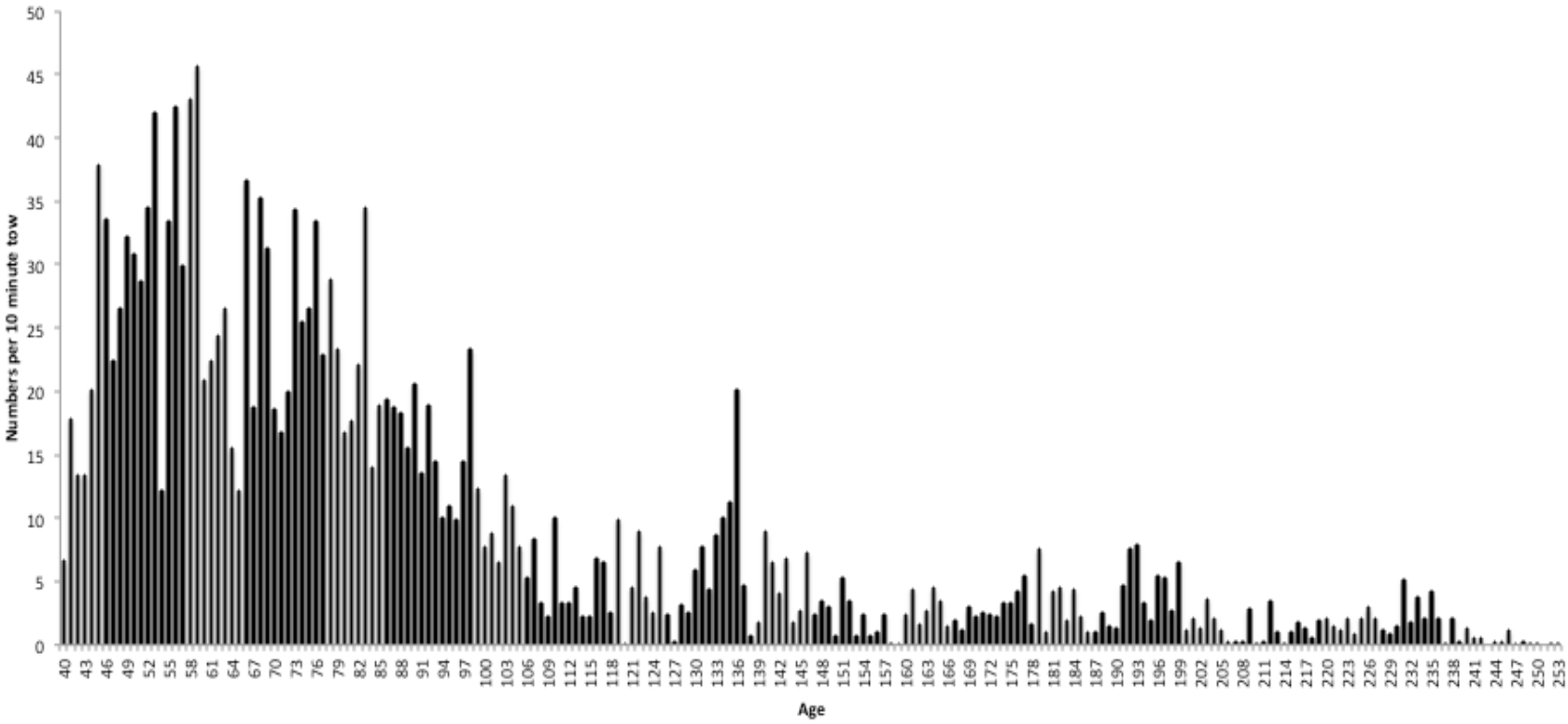
- SCeMFiS, with contributions from NMFS NEFSC, has completed research into data corrections for the breakage of clams in survey mode. This research was taken up because of the additional breakage since switching over to an industry vessel for surveys. If any size clam, large or small, experienced disproportionate breakage the age demographic of the population would not be accurately represented in the assessment. The final report is available on the SCeMFiS website.
- SCeMFiS has completed the fabrication of a dredge for the collection of juvenile (pre-recruit size) ocean quahog and surfclams. The new Dameron-Kubiak dredge, to be used for selectivity sampling typically conducted during survey operations, has been tested by the NEFSC, NMFS, and found to improve selectivity experiments. The final report is available on the SCeMFiS website.

- SCeMFiS has evaluated an area management strategy for the surfclam fishery as one of its projects. The final report is available on the SCeMFiS website.
- SCeMFiS has funded Ocean Quahog recruitment and life history dynamics research. SCeMFiS research does not agree with the long held belief that major quahog recruitment events appear to be separated by decades, that ocean quahogs are relatively unproductive with infrequent recruitment thus vulnerable to overfishing and potential contribution of recruitment to stock biomass and productivity is unknown. The Dameron – Kubiak dredge has shown regular recruitment from the last 60 years down to 10 years of age where the dredge efficiently captures animals. (Recruitment of the ocean quahog (*Arctica islandica*): size and age structure in collections with the Dameron-Kubiak dredge in summer 2014. A final report to Industry Advisory Board (IAB) of the SCeMFiS project number: 2014-02-RM-VIMS now on the SCeMFiS website - [www.scemfish.org](http://www.scemfish.org)). Ongoing studies of age structure from 60 – 180 years of age show regular recruitment with lower reports of very old animals probably due to natural mortality. Major recruitment events appear to be more by chance of larval survival and the fact that the stock is near carrying capacity. For more details see Attachment 1, which are preliminary attached age frequency plots from ongoing research to be released towards year-end with Sara Pace’s master’s thesis.
- SCeMFiS has funded a Surfclam and Ocean Quahog assessment team made up of Drs. Daphne Monroe, Eric Powell and Roger Mann. The team will attend meetings of the Invertebrate Subcommittee, SAW and MAFMC SSC and support the academic commitment to the ocean quahog benchmark assessments. The team will provide new information through the Invertebrate Subcommittee process on historical and recent recruitment to address SSC concerns. The SCeMFiS team will interface with and provide support to the NMFS assessment team during the assessment process with the goal of reducing uncertainty in the assessment process.

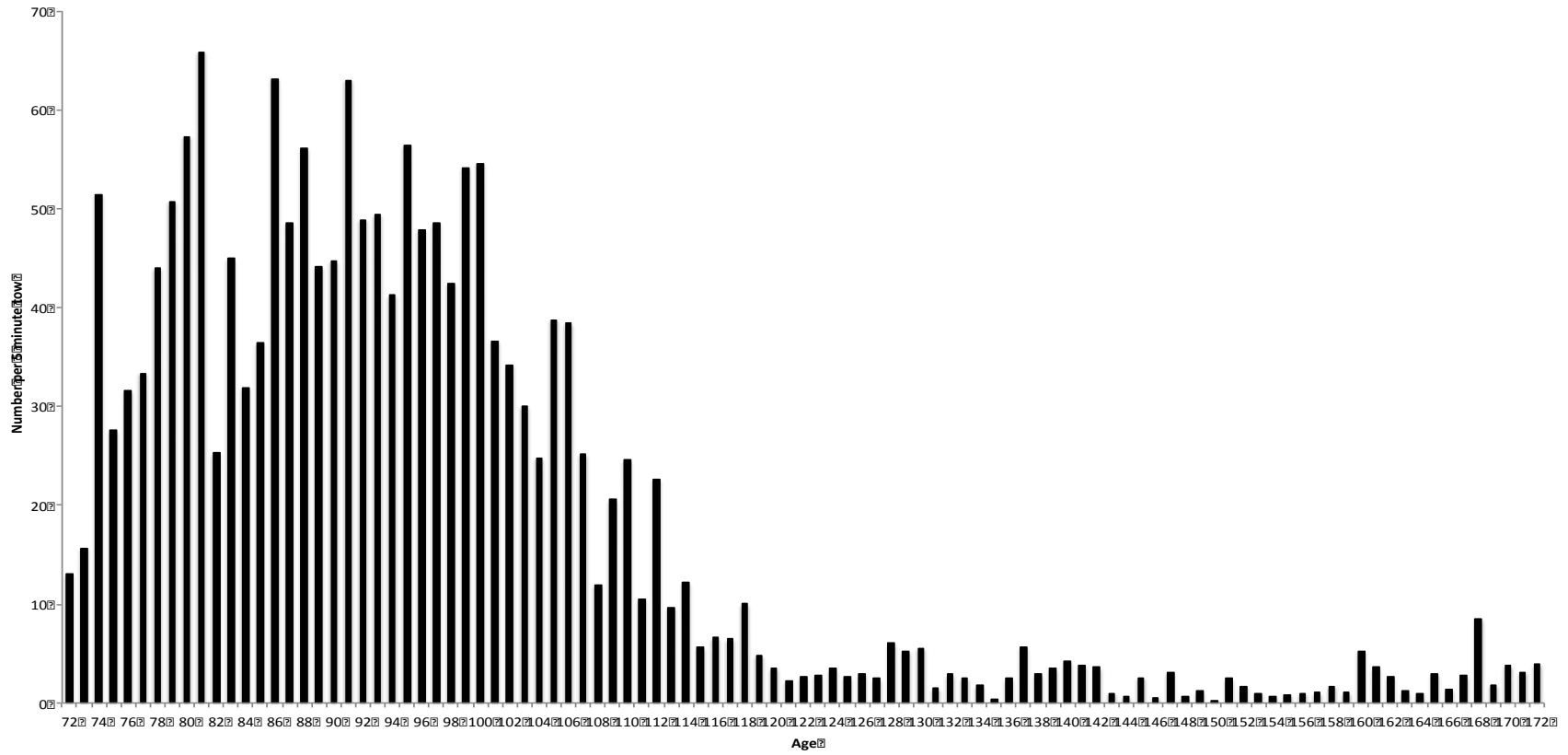
**Attachment 1. New Jersey, Long Island, Southern New England, and Georges Bank age frequencies.**



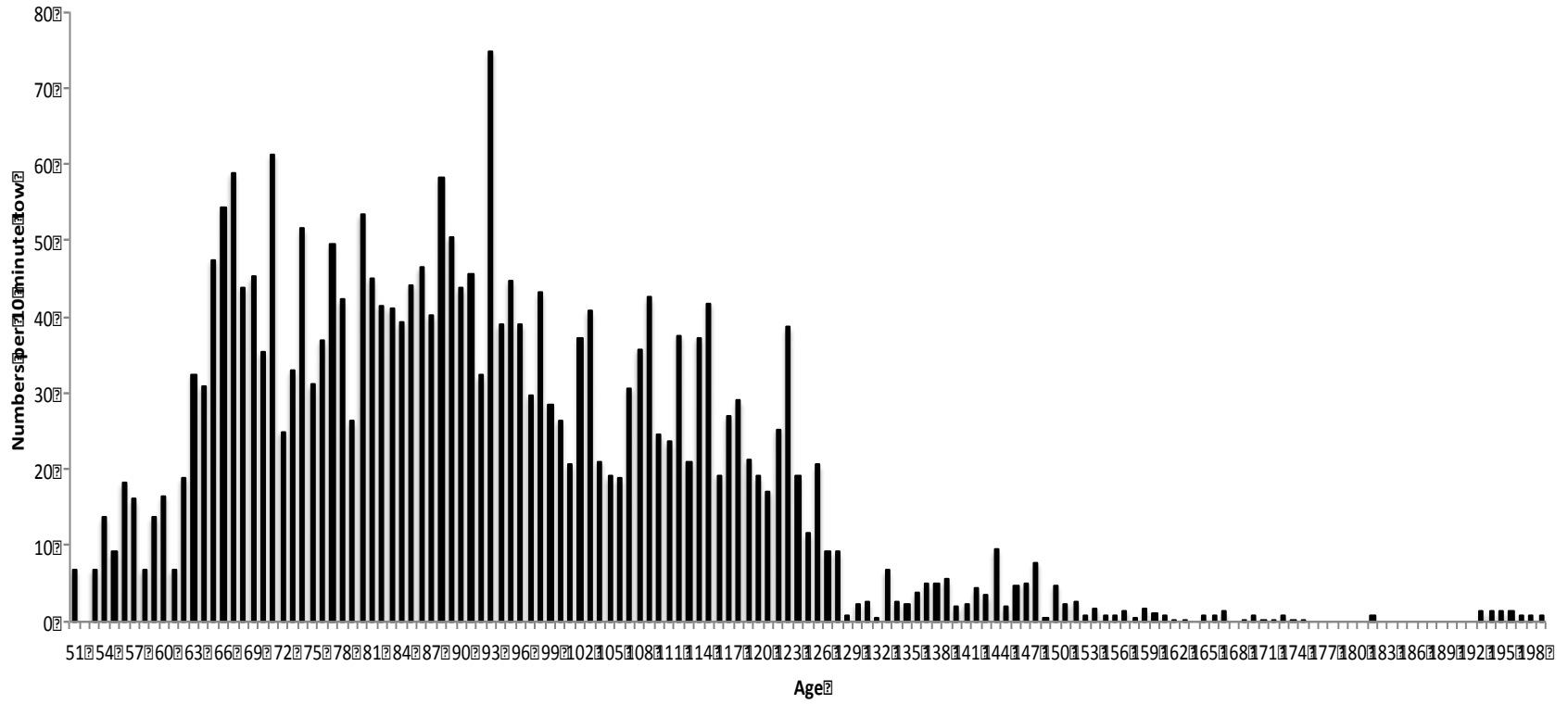
### LI age frequency



SNE Age frequency



# GB age frequency





## Mid-Atlantic Fishery Management Council

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# MEMORANDUM

**Date:** May 6, 2016  
**To:** Chris Moore, Executive Director  
**From:** Jessica Coakley and José Montañez, Staff  
**Subject:** Surfclam Management Measures (2017 and 2018)

### Executive Summary

The Atlantic surfclam resource in the US exclusive economic zone (EEZ) is not overfished and overfishing is not occurring in 2011 (NEFSC 2013a). The National Marine Fisheries Service (NMFS) Northeast Fishery Science Center (NEFSC; Dan Hennen Pers. Comm., NEFSC 2016) has provided data updates regarding recent fishery and biological data available at:

[http://www.mafmc.org/s/DataUpdatefromNEFSC\\_Surfclam.pdf](http://www.mafmc.org/s/DataUpdatefromNEFSC_Surfclam.pdf).

Atlantic surfclam specifications expire at the end of 2016. Staff recommend specifications be set for 2 years (2017-2018) to ensure there is no lapse in management measures through 2018. New stock assessment information will be available in 2017 to possibly change the previously recommended management measures for 2018 as well as set the measures for 2019-2020. The staff recommendation for acceptable biological catches (ABCs) for 2017 and 2018 are 44,469 mt and 45,524 mt, respectively. This is based on surfclam being classified as a typical stock, and the application of the Council risk policy using a Scientific and Statistical Committee (SSC) modified overfishing limit (OFL) probability distribution. The FMP specifies that the annual catch limit (ACL) equals the ABC. Staff recommend an annual catch target (ACT) = 29,364 mt and a commercial quota of 26,218 mt (3.4 million bushels) for 2017 and 2018. This is the same ACT and commercial quota that was implemented for the 2014-2016 fishing years. Staff recommend the surfclam minimum size be suspended in 2017, but recommend that the Council consider the issue of large numbers of small clams appearing in the landings from the Delmarva area. Staff also recommend NMFS undertake detailed analysis of the data relative to the small clam area closure regulations, so the information is available for May/June 2017.

### Introduction

The MSA requires each Council's SSC to provide, among other things, ongoing scientific advice for fishery management decisions, including recommendations for ABC, preventing overfishing, and maximum sustainable yield. The Council's catch limit recommendations for the upcoming fishing year(s) cannot exceed the ABC recommendation of the SSC. In this memorandum, information is presented to



assist the development of measures for the Council to consider for the 2017 and 2018 fishery for surfclams. The SSC will recommend an ABC for the surfclam fishery that addresses scientific uncertainty. Based on the SSC recommendations, the Council will make recommendations for ACLs, ACTs, and other implemented measures, and provide those recommendations to the NMFS Northeast Regional Administrator.

### **Review of SSC Recommendations from May 2013**

In May 2013, the SSC met to recommend ABCs for surfclam for fishing years 2014-2016. The SSC recommended that the assessment be considered Level 3 because it provided an acceptable OFL estimate, included estimates of pertinent life history parameters, and explicitly incorporated a substantial amount of available data and also permits uncertainty in input parameters. At that time, the SSC concluded it did not rank higher because the reference points were proxies (not internally estimated) and the uncertainty estimates of the OFL in the assessment could not be used directly to represent all key sources of uncertainty.

The SSC considered surfclam to be a “typical” stock and applied the Council’s risk policy to generate ABCs assuming the uncertainty around the OFL is lognormally distributed with a CV=100%.

<b>Year</b>	<b>OFL (mt)</b>	<b>ABC (mt)</b>	<b>P (overfishing)</b>
<b>2014</b>	81,150	60,313	36%
<b>2015</b>	75,178	51,804	33%
<b>2016</b>	71,512	48,197	32%

At that May 2013 meeting, the SSC noted the principle sources of scientific uncertainty are:

- a) The  $F = M$  foundation for establishing OFL;
- b) Estimates of  $M$  used in the assessment are uncertain;
- c) Uncertainty over the scales at which regional replenishment occurs and the potential impact of localized depletion;
- d) Absolute biomass is not known, and biomasses are currently scaled to presumed abundance in 1999 to develop reference points; and,
- e) Uncertainty in the fishing mortality rates ( $F$ ), as identified by the SARC external review panel (Houde, et al. 2013). In particular, the comparison of catch to the scaled abundance (see point c above) introduces unquantified uncertainty in estimates of  $F$ . Also, incidental mortality estimates, which are used, in part, to generate fishing mortality rates are poorly described and are not current.

## **Stock Status and Biological Reference Points**

The Atlantic surfclam stock assessment was peer reviewed and approved for management at Stock Assessment Workshop 56 (SAW 56). A statistical catch at age and length model called SS3 was used and incorporates age and length structure, and was conducted as two assessment area pieces and then combined (NEFSC 2013a). More detailed descriptions of stock assessment are available in the SAW 56 documents (i.e., summary, report, SARC panel reviews) at: <http://www.nefsc.noaa.gov/saw>.

SAW 56 biological reference points were not revised from the prior SAW and include:

- Fishing mortality threshold of  $F_{MSYPROXY} = M = 0.15$ ,
- $B_{MSYPROXY} = B_{TARGET} = 972,000$  mt meats, and,
- Minimum stock size threshold, one-half  $B_{MSYPROXY}$ , as  $B_{THRESHOLD} = 486,000$  mt meats.

The Atlantic surfclam resource in the US EEZ is not overfished and overfishing is not occurring in 2011 (NEFSC 2013a). Estimated biomass of the entire resource during 2011 (approximate 120+ mm shell length, SL) was 1,060,000 mt meats, with a 95% confidence interval of 802,000 - 1,401,000 mt. The 95% confidence interval overlaps the  $B_{TARGET} = \frac{1}{2} B_{1999} = 972,000$  mt meats but is entirely above the  $B_{THRESHOLD} = 486,000$  mt. Estimated annual fishing mortality during 2011 for the entire resource was  $F = 0.027$  (95% confidence interval 0.016 - 0.045), which is entirely below the overfishing threshold  $F_{MSYPROXY} = 0.15$ .

## **Basis for 2017-2018 ABC Recommendation**

Staff recommend measures be developed for 2-years. The current specifications expire in December 31, 2016; therefore, management measures (catch and landings limits) must be implemented by January 1, 2017. The results of a July 2016 SAW/SARC review of the surfclam stock assessment will not be available for consideration when setting 2017 measures but will be available for the May 2017 SSC meeting. It is also expected that results from a February/March 2017 SAW/SARC for ocean quahogs will also be available for the May 2017 SSC meeting.

In order to ensure administrative efficiency and that there is no lapse in measures given the timing of the SAW/SARCs for both species, staff is also recommending measures be specified in 2018. These measures can be overwritten with information from the new assessment when it becomes available.

Based on projections from the SAW 56 report (NEFSC 2013b), the annual OFL's provided in the stock assessment based on fishing at  $F_{MSYPROXY}$  and the projected stock biomass for each year (2017 and 2018) are:

<b>Year</b>	<b>OFL (mt)</b>	<b>Biomass (mt)</b>
<b>2014</b>	81,150	886,251
<b>2015</b>	75,178	813,077
<b>2016</b>	71,512	792,205
<b>2017</b>	69,925	739,359
<b>2018</b>	70,102	757,738

Staff recommends surflams be considered a typical stock and that the SSC apply methods that include an SSC-modified OFL probability distribution (the same methods applied in 2013 by the SSC).

Based on the 2017 projected  $B/B_{MSY} = 76\%$ , the Council risk policy for a typical stock ( $P^* = 0.29$ ), and an assumed lognormal distribution with a  $CV = 100\%$ , the staff recommend an ABC of 44,469 mt for 2017. For 2018, the staff recommend an ABC of 45,524 mt based on a projected  $B/B_{MSY} = 78\%$ , the Council risk policy for a typical stock  $P^* = 0.30$ , and a lognormal distribution  $CV = 100\%$ .

<b>Year</b>	<b>ABC (mt)</b>	<b>P (overfishing)</b>
<b>2014</b>	60,313	36%
<b>2015</b>	51,804	33%
<b>2016</b>	48,197	32%
<b>2017</b>	44,469	29%
<b>2018</b>	45,524	30%

## **Other Management Measures**

### ***Catch and Landings Limits***

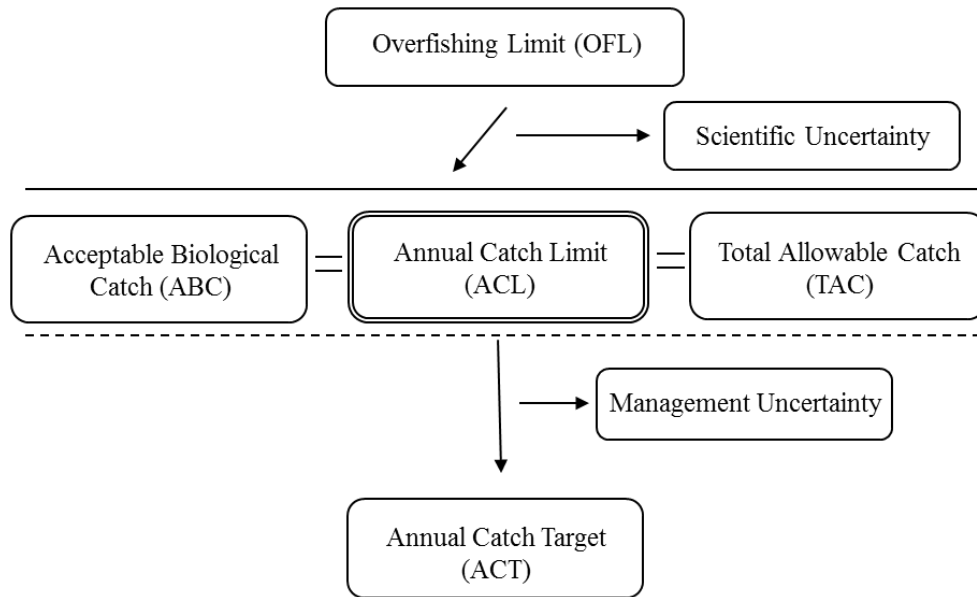
In the FMP, the  $ABC=ACL=TAC$  and the Council specifies an ACT that accounts for management uncertainty and other relevant factors (Figure 1). Discards are assumed to be zero; however, there is an incidental fishing mortality rate of 12% that applies to landings (commercial quota).

Management uncertainty is comprised of two parts: uncertainty in the ability of managers to control catch and uncertainty in quantifying the true catch (i.e., estimation errors). Because this is an ITQ fishery, and clams cannot be landed without cage tags, the implementation uncertainty is generally considered to be insignificant.

Catch is defined as the sum of landings, a 12% incidental mortality applied to landings, and discards (which are assumed to be 0). The ACL is equal to the ABC as prescribed in the FMP.

Staff recommend the ACT for 2017 and 2018, be set at 29,364 mt, which results in a commercial quota of 26,218 mt (3.40 million bushels). This is the same ACT and commercial quota that was implemented for the 2014-2016 fishing years.

### Atlantic Surfclam Flowchart



**Figure 1. Atlantic surfclam catch limit structure.**

#### *Surfclam Minimum Size*

In the regulations it states that, "Upon recommendation of the MAFMC, the [NMFS] Regional Administrator [RA] may suspend annually, by publication in the Federal Register, the minimum shell-length standard, unless discard, catch, and survey data indicate that 30 percent of the surfclams are smaller than 4.75 inches (12.065 cm) and the overall reduced shell length is not attributable to beds where the growth of individual surfclams has been reduced because of density dependent factors."

Each year an analysis of the size composition of the landings is developed to inform the Regional administrator regarding minimum size regulations. The report titled, "Estimated Proportion of Undersized Surfclam Landings for 2015" (Hermsen 2015), indicates that:

“The 54 samples used in this analysis contained 1,621 measured surfclams, of which 308 individual surfclams were undersized. Eleven of the 54 samples collected had 30% or more undersized surfclams; one of those samples came from the Georges Bank stock area while the other ten samples with 30% or more undersized surfclams were from the DelMarVa stock area” (Hermsen 2015).

“An estimated 19.2% of the coast wide surfclam landings to date in 2015 were undersized. The lower and upper 95% confidence bounds for this estimate were 18.3% and 20.1%. These estimates are below the 30% maximum that would preclude the Regional Administrator from suspending the minimum shell height standard” (Hermsen 2015).

Staff recommend continued suspension of the minimum shell-length standard for 2017 given that the coastwide 30% threshold for suspension was not triggered. However, the Council should carefully review this information next year and consider issues related to the large numbers of undersized clams that are appearing in the landings in the Delmarva area (up to 70%; Hermsen, 2015) as shown in this report.

### ***Small Surfclam Areas***

The regulations state that, the "[NMFS] Regional Administrator [RA] may close an area to surfclams and ocean quahog fishing if he/she determines, based on logbook entries, processors' reports, survey cruises, or other information, that the area contains surfclams of which:

- (i) Sixty percent or more are smaller than 4.5 inches (11.43 cm); and
- (ii) Not more than 15 percent are larger than 5.5 inches (13.97 cm) in size."

The last time this provision was applied was during the 1980's with three area closures (Atlantic City, NJ, Ocean City, MD, and Chincoteague, VA), with the last of the three areas reopening in 1991.

An analysis of surfclam size distributions for consideration of these regulations was provided to the Council in 2013, when 2014-2016 specifications were developed. The NEFSC fishery-independent clam survey data was used because it has a dredge design which captures smaller surfclams, has randomly selected stations within each survey strata, and provides a sample of the proportions of small (<114 mm, ~4.5 inches), large (> 4.5 inches and <140 mm (~5.5 inches), and extra-large clams (>5.5 inches) in the sampling strata.

In 2013, the Council requested that NEFSC provide these same analyses for the next 3 year specifications cycle. Given the measures proposed for 2017-2018 are interim while awaiting the ongoing surfclam SAW/SARC results, staff recommend NEFSC undertake detailed analysis of the data relative to these regulations so the information is available for the May 2017 SSC meeting and June 2017 Council meeting. The NEFSC may have recommendations for improved analysis and interpretation of the data beyond what was provided in 2013, or other appropriate data with which these could be combined.

### **References**

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Northeast Fisheries Science Center. 2013a. 56th Northeast Regional Stock Assessment Workshop (56th SAW) Assessment Summary Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 13-04; 42 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at <http://nefsc.noaa.gov/publications/>.

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# MEMORANDUM

**Date:** May 9, 2016  
**To:** Chris Moore, Executive Director  
**From:** Jessica Coakley and José Montañez, Staff  
**Subject:** Ocean Quahog Management Measures (2017 and 2018)

### Executive Summary

The ocean quahog resource in the US exclusive economic zone (EEZ) is not overfished and overfishing is not occurring in 2011 (Chute et al. 2013). The National Marine Fisheries Service (NMFS) Northeast Fishery Science Center (NEFSC; Dan Hennen Pers. Comm., NEFSC 2016) has provided data updates regarding recent fishery and biological data available at:

[http://www.mafmc.org/s/DataUpdatefromNEFSC\\_OceanQuahog.pdf](http://www.mafmc.org/s/DataUpdatefromNEFSC_OceanQuahog.pdf).

Ocean quahog specifications expire at the end of 2016. Staff recommend specifications be set for 2 years (2017-2018) to ensure there is no lapse in management measures through 2018. New stock assessment information will be available in 2017 to possibly change the previously recommended management measures for 2018 as well as set the measures for 2019-2020. Staff recommend acceptable biological catches (ABCs) for 2017 and 2018 be set at 26,100 mt each year. This is the same ABC that the Scientific and Statistical Committee (SSC) recommended for 2014-2016. The Fishery Management Plan (FMP) specifies that the annual catch limit (ACL) equals the ABC. Staff recommend an annual catch target (ACT) for the Maine fishery be set as 524 mt, and the Non-Maine fishery ACT be set at 25,511 mt for 2017 and 2018. This results in a Maine commercial quota of 499 mt (100,000 ME bushels) and a Non-Maine commercial quota of 24,296 mt (5.36 million bushels) for 2017 and 2018. These are the same ACTs and commercial quotas that were implemented for the 2014-2016 fishing years.

### Introduction

The Magnuson-Steven Act requires each Council's SSC to provide, among other things, ongoing scientific advice for fishery management decisions, including recommendations for ABC, preventing overfishing, and maximum sustainable yield. The Council's catch limit recommendations for the upcoming fishing year(s) cannot exceed the ABC recommendation of the SSC. In this memorandum, information is presented to assist the development of measures for the Council to consider for the 2017 and 2018 fishery for ocean quahogs. The SSC will recommend ABCs for the ocean quahog fishery that addresses scientific uncertainty. Based on the SSC recommendations, the Council will make recommendations for ACLs, ACTs, and other implemented measures, and provide those recommendations to the NMFS Northeast Regional Administrator.

### **Review of SSC Recommendations from May 2013**

In May 2013, the SSC met to recommend ABCs for ocean quahog for fishing years 2014-2016. The SSC recommended the ocean quahog assessment be considered Level 4 and noted, “that the survey and assessment model provides reliable information on the trends in stock biomass. As a result, given the information on catches, it is possible to develop indices of relative exploitation that likely provide reliable indications of the trend in exploitation. In contrast, the SSC deemed the OFL to be non-credible because few recruitment pulses have been observed in the survey, due to the extreme longevity of quahog, and it appears to be incompatible with the observed stock dynamics. The SSC also notes that the species has an “atypical” life history.”

Because the assessment was categorized as Level 4, it was not possible to provide the level of catch associated with the OFL. The SSC also, “deemed that it lacked credible scientific information on which to base a change in ABC.”

The SSC recommended setting an ABC equivalent to status quo (26,100 mt) for 2014-2016. It was noted that, “It is the SSC’s expectations that catches will remain relatively unchanged during this period. Moreover, the SSC wishes to recommend to the Council, in the strongest possible terms that a benchmark assessment be conducted that focuses on establishing credible biological reference points for a species that is extremely long lived and has a highly uncertain recruitment pattern.”

At that May 2013 meeting, the SSC noted that the principle sources of scientific uncertainty are:

- a. The fishing mortality rate reference point is deemed to be non-credible, both because of the species to which quahogs were compared were inappropriate and because the details of the calculations of spawning-per-recruit for any particular level were poorly justified.
- b. Forecasts over 40-50 years were provided to SSC. Although these forecasts were not used in the ABC determination, the SSC notes that forecasts over this duration should be continued.
- c. It is not known whether the low recent recruitments were reflective of a change in underlying stock productivity or a consequence of the life history of a long-lived species with highly uncertain recruitment.
- d. The nature of historical recruitments is poorly known.
- e. The SSC notes that it identified other substantial sources of uncertainty in its report in 2010.

### **Stock Status and Biological Reference Points**

A forward projecting stock assessment model, based on the Deriso-Schnute delay-difference equation, was applied in a program called (KLAMZ) and was used in the most recent ocean quahog assessment update (Chute et al. 2013). This update utilized the same peer-reviewed and approved methods developed at Stock Assessment Workshop 48 (SAW 48). Based on the June 2013 update, which utilized data through 2011, the stock is not overfished and overfishing is not occurring in 2011, relative to the



biological reference points. Whole stock fishable biomass during 2011 was 2.96 million mt meats and the fishing mortality rate during 2011 for the stock in the exploited region was  $F = 0.010 \text{ y}^{-1}$ .

The SAW 48 biological reference points for ocean quahog include:

- Fishing mortality threshold of  $F_{\text{MSYPROXY}} = F_{45\%} = 0.022 \text{ y}^{-1}$ ,
- $B_{\text{MSYPROXY}} = B_{\text{TARGET}} = 1.73$  million mt meats, and,
- Minimum stock size threshold, one-half  $B_{\text{MSYPROXY}}$ ,  $B_{\text{THRESHOLD}} = 1.39$  million mt meats.

### **Basis for 2017 and 2018 ABC Recommendation**

Staff recommend measures be developed for 2-years. The current specifications expire in December 31, 2016; therefore, management measures (catch and landings limits) must be implemented by January 1, 2017. The results of a February/March 2017 SAW/SARC review of the ocean quahog stock assessment will not be available for consideration when setting 2017 measures but will be available for the May 2017 SSC meeting. The results of a July 2016 SAW/SARC review of the surfclam stock assessment will also be available for the May 2017 SSC meeting.

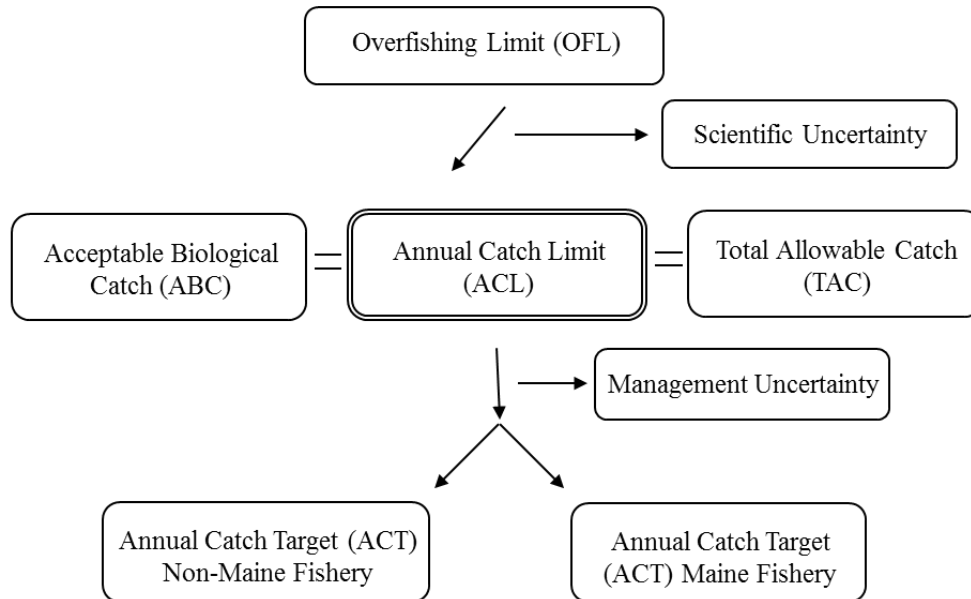
In order to ensure administrative efficiency and that there is no lapse in measures given the timing of the SAW/SARCs for both species, staff is also recommending measures be specified in 2018. These measures can be overwritten with information from the new assessment when it becomes available.

Staff recommends ocean quahogs be considered an atypical stock and that the SSC apply methods appropriate when the OFL cannot be specified given current state of knowledge. Based on the prior approaches used, staff recommend an ABC for 2017 and 2018 be set at 26,100 mt each year. This is the same ABC specified by the SSC for 2014-2016.

### **Other Management Measures**

In the FMP, the  $ABC = ACL = TAC$  and the Council specifies ACTs that accounts for management uncertainty and other relevant factors (Figure 1). Discards are assumed to be zero; however, there is an incidental fishing mortality rate of 5% that applies to landings (commercial quota). The sum of the Non-Maine and Maine ACTs, may be less than ACL based on achieving the optimum yield (OY), any additional reduction in catch to address management uncertainty, or other factors. Management uncertainty is comprised of two parts: uncertainty in the ability of managers to control catch and uncertainty in quantifying the true catch (i.e., estimation errors). Because this is an ITQ fishery, and ocean quahogs cannot be landed without cage tags, the implementation uncertainty is generally considered to be insignificant.

### Ocean Quahog Flowchart



**Figure 1. Ocean quahog catch limit structure.**

Catch for ocean quahogs is defined as the sum of landings, a 5 percent incidental mortality applied to landings, and discards (which are assumed to be 0). The ACL is equal to the ABC as prescribed in the FMP.

Staff recommended the ACT for the Maine fishery be set as 524 mt, and the Non-Maine fishery ACT be set at 25,511 mt for 2017 and 2018. This results in a Maine commercial quota of 499 mt (100,000 ME bushels) and a Non-Maine commercial quota of 24,296 mt (5.36 million bushels) for 2017 and 2018. This is the same ACT and commercial quota that was implemented for the 2014-2016 fishing years.

### References

Chute A, Hennen D, Russell R, Jacobson L. 2013. Stock Assessment Update for Ocean Quahogs (*Arctica islandica*) through 2011. NEFSC Ref Doc 13-17; 156 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at <http://nefsc.noaa.gov/publications/>

Hennen, Dan. Personal Communication. February 25, 2016. NOAA Fisheries, Northeast Fisheries Science Center, 166 Water St., Woods Hole, MA 02543.

**Mid-Atlantic Fishery Management Council**  
**Atlantic Surfclam Information Document - May 2016**

**Note:** The National Marine Fisheries Service (NMFS) Northeast Fishery Science Center (Dan Hennen Pers. Comm., NEFSC 2016) has provided data updates regarding recent fishery and biological data available. The following summarizes some of the information from that data update, but not all; the data update can be referenced for additional details and is available at: [http://www.mafmc.org/s/DataUpdatefromNEFSC\\_Surfclam.pdf](http://www.mafmc.org/s/DataUpdatefromNEFSC_Surfclam.pdf).

### **Management System**

The Fishery Management Plan (FMP) for Atlantic surfclam (*Spisula solidissima*) became effective in 1977. The FMP established the management unit as all Atlantic surfclams in the Atlantic Exclusive Economic Zone (EEZ). The FMP is managed by the Mid-Atlantic Fishery Management Council (Council), in conjunction with NMFS as the Federal implementation and enforcement entity. The primary management tool is the specification of an annual quota, which is allocated to the holders of allocation shares (Individual Transferable Quotas - ITQs) at the beginning of each calendar year as specified in Amendment 8 to the FMP (1988). In addition to the Federal waters fishery, there is a small fishery prosecuted in the state waters of New York, New Jersey, and Massachusetts. The FMP, including subsequent Amendments and Frameworks, is available on the Council website at: <http://www.mafmc.org>.

### **Basic Biology**

Information on Atlantic surfclam biology can be found in the document titled, “Essential Fish Habitat Source Document: Surfclam, *Spisula solidissima*, Life History and Habitat Requirements” (Cargnelli et al. 1999). An electronic version is available at the following website: <http://www.nefsc.noaa.gov/nefsc/habitat/efh/>. Additional information on this species is available at the following website: <http://www.fishwatch.gov/>. A summary of the basic biology is provided below.

Atlantic surfclams are distributed along the western North Atlantic Ocean from the southern Gulf of St. Lawrence to Cape Hatteras. Surfclams occur in both the state territorial waters ( $\leq 3$  mi from shore) and within the EEZ (3-200 miles from shore). Commercial concentrations are found primarily off New Jersey, the Delmarva Peninsula, and on Georges Bank. In the Mid-Atlantic region, surfclams are found from the intertidal zone to a depth of about 60 meters, but densities are low at depths greater than 40 meters.

The maximum size of surfclams is about 22.5 cm (8.9 inches) shell length, but surfclams larger than 20 cm (7.9 inches) are rare. The maximum age exceeds 30 years and surfclams of 15-20 years of age are common in many areas. Surfclams are capable of reproduction in their first year of life, although full maturity may not be reached until the second year. Eggs and sperm are shed directly into the water column. Recruitment to the bottom occurs after a planktonic larval period of about three weeks.

Atlantic surfclams are suspension feeders on phytoplankton, and use siphons which are extended above the surface of the substrate to pump in water. Predators of surfclams include certain species of crabs, sea stars, snails, and other crustaceans, as well as fish predators such as cod and haddock.

## Status of the Stock

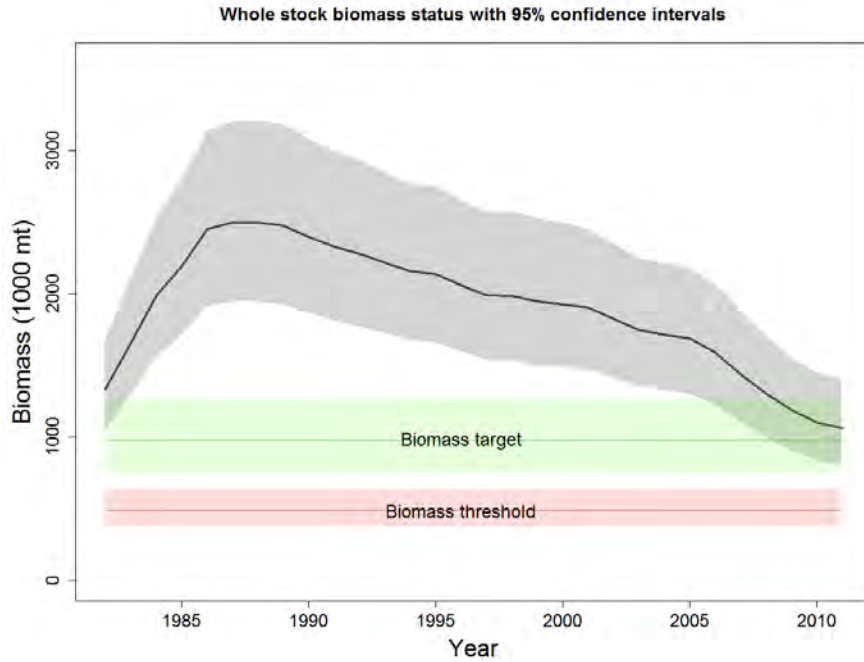
The Atlantic surfclam stock assessment was peer reviewed and approved for use by management at Stock Assessment Workshop 56 (SAW 56). A statistical catch at age and length model called SS3 was used and incorporates age and length structure. Reports on “Stock Status,” including assessment and reference point updates, SAW reports, and Stock Assessment Review Committee (SARC) panelist reports are available online at the NEFSC website: <http://www.nefsc.noaa.gov/saw>.

The Atlantic surfclam resource in the US EEZ is not overfished and overfishing is not occurring in 2011 (NEFSC 2013). Estimated biomass of the entire resource during 2011 (approximately 120+ mm shell length, SL) was 1,060 thousand mt (2,337 million lbs), with a 95% confidence interval of 802 - 1,401 thousand mt meats (NEFSC 2013). The 95% confidence interval overlaps the  $B_{\text{Target}} = \frac{1}{2} B_{1999} = 972$  thousand mt meats (2,142 million lbs) but is entirely above  $B_{\text{Threshold}} = \frac{1}{2} B_{\text{Target}} = 486$  thousand mt meats (1,071 million lbs; Figure 1). Estimated annual fishing mortality during 2011 for the entire resource was  $F = 0.027$  (95% confidence interval 0.016 - 0.045), which is entirely below the overfishing threshold  $F_{\text{MSY proxy}} = M = 0.15$  (Figure 2).

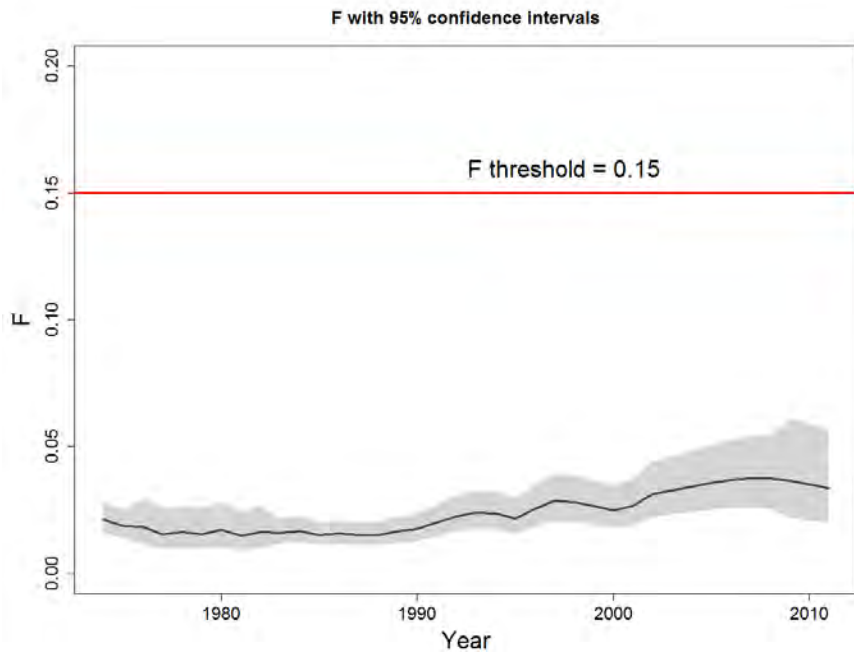
Estimated biomass on Georges Bank during 2011 (ages 7+, approximately 120+ mm shell length, SL) was 357 thousand mt of meats (787 million lbs) with a 95% confidence interval 252 - 506 mt. Surfclams on Georges Bank were not fished from 1990 to 2008 due to the risk of paralytic shellfish poisoning (PSP).<sup>1</sup> There was light fishing in years 2009-2011 under an exempted fishing permit. Fishing mortality on Georges Bank was close to zero ( $F_{2011} = 0.009$ ; 95% confidence interval 0.006 - 0.013) during 2011. Estimated biomass of the southern area during 2011 (ages 6+, approximately 120+ mm shell length, SL) was 703 thousand mt (1,549 million lbs), with a 95% confidence interval of 481 - 1,028 thousand mt meats (Figure 3). Estimated fishing mortality during 2011 for the southern area was  $F = 0.037$  (95% confidence interval 0.025 - 0.056) (Figure 4). Recruitment (age 0) has been below average for the whole stock since 1999 (Figure 5).

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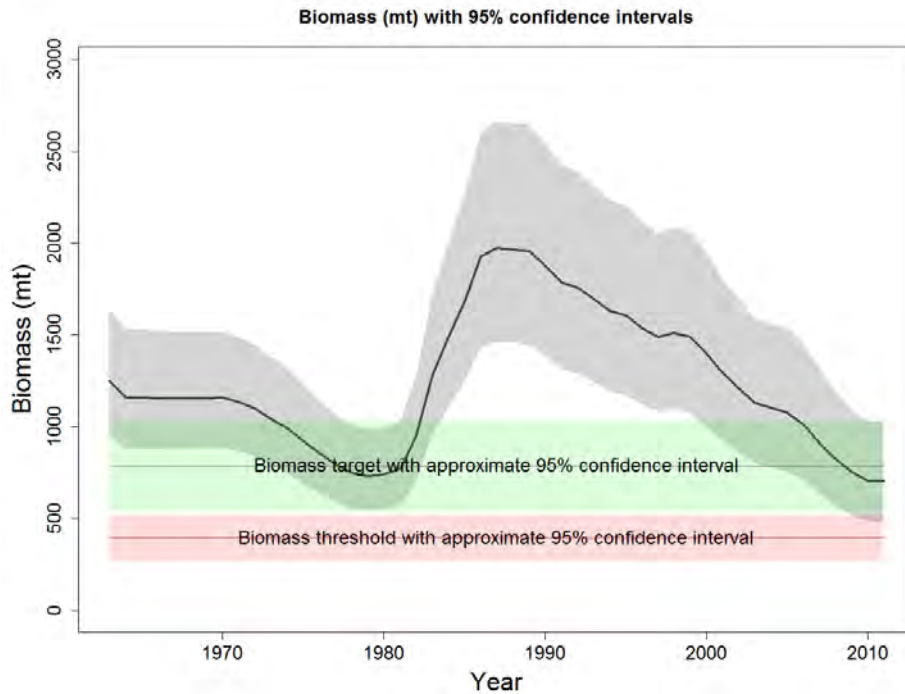
<sup>1</sup> See Area Closure section on page 15 for additional information.



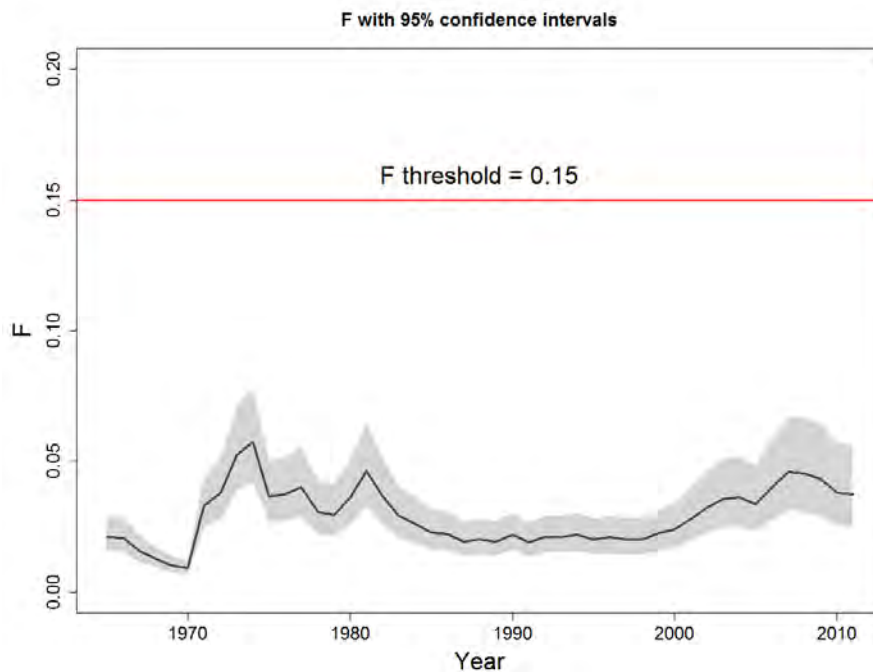
**Figure 1. Whole stock biomass status estimates with approximate 95% confidence intervals on the estimates and reference points. Source: Stock Assessment Summary (NEFSC 2013).**



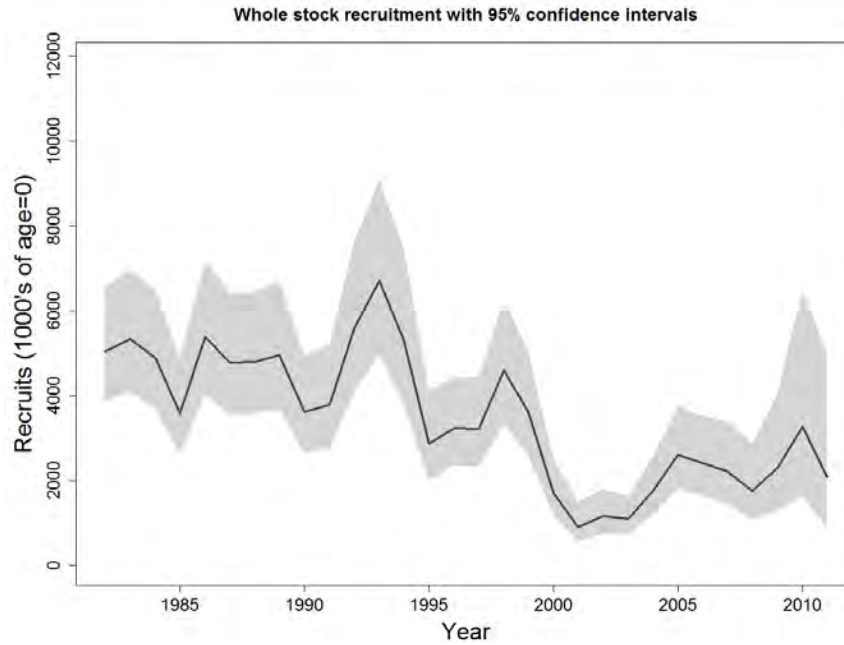
**Figure 2. Whole stock fishing mortality estimates with approximate 95% confidence intervals, and the overfishing threshold. Source: Stock Assessment Summary (NEFSC 2013).**



**Figure 3. Southern area biomass estimates, and biomass reference points with approximate 95% confidence intervals. Source: Stock Assessment Summary (NEFSC 2013).**



**Figure 4. Southern area fishing mortality estimates and with approximate 95% confidence intervals, and the overfishing threshold. Source: Stock Assessment Summary (NEFSC 2013).**



**Figure 5. Whole stock recruitment estimates with approximate 95% confidence intervals. Source: Stock Assessment Summary (NEFSC 2013).**

## **Description of the Fishery and Market**

The commercial fishery for surfclam in Federal waters is prosecuted with large vessels and hydraulic dredges. Surfclam landings and commercial quotas are given in Table 1 and Figure 6. The distribution of the fishery has changed over time, as shown in Figures 7-11, with a shift to increased landings in Southern New England and Georges Bank areas.

Figures 12-14 provide the distribution of surfclam landings, fishing effort, and landings per unit effort (LPUE) in “important” ten minute squares (TMSQ). Important means that a square ranked in the top 10 TMSQ for total landings during any five-year period (1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2015). Data for 2015 are incomplete and preliminary.

Additional information of the length composition of port sampled surfclams, and their associated sample sizes by area, are available in the data updates (Dan Hennen Pers. Comm., NEFSC 2016) at: [http://www.mafmc.org/s/DataUpdatefromNEFSC\\_Surfclam.pdf](http://www.mafmc.org/s/DataUpdatefromNEFSC_Surfclam.pdf).

### *Port and Community Description*

When Amendment 13 to the FMP was developed, the Council hired Dr. Bonnie McCay and her associates at Rutgers University to describe the ports and communities that are associated with the surfclam and ocean quahog fisheries. The researchers did an extensive job characterizing the three main fisheries (non-Maine ocean quahog, Maine ocean quahog, and surfclam). The McCay team characterizations of the ports and communities are based on government census and labor statistics and on observations and interviews carried out during the late 1990s and in the fall of 2001. The description of the fishing gear, areas fished, etc. are fully described in Amendment 13. Communities from Maine to Virginia are involved in the harvesting and processing of surfclams and ocean quahogs. Ports in New Jersey and Massachusetts handle the most volume and value, particularly Atlantic City and Point Pleasant, New Jersey, and New Bedford, Massachusetts. There are also landings in Ocean City, Maryland, and the Jonesport and Beals Island areas of Maine.

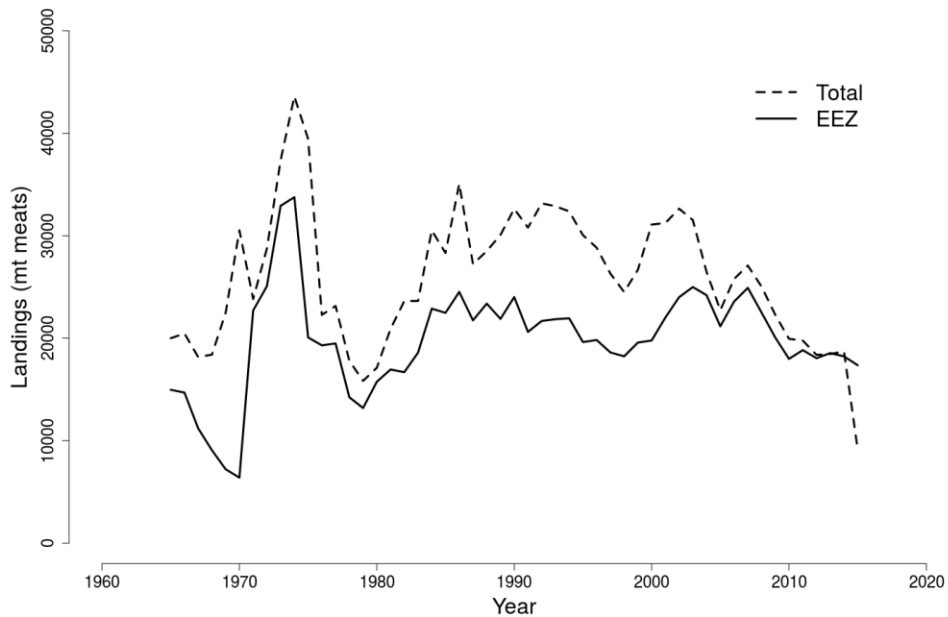
Additional information on "Community Profiles for the Northeast US Fisheries" can be found at: <http://www.nefsc.noaa.gov/read/socialsci/communityProfiles.html>.



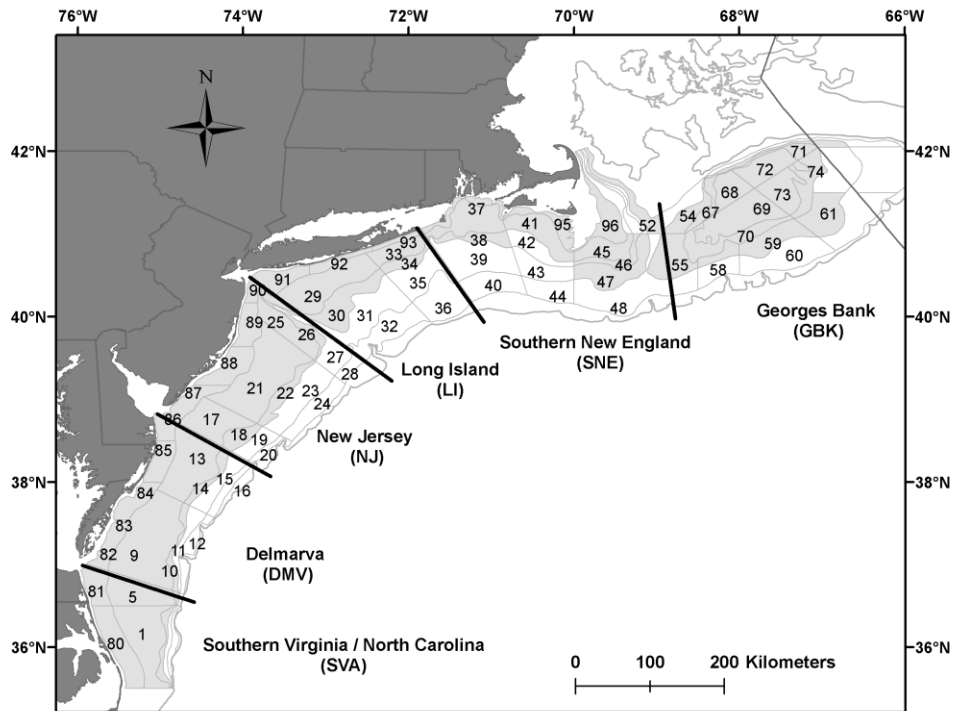
**Table 1. Federal surfclam quotas and landings: 1998 - 2016.**

<b>Year</b>	<b>Total Landings (includes state waters)</b>	<b>EEZ Landings (mt meats)</b>	<b>EEZ Landings<sup>a</sup> ('000 bu)</b>	<b>EEZ Quota ('000 bu)</b>	<b>% Harvested</b>
<b>1998</b>	24,506	18,234	2,365	2,565	92%
<b>1999</b>	26,677	19,577	2,539	2,565	99%
<b>2000</b>	31,093	19,788	2,566	2,565	100%
<b>2001</b>	31,237	22,017	2,855	2,850	100%
<b>2002</b>	32,645	24,006	3,113	3,135	99%
<b>2003</b>	31,526	24,994	3,241	3,250	100%
<b>2004</b>	26,463	24,197	3,138	3,400	92%
<b>2005</b>	22,734	21,163	2,744	3,400	81%
<b>2006</b>	25,779	23,573	3,057	3,400	90%
<b>2007</b>	27,091	24,915	3,231	3,400	95%
<b>2008</b>	25,038	22,510	2,919	3,400	86%
<b>2009</b>	22,283	20,065	2,602	3,400	77%
<b>2010</b>	19,941	17,984	2,332	3,400	69%
<b>2011<sup>b</sup></b>	19,776	18,839	2,443	3,400	72%
<b>2012<sup>b</sup></b>	18,378	18,054	2,341	3,400	69%
<b>2013<sup>b</sup></b>	18,459	18,551	2,406	3,400	71%
<b>2014<sup>c</sup></b>	18,707	18,227	2,364	3,400	70%
<b>2015<sup>c</sup></b>	9,117 <sup>d</sup>	17,362 <sup>d</sup>	2,252 <sup>d</sup>	3,400	66% <sup>d</sup>
<b>2016<sup>c</sup></b>	NA	NA	NA	3,400	NA

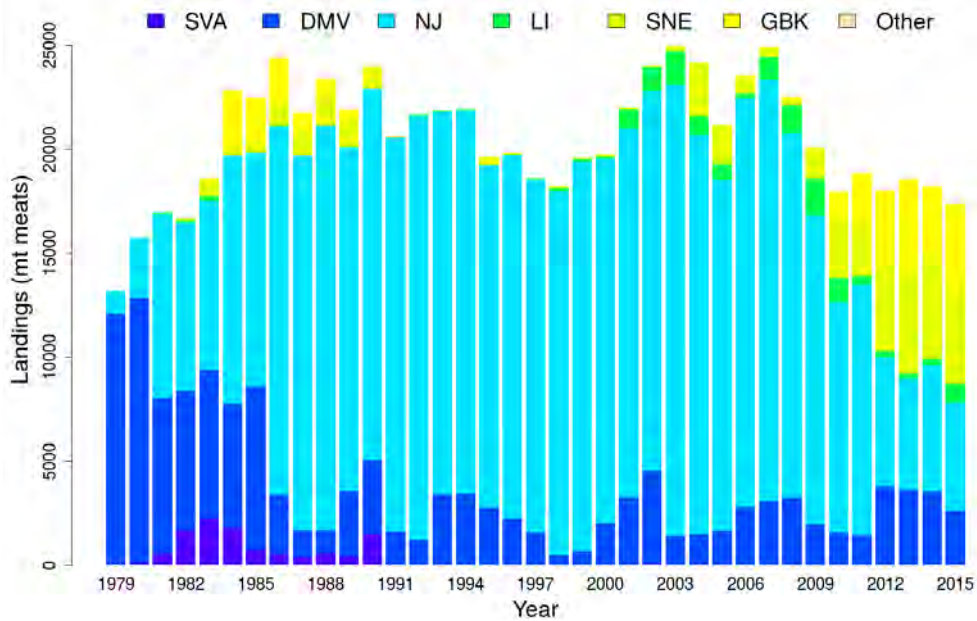
<sup>a</sup> 1 surfclam bushel is approximately 17 lb. <sup>b</sup> The Scientific and Statistical Committee (SSC) recommended an overfishing limit (OFL) for 2010, 2011, 2012, and 2013 of 129,300 mt, 114,00 mt, 102,300 mt, and 93,400 mt, respectively, and an acceptable biological catch (ABC) of 96,600 mt (2011-2013). <sup>c</sup> For 2014-2016, the SSC recommended an OFL of 81,150 mt, 75,178 mt, 71,512 mt, respectively, and an acceptable biological catch (ABC) of 60,313 mt, 51,804 mt, and 48,197 mt, respectively. <sup>d</sup> Preliminary, incomplete 2015 data. Source: NMFS clam vessel logbook reports. Dan Hennen Pers. Comm., NEFSC 2016.



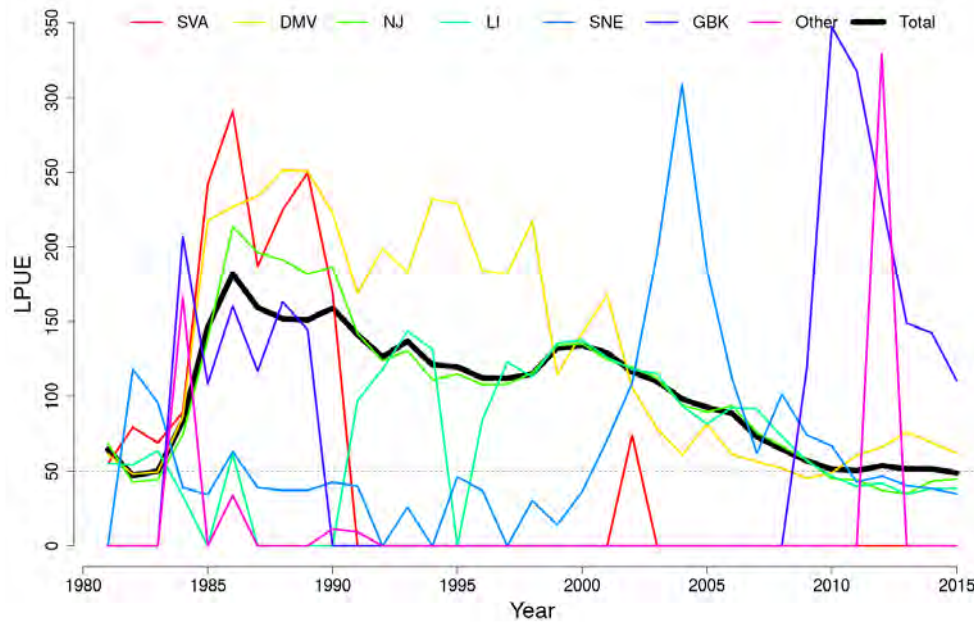
**Figure 6. Surfclam landings (total and EEZ) during 1965-2014, and preliminary 2015. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



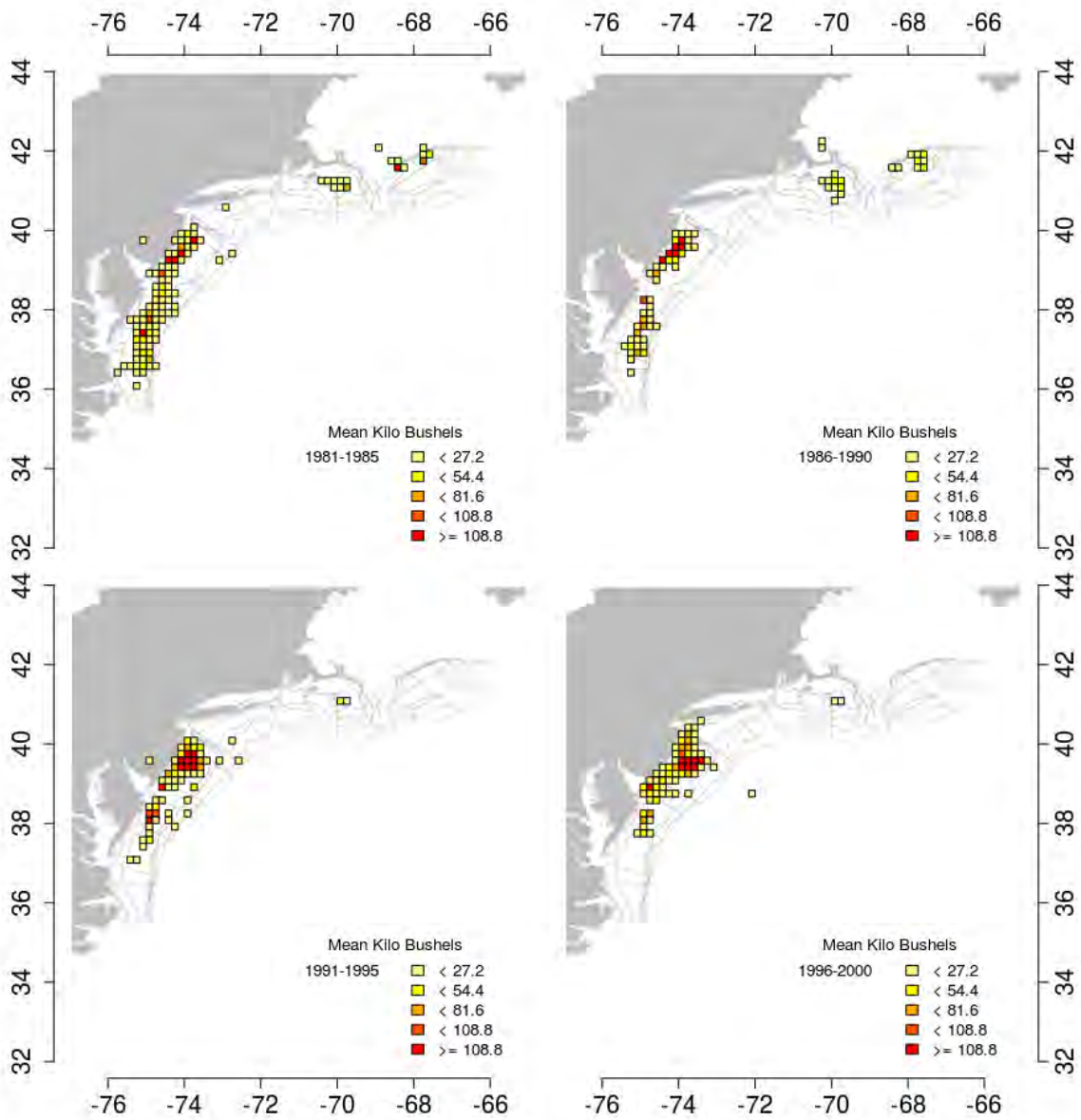
**Figure 7. Surfclam stock assessment regions and NEFSC shellfish survey strata. The shaded strata are where surfclams are found. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



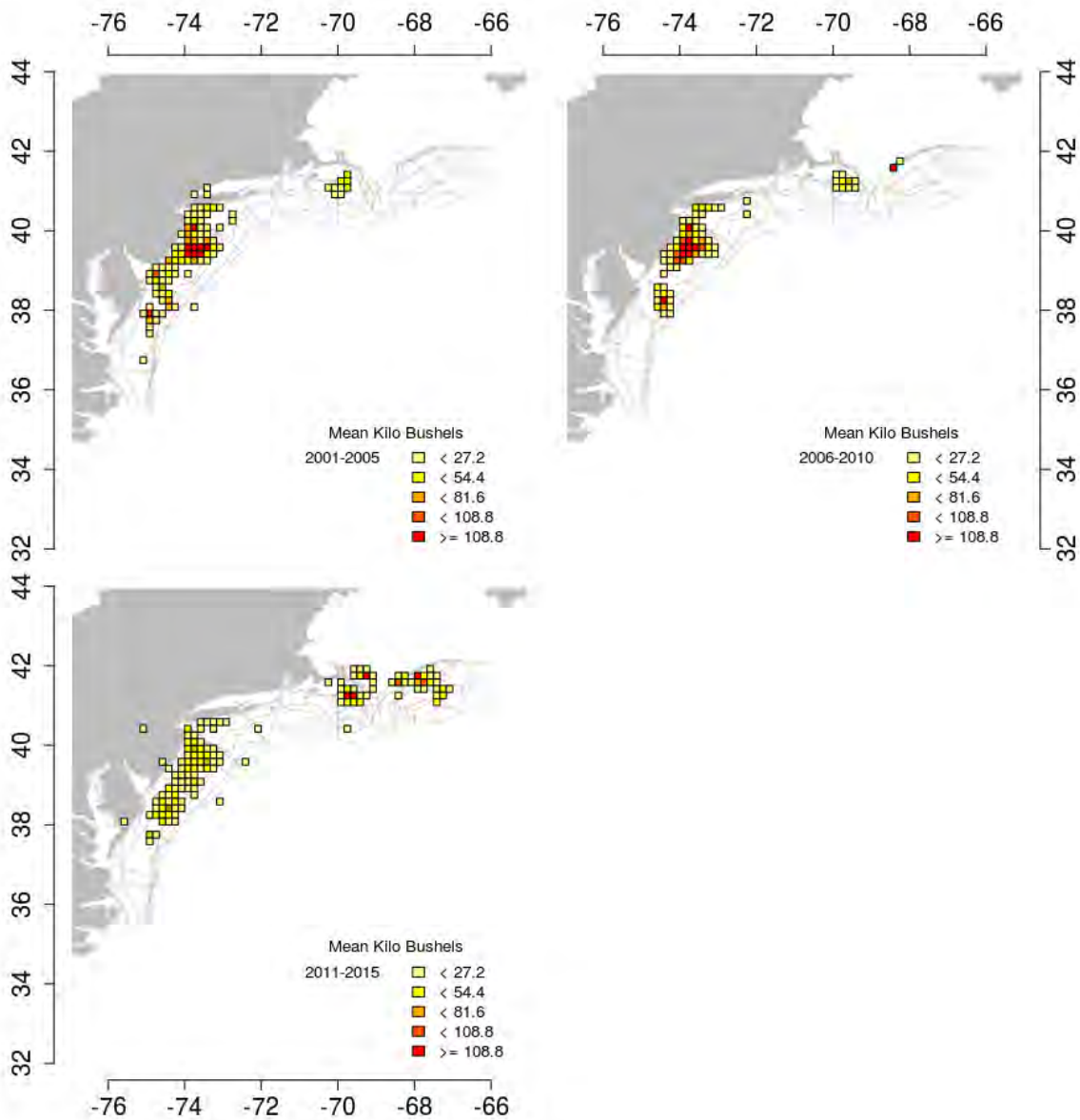
**Figure 8. Surfclam landings from the US EEZ during 1979-2014, and preliminary 2015, by stock assessment region. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



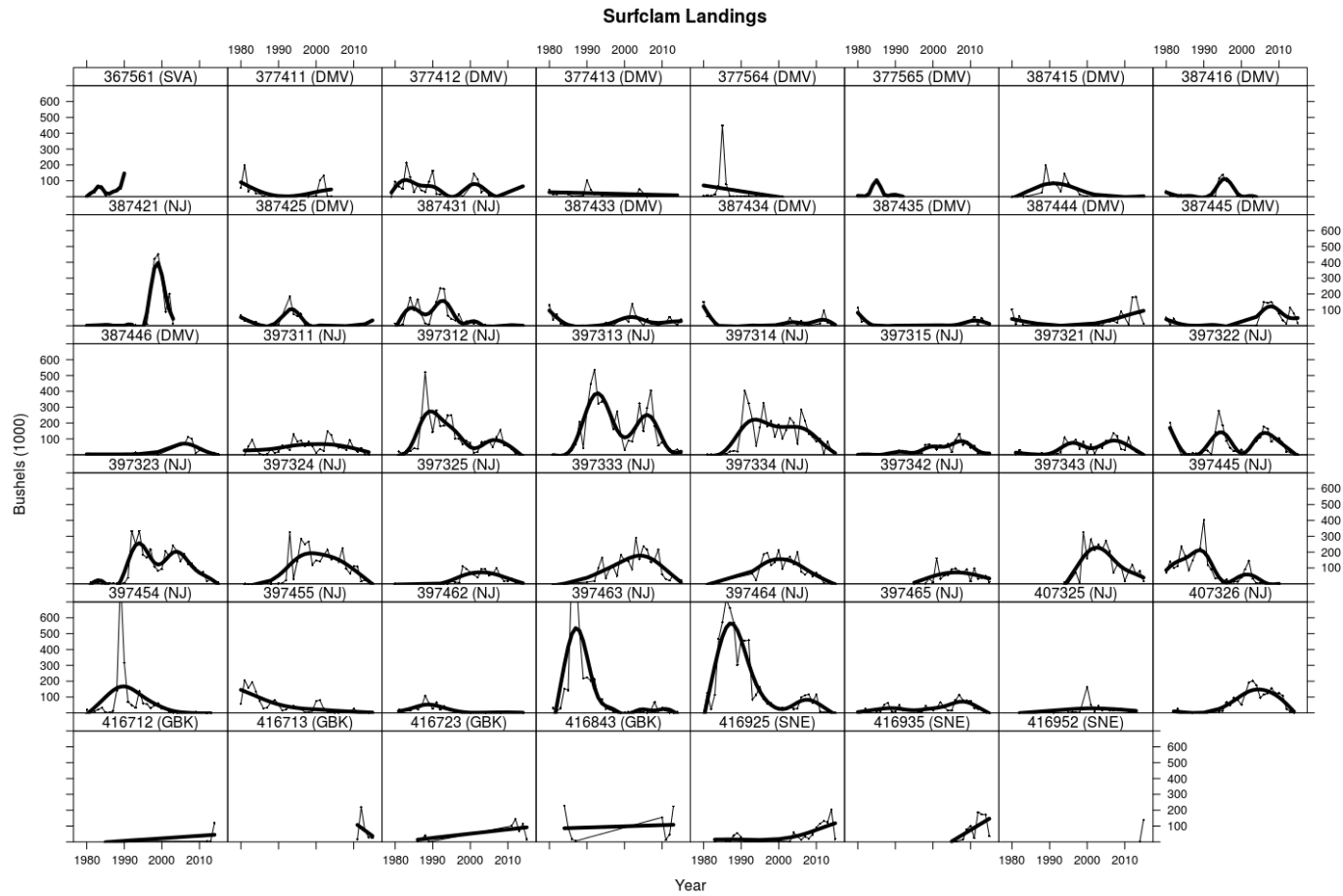
**Figure 9. Nominal landings per unit effort (LPUE in bushels landed per hour fished) for surfclam, by region, during 1981-2014, and preliminary 2015. LPUE is total landings in bushels divided by total fishing effort. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



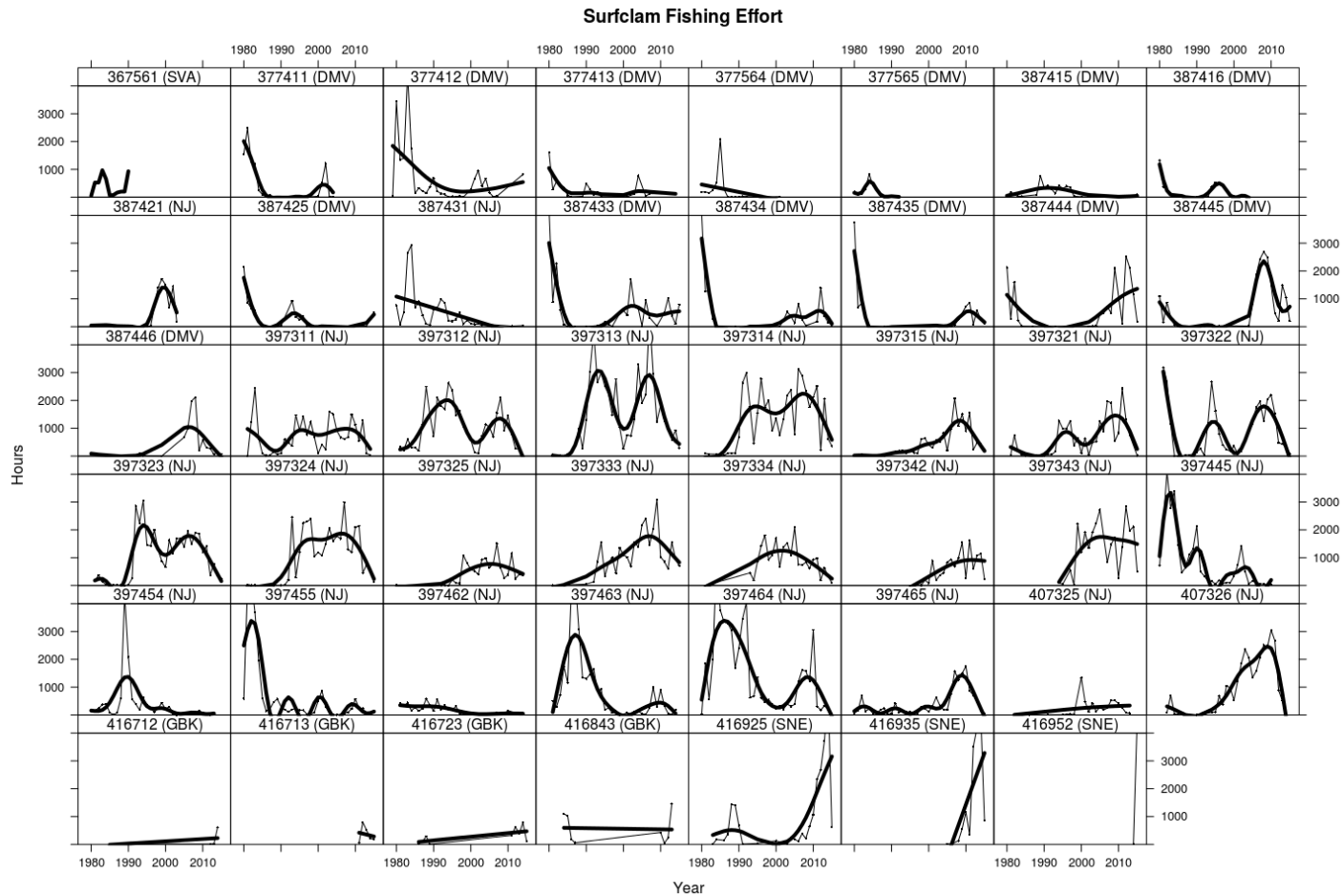
**Figure 10. Average surfclam landings by ten-minute square (TMSQ), the finest scale location for landings reported in logbooks, for 1981-2000 (1 kilobushel = 1000 bu y<sup>-1</sup>). Source: Dan Hennen Pers. Comm., NEFSC 2016.**



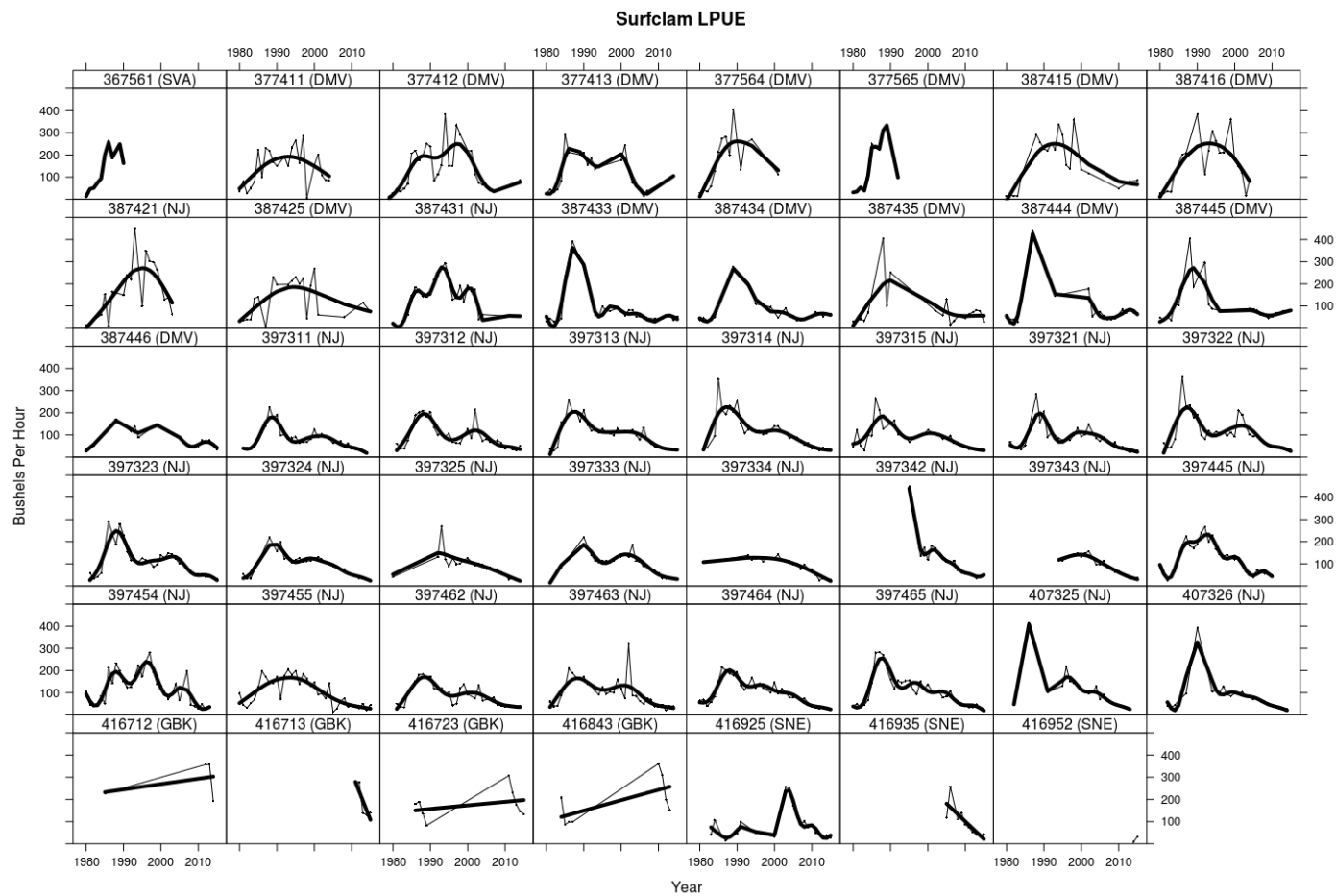
**Figure 11. Average surfclam landings by ten-minute square (TMSQ), the finest scale location for landings reported in logbooks, for 2001-2014, and preliminary 2015 (1 kilobushel = 1000 bu y<sup>-1</sup>). Source: Dan Hennen Pers. Comm., NEFSC 2016.**



**Figure 12. Annual surfclam landings in "important" ten minute squares (TMSQ) during 1980-2015 based on logbook data. Important means that a square ranked in the top 10 TMSQ for total landings during any five-year period (1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2015). Data for 2015 are incomplete and preliminary. To protect the privacy of individual firms, data are not plotted if the number of vessels is less than 2. Instead, a "^" is shown on the x-axis to indicate where data are missing. The solid dark line is a spline intended to show trends. The spline was fit to all available data, including data not plotted. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



**Figure 13. Annual surfclam fishing effort (h y<sup>-1</sup>) in "important" ten minute squares (TMSQ) during 1980-2015 based on logbook data. Important means that a square ranked in the top 10 TMSQ for total landings during any five-year period (1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2015). Data for 2015 are incomplete and preliminary. To protect the privacy of individual firms, data are not plotted if the number of vessels is less than 2. Instead, a '^' is shown on the x-axis to indicate where data are missing. The solid dark line is a spline intended to show trends. The spline was fit to all available data, including data not plotted. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



**Figure 14. Annual surfclam LPUE (bushels h<sup>-1</sup>) in "important" ten minute squares (TMSQ) during 1980-2015 based on logbook data. Important means that a square ranked in the top 10 TMSQ for total landings during any five-year period (1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2015). Data for 2015 are incomplete and preliminary. To protect the privacy of individual firms, data are not plotted if the number of vessels is less than 2. Instead, a '^' is shown on the x-axis to indicate where data are missing. The solid dark line is a spline intended to show trends. The spline was fit to all available data, including data not plotted. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



### *Federal Fleet Profile*

The total number of vessels participating in the surfclam fishery has remained relatively stable from 2005 through 2015, and has ranged from 29 vessels in 2006 to 42 vessels in 2012 (Table 2). The average ex-vessel price of surfclams reported by processors was \$12.61 in 2015, nearly identical to the \$12.66 per bushel seen in 2014. The total ex-vessel value of the 2015 federal harvest was approximately \$30 million, also nearly identical to 2014. A myriad of factors have contributed to the difficulties in the clam industry. Major users of clam meats have reduced their purchases from industry and stopped advertising products like clam chowder in the media. Industry members reported that imported meat from Canada and Vietnam contributed to an oversupply of clam meats in the marketplace. The costs to vessels harvesting clams has increased due to the rising costs of insurance; industry has also indicated price of diesel fuel in conjunction with distance traveled to fish is a big factor determining trip cost. Trips harvesting surfclams have increased in length as catch rates have declined. The distribution of LPUE in bushels per hour over time is shown below in Figures 9, 15 and 16.

### *Processing Sector*

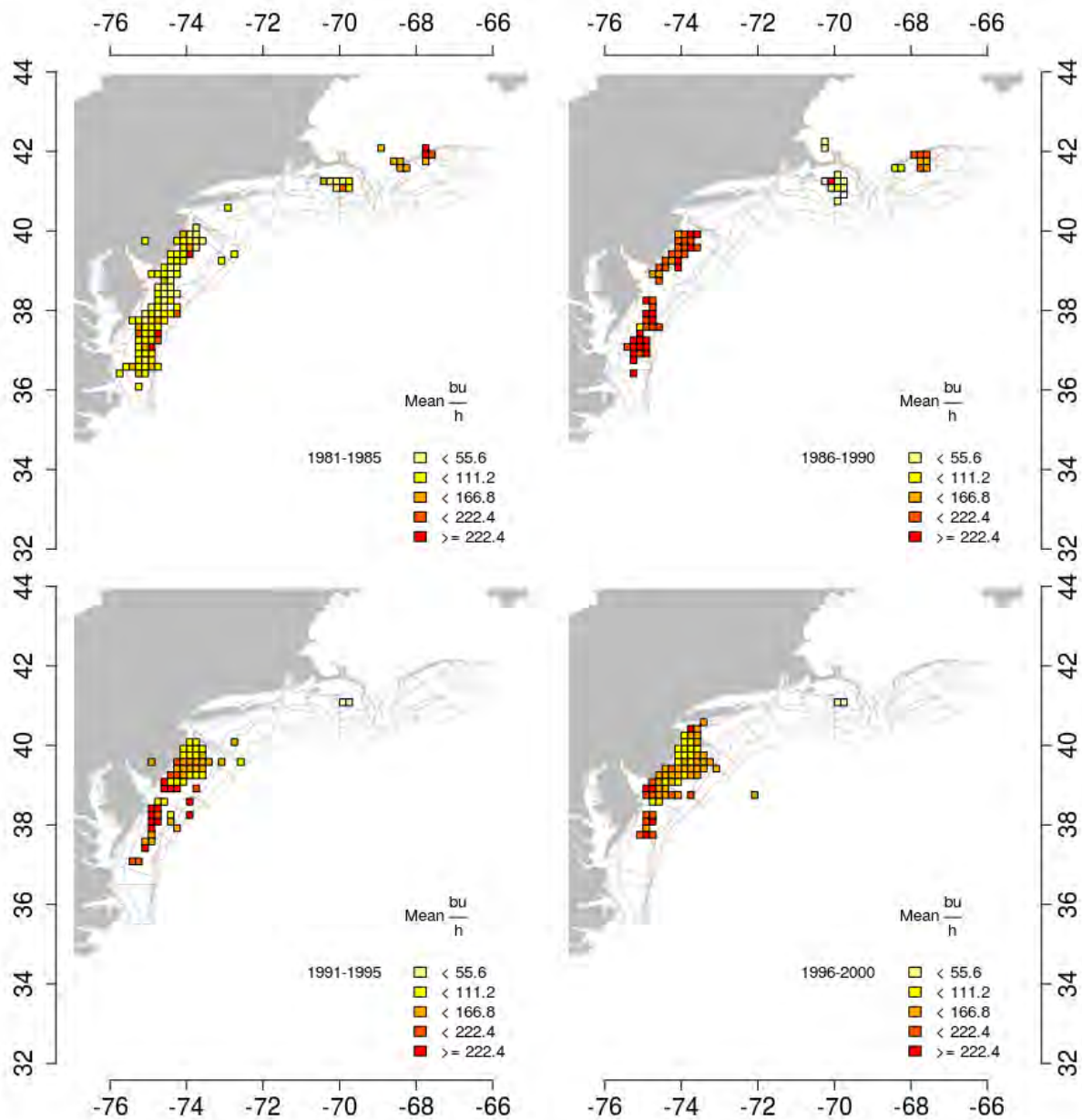
Even though this document describes the surfclam fishery, the information presented in this section regarding the processing sector is for both surfclams and ocean quahogs as some of these facilities purchase/process both species. In 2015, there were 9 companies reporting purchases of surfclams and/or ocean quahogs from the industrial fisheries outside of Maine. They were distributed by state as indicated in Table 3. Employment data for these specific firms are not available. In 2015, these companies bought approximately \$30 million worth of surfclams and \$21 million worth of ocean quahogs.

### *Area Closures*

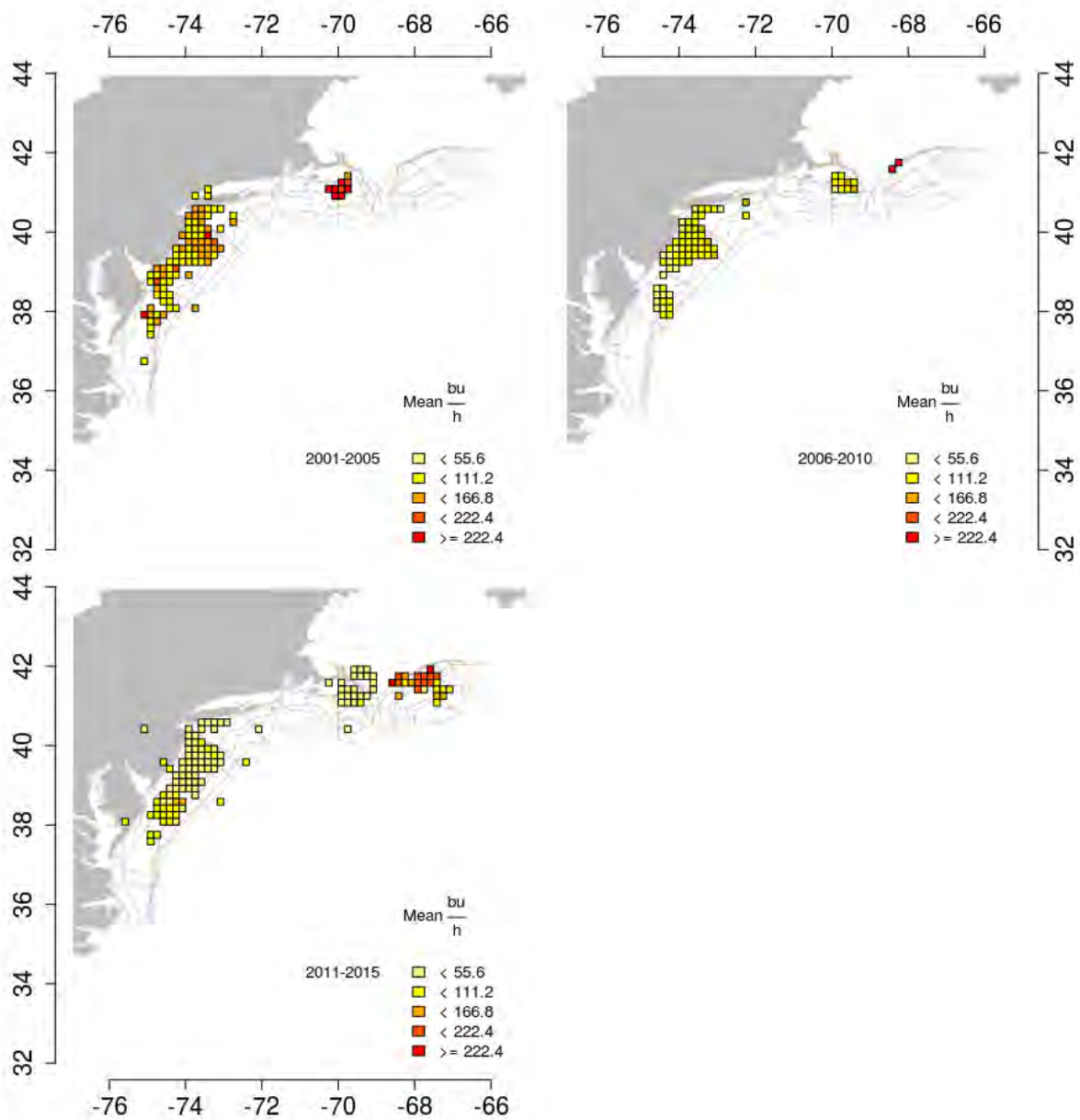
Areas can be closed to surfclam fishing if the abundance of small clams in an area meets certain threshold criteria. This small surfclam closure provision was applied during the 1980's with three area closures (off Atlantic City, NJ, Ocean City, MD, and Chincoteague, VA), with the last of the three areas reopening in 1991.

Fishing areas can also be closed for public health related issues due to environmental degradation or the toxins that cause PSP. PSP is a public health concern for surfclams. PSP is caused by saxitoxins, produced by the alga *Alexandrium fundyense* (red tide). Surfclams on Georges Bank were not fished from 1990 to 2008 due to the risk of PSP. There was light fishing on Georges Bank in years 2009-2011 under an exempted fishing permit and LPUE in that area was substantially higher (5-7 times higher) than in other traditional fishing grounds. The Greater Atlantic Regional Fisheries Office reopened a portion of Georges Bank to the harvest of surfclams and ocean quahogs beginning January 1, 2013 (77 FR 75057, December 19, 2012) under its authority in 50 CFR 648.76. Harvesting vessels have to adhere to the adopted testing protocol from the National Shellfish Sanitation Program.

Industry has indicated that they have recently implemented a large, voluntary closure off Atlantic City, New Jersey because of concerns for the fishery in the area and the prevalence of large numbers of small clams.



**Figure 15. Surfclam landings per unit effort (LPUE in bushels per hour fished) by ten-minute square (TMSQ), the finest scale location for landings reported in logbooks, for 1981-2000. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



**Figure 16. Surfclam landings per unit effort (LPUE in bushels per hour fished) by ten-minute square (TMSQ), the finest scale location for landings reported in logbooks, for 2001-2014, and preliminary 2015. Source: Dan Hennen Pers. Comm., NEFSC 2016.**

**Table 2. Federal fleet profile, 2006 through 2015.**

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Harvesting BOTH surfclams &amp; ocean quahogs</b>	9	9	8	8	12	12	13	7	7	6
<b>Harvesting only surfclams</b>	20	24	24	28	22	24	29	33	31	31
<b>Total Vessels</b>	29	33	32	36	34	36	42	40	38	37

Source: NMFS clam vessel logbooks

**Table 3. Companies that reported buying surfclams ocean quahogs and by state (from NMFS dealer/processor surfclam/ocean quahog dealer/processor report database) in 2015.**

Number of Companies	MA	NJ
	7	2

## References

Cargnelli, L., S. Griesbach, D. Packer, and E. Weissberger. 1999. Essential Fish Habitat Source Document: Atlantic Surfclam, *Spisula solidissima*, Life History and Habitat Characteristics. NOAA Tech. Memo. NMFS-NE-142.

Hennen, Dan. Personal Communication. February 25, 2016. NOAA Fisheries, Northeast Fisheries Science Center, 166 Water St., Woods Hole, MA 02543.

Northeast Fisheries Science Center. 2013. 56th Northeast Regional Stock Assessment Workshop (56th SAW) Assessment Summary Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 13-04; 42 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at <http://nefsc.noaa.gov/publications/>

## **Mid-Atlantic Fishery Management Council** **Ocean Quahog Information Document - April 2016**

**Note:** The National Marine Fisheries Service (NMFS) Northeast Fishery Science Center (Dan Hennen Pers. Comm., NEFSC 2016) has provided data updates regarding recent fishery and biological data available. The following summarizes some of the information from that data update, but not all; the data update can be referenced for additional details and is available at: [http://www.mafmc.org/s/DataUpdatefromNEFSC\\_OceanQuahog.pdf](http://www.mafmc.org/s/DataUpdatefromNEFSC_OceanQuahog.pdf).

### **Management System**

The Fishery Management Plan (FMP) for ocean quahog (*Arctica islandica*) became effective in 1977. The FMP established the management unit as all ocean quahog in the Atlantic Exclusive Economic Zone (EEZ). The FMP is managed by the Mid-Atlantic Fishery Management Council (Council), in conjunction with NMFS as the Federal implementation and enforcement entity. The primary management tool is the specification of an annual quota, which is allocated to the holders of allocation shares (Individual Transferable Quotas - ITQs) at the beginning of each calendar year as specified in Amendment 8 to the FMP (1988). In addition to the Federal waters fishery, there is a small fishery prosecuted in the state waters of Maine. The FMP, including subsequent Amendments and Frameworks, is available on the Council website at: <http://www.mafmc.org>.

### **Basic Biology**

Information on ocean quahog biology can be found in the document titled, “Essential Fish Habitat Source Document: Ocean Quahog, *Arctica islandica*, Life History and Habitat Requirements” (Cargnelli et al. 1999). An electronic version is available at the following website: <http://www.nefsc.noaa.gov/nefsc/habitat/efh/>. Additional information on this species is available at the following website: <http://www.fishwatch.gov/>. A summary of the basic biology is provided below.

The ocean quahog is a bivalve mollusk distributed in temperate and boreal waters on both sides of the North Atlantic Ocean. In the Northeast Atlantic, quahogs occur from Newfoundland to Cape Hatteras from depths of about 8 to 400 meters. Ocean quahogs further north occur closer to shore. The US stock resource is almost entirely within the EEZ (3-200 miles from shore), outside of state waters, and at depths between 20 and 80 meters. However, in the northern range, ocean quahogs inhabit waters closer to shore, such that the state of Maine has a small commercial fishery which includes beds within the state's territorial sea ( $\leq 3$  miles). Ocean quahogs burrow in a variety of substrates and are often associated with fine sand.

Ocean quahogs are one of the longest-living, slowest growing marine bivalves in the world. Under normal circumstances, they live to more than 100 years old. Ocean quahogs have been aged well in excess of 200 years. Growth tends to slow after age 20, which corresponds to the size currently harvested by the industry (approximately 3 inches). Size and age at sexual maturity are variable and poorly known. Studies in Icelandic waters indicate that 10, 50, and 90 percent of female ocean quahogs were sexually mature at 40, 64 and 88 mm (1.5, 2.5 and 3.5 inches) shell

length or approximately 2, 19 and 61 years of age. Spawning occurs over a protracted interval from summer through autumn. Free-floating larvae may drift far from their spawning location because they develop slowly and are planktonic for more than 30 days before settling. Major recruitment events appear to be separated by periods of decades.

Based on their growth, longevity and recruitment patterns, ocean quahogs are relatively unproductive and able to support only low levels of fishing. The current resource consists of individuals that accumulated over many decades.

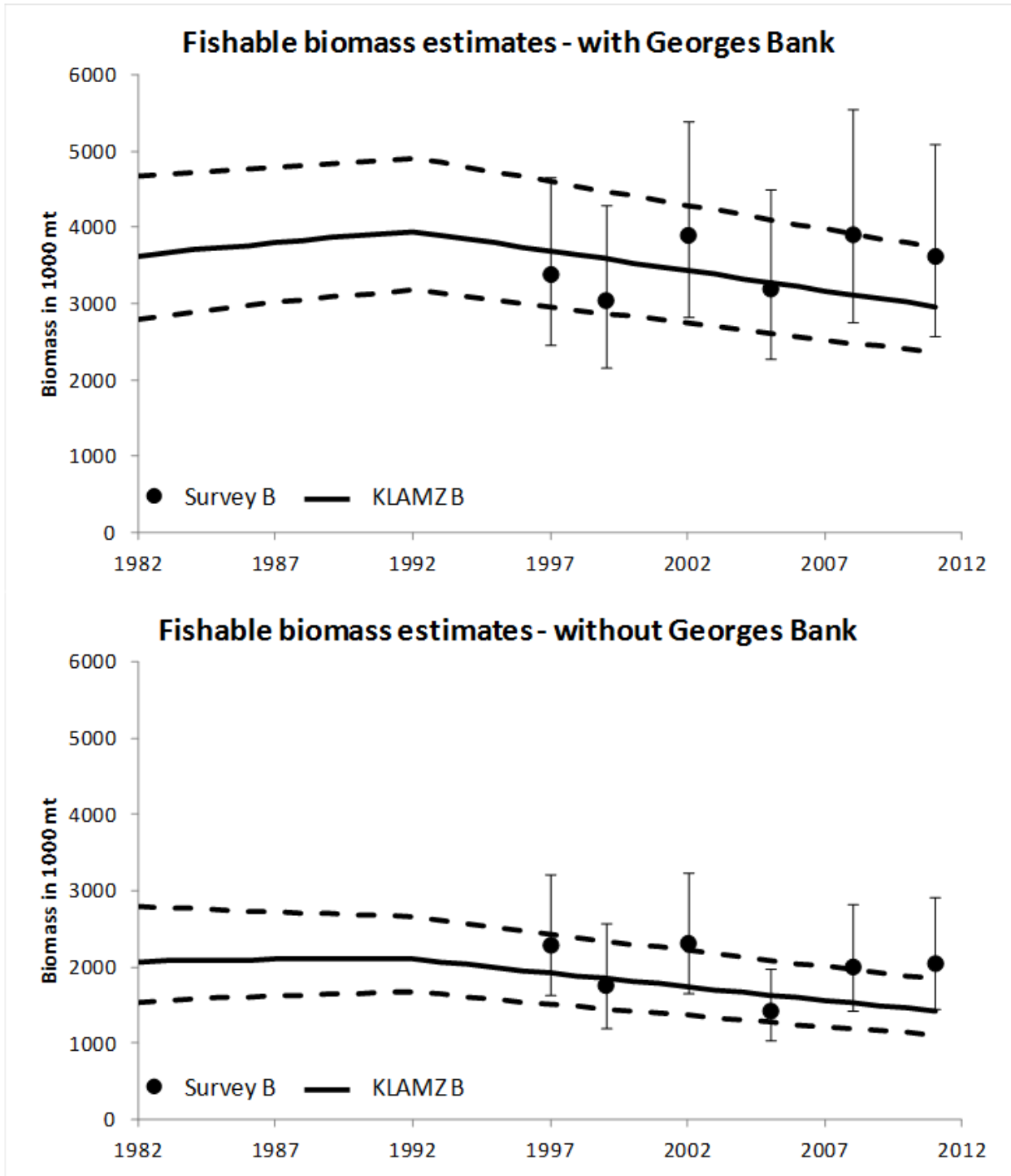
Ocean quahogs are suspension feeders on phytoplankton, and use siphons which are extended above the surface of the substrate to pump in water. Predators of ocean quahogs include certain species of crabs, sea stars, and other crustaceans, as well as fish species such as sculpins, ocean pout, cod, and haddock.

### **Status of the Stock**

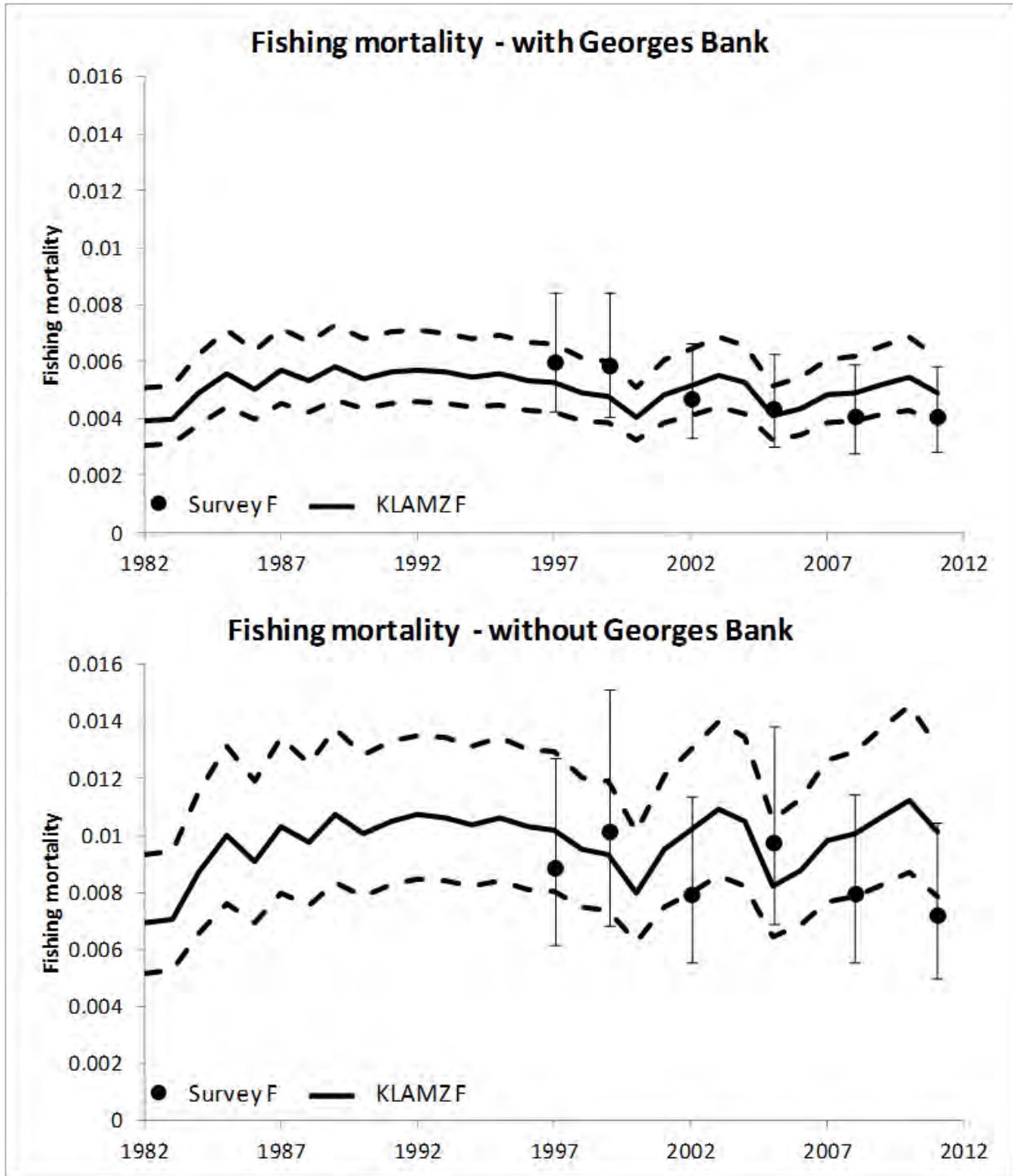
A forward projecting stock assessment model, based on the Deriso-Schnute delay-difference equation, was applied in a program called (KLAMZ) and was used in the most recent ocean quahog assessment update (Chute et al. 2013). This update utilized the same peer-reviewed and approved methods developed at Stock Assessment Workshop 48 (SAW 48). Detailed reports on “Stock Status,” including annual assessment and reference point update reports, SAW reports, and Stock Assessment Review Committee (SARC) panelist reports are available online at the NEFSC website: <http://www.nefsc.noaa.gov/>.

Based on the June 2013 update, which utilized data through 2011, the stock is not overfished and overfishing is not occurring, relative to the biological reference points (Chute et al. 2013). Whole stock fishable biomass during 2011 was 2.96 million mt meats (Figure 1), which is above the revised  $B_{\text{target}}$  of 1.73 million mt and the revised  $B_{\text{threshold}}$  of 1.39 million mt. The fishing mortality rate during 2011 for the stock in the exploited region was  $F = 0.010 \text{ y}^{-1}$  (Figure 2), below the revised  $F_{\text{threshold}}$  of  $0.022 \text{ y}^{-1}$ . Fishing mortality for the exploited area of the stock was also below the previous  $F_{\text{threshold}}$  of  $0.08 \text{ y}^{-1}$ , and whole stock biomass was above the previous  $B_{\text{threshold}}$  of 0.89 million mt.

Based on assessment data, the ocean quahog population is an unproductive stock with infrequent recruitment, and thus vulnerable to overfishing (Chute et al. 2013). After three decades of fishing at a low  $F$ , the stock as a whole is being fished down. In 2011, fishable stock biomass in the southernmost regions of Southern VA, Delmarva, and NJ was less than half of 1978 pre-fishery levels (recommended target biomass for the stock as a whole is 50% of the pre-fishery biomass). Biomass in the more northern regions of LI increased after 1978 due to a recruitment event and growth, but then began to decrease in the early 1990s when recruitment declined and the fishery gradually began to move north into these regions. Recruitment events appear to be localized and separated by decades, although survey length frequencies show that a low level of recruitment occurs on a continuous basis. The potential contribution of this recruitment to stock biomass and productivity is unknown.



**Figure 1. KLAMZ model estimates of fishable biomass for the entire stock (top) and the exploited regions (bottom), 1982-2011. Source: Stock Assessment Update (Chute et al. 2013).**



**Figure 2. KLAMZ estimates of fishing mortality for the entire stock (top) and the exploited regions (bottom), 1982-2011. Source: Stock Assessment Update (Chute et al. 2013).**



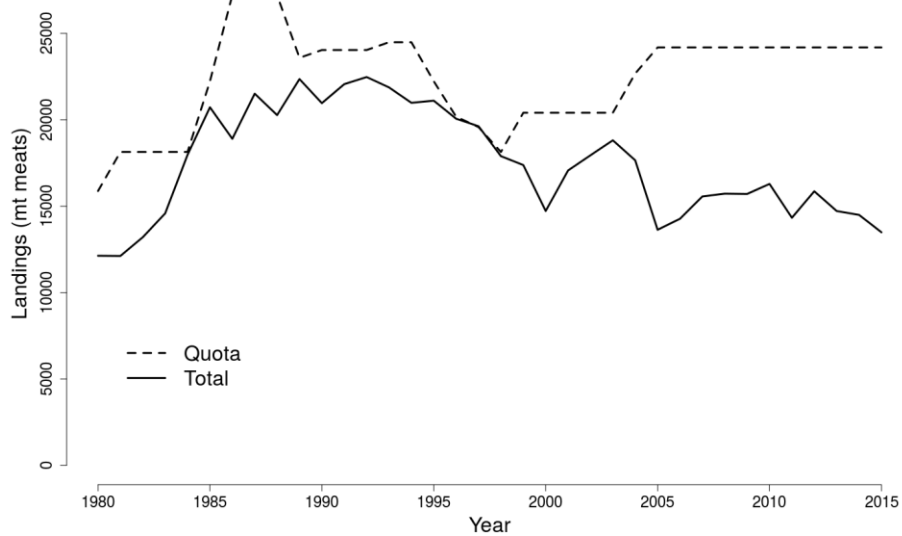
## Description of the Fishery and Market

The commercial fishery for ocean quahog in Federal waters is prosecuted with large vessels and hydraulic dredges, and is very different from the small Maine fishery prosecuted with small vessels (35-45 ft) targeting quahogs for the local fresh, half shell market. Ocean quahog landings and commercial quotas are given below in Table 1 and Figure 3.

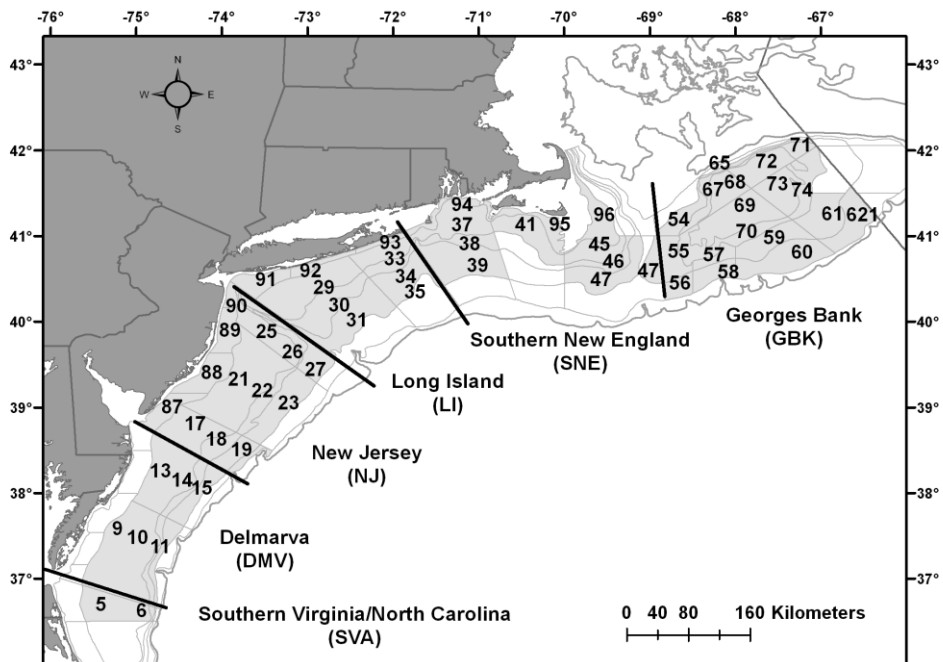
**Table 1. Federal Ocean Quahog Quotas and Landings: 1998 - 2016.**

Year	EEZ Landings (mt meats)	EEZ Landings <sup>a</sup> ('000 bu)	EEZ Quota ('000 bu)	% Harvested
1998	17,897	3,946	4,000	99%
1999	17,381	3,832	4,500	85%
2000	14,723	3,246	4,500	72%
2001	17,069	3,763	4,500	84%
2002	17,947	3,957	4,500	88%
2003	18,815	4,148	4,500	92%
2004	17,655	3,892	5,000	78%
2005	13,635	3,006	5,333	56%
2006	14,273	3,147	5,333	59%
2007	15,564	3,431	5,333	64%
2008	15,727	3,467	5,333	65%
2009	15,710	3,463	5,333	65%
2010	16,289	3,591	5,333	67%
2011 <sup>b</sup>	14,332	3,160	5,333	59%
2012 <sup>b</sup>	15,864	3,497	5,333	66%
2013 <sup>b</sup>	14,721	3,245	5,333	61%
2014 <sup>c</sup>	14,498	3,196	5,333	60%
2015 <sup>c</sup>	13,491 <sup>d</sup>	2,974 <sup>d</sup>	5,333	56% <sup>d</sup>
2016 <sup>c</sup>	NA	NA	5,333	NA

<sup>a</sup> 1 ocean quahog bushel is approximately 10 lb. <sup>b</sup> The Scientific and Statistical Committee (SSC) recommended an overfishing limit (OFL) for 2011-2013 = 34,800 mt, and an acceptable biological catch (ABC) = 26,100 mt. <sup>c</sup> For 2014-2016, the SSC did not recommend an OFL. They recommended a constant ABC of 26,100 mt, for 2014-2016. <sup>d</sup> Preliminary 2015 data. Source: NMFS clam vessel logbook reports. Dan Hennen Pers. Comm., NEFSC 2016.

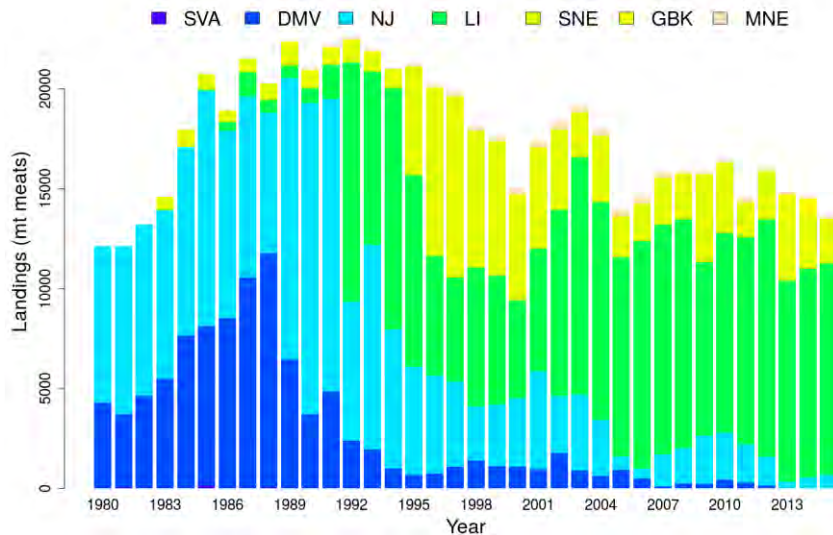


**Figure 3. Ocean quahog landings during 1981-2014, and preliminary 2015. Source: Dan Hennen Pers. Comm., NEFSC 2016.**

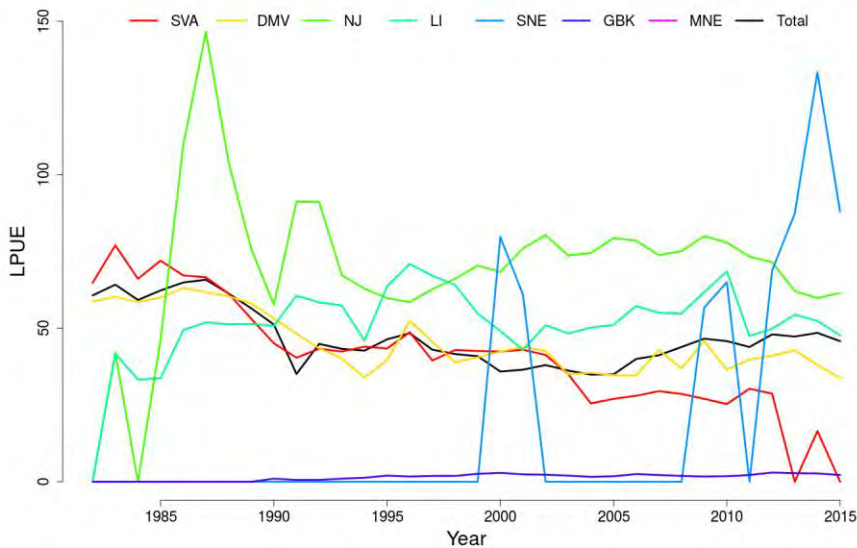


**Figure 4. Ocean Quahog stock assessment regions and NEFSC shellfish survey strata. The shaded strata are where ocean quahogs are found. Dan Hennen Pers. Comm., NEFSC 2016.**

The distribution of the fishery has changed over time, with the bulk of the fishery from 1980-1990 being prosecuted off the Delmarva, to now being prosecuted in more Northern areas (Figures 4-11). Surfclams on Georges Bank were not fished from 1990 to 2008 due to the risk of paralytic shellfish poisoning (PSP).<sup>1</sup>

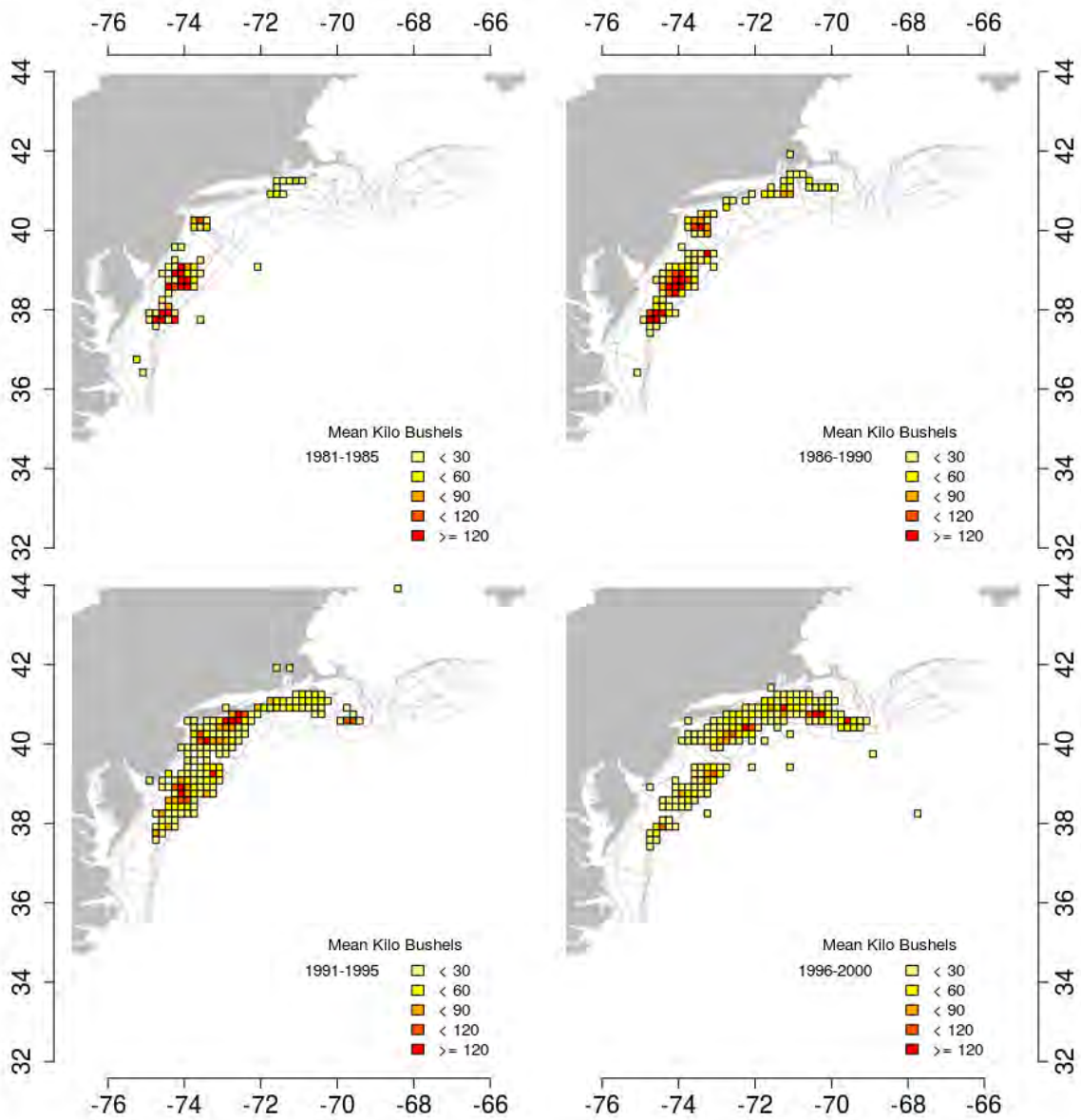


**Figure 5. Ocean quahog landings from the US EEZ during 1979-2014, and preliminary 2015, by stock assessment region. Source: Dan Hennen Pers. Comm., NEFSC 2015.**

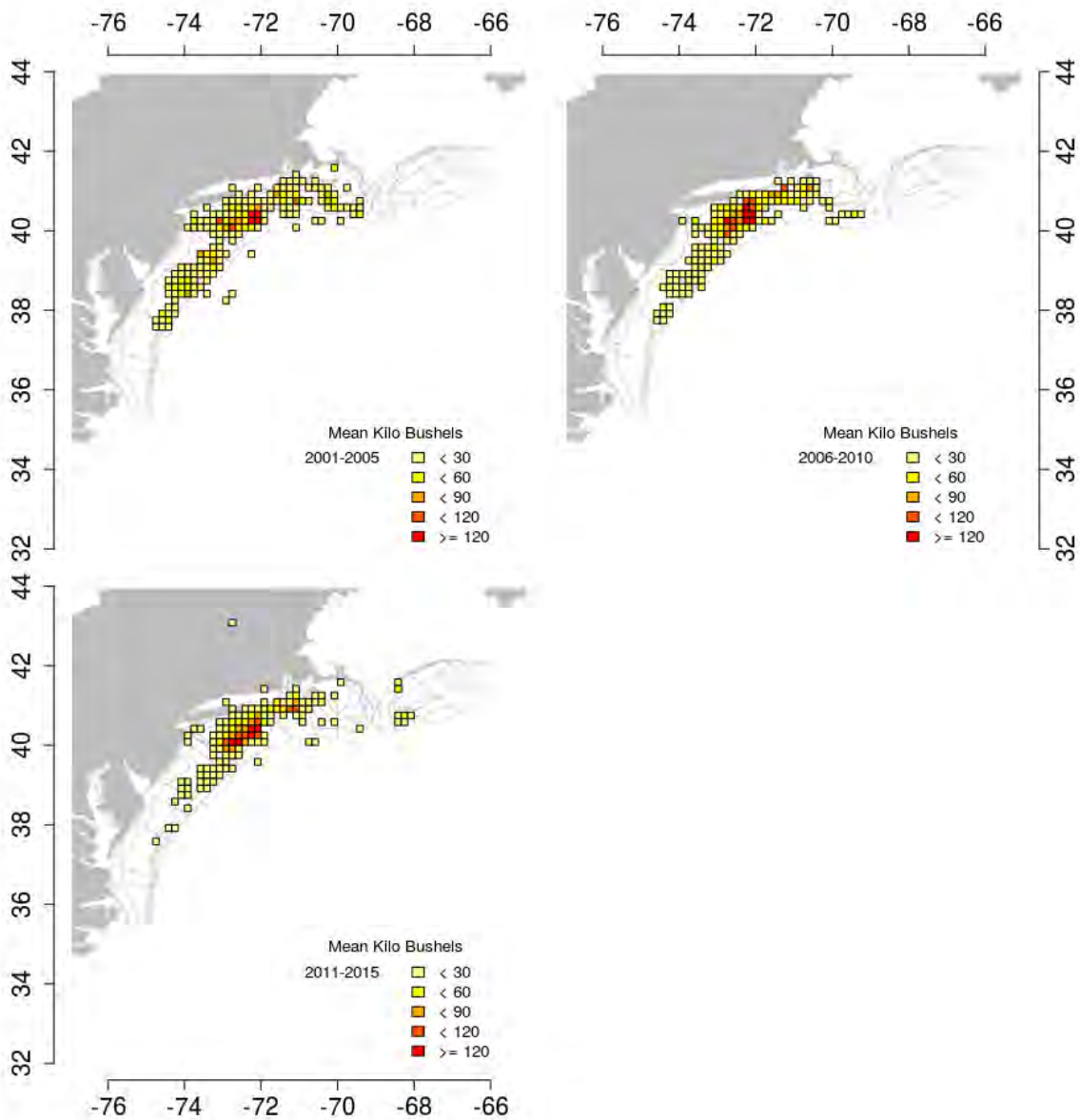


**Figure 6. Nominal landings per unit effort (LPUE in bushels landed per hour fished) for ocean quahog, by region, during 1981-2014, and preliminary 2015. LPUE is total landings in bushels divided by total fishing effort. Source: Dan Hennen Pers. Comm., NEFSC 2016.**

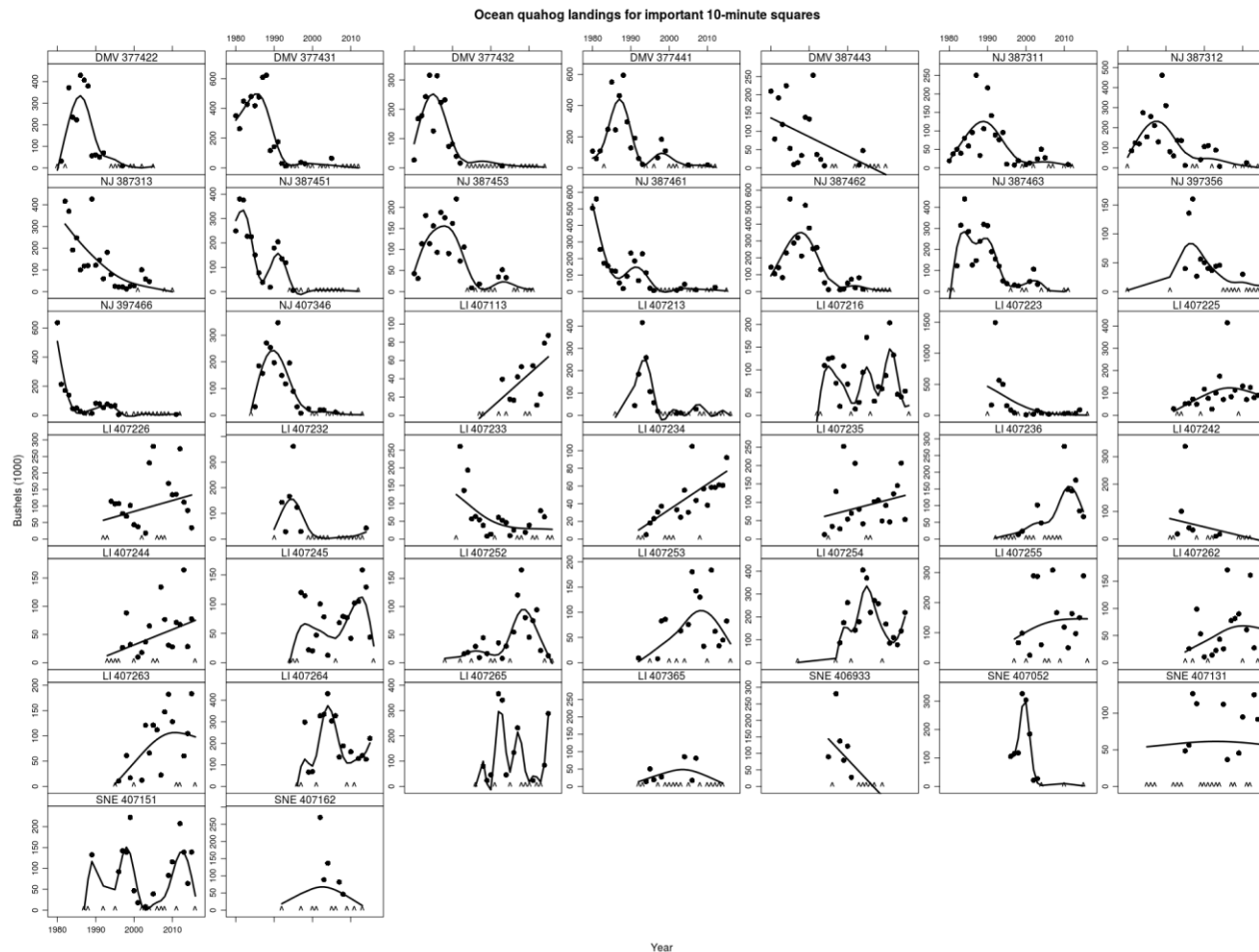
<sup>1</sup> See Area Closure section on page 17 for additional information.



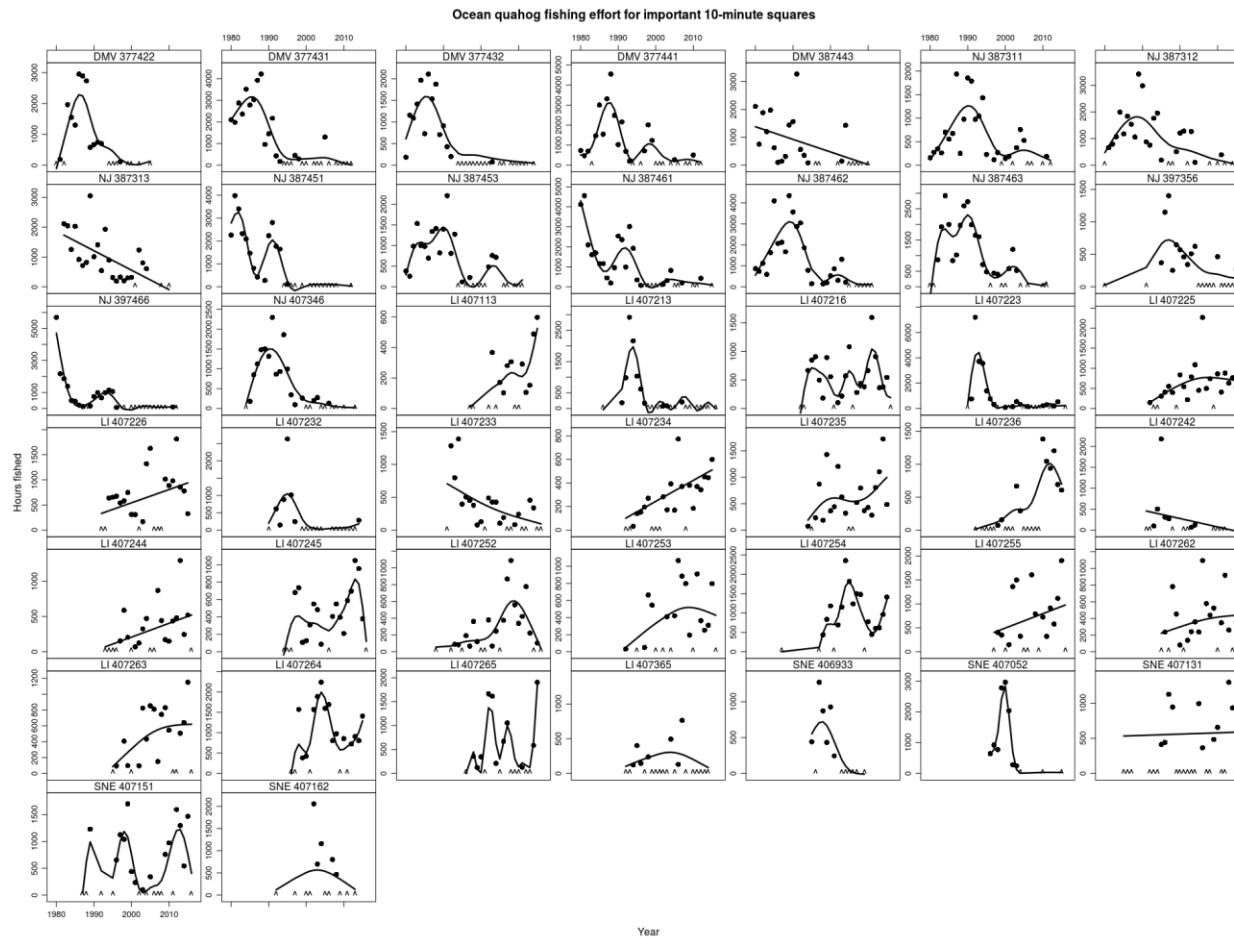
**Figure 7. Average ocean quahog landings by ten-minute square (TMSQ), the finest scale location for landings reported in logbooks, for 1981-2000 (1 kilobushel = 1000 bu y<sup>-1</sup>). Only squares where more than 5 kilo bushels were caught are shown. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



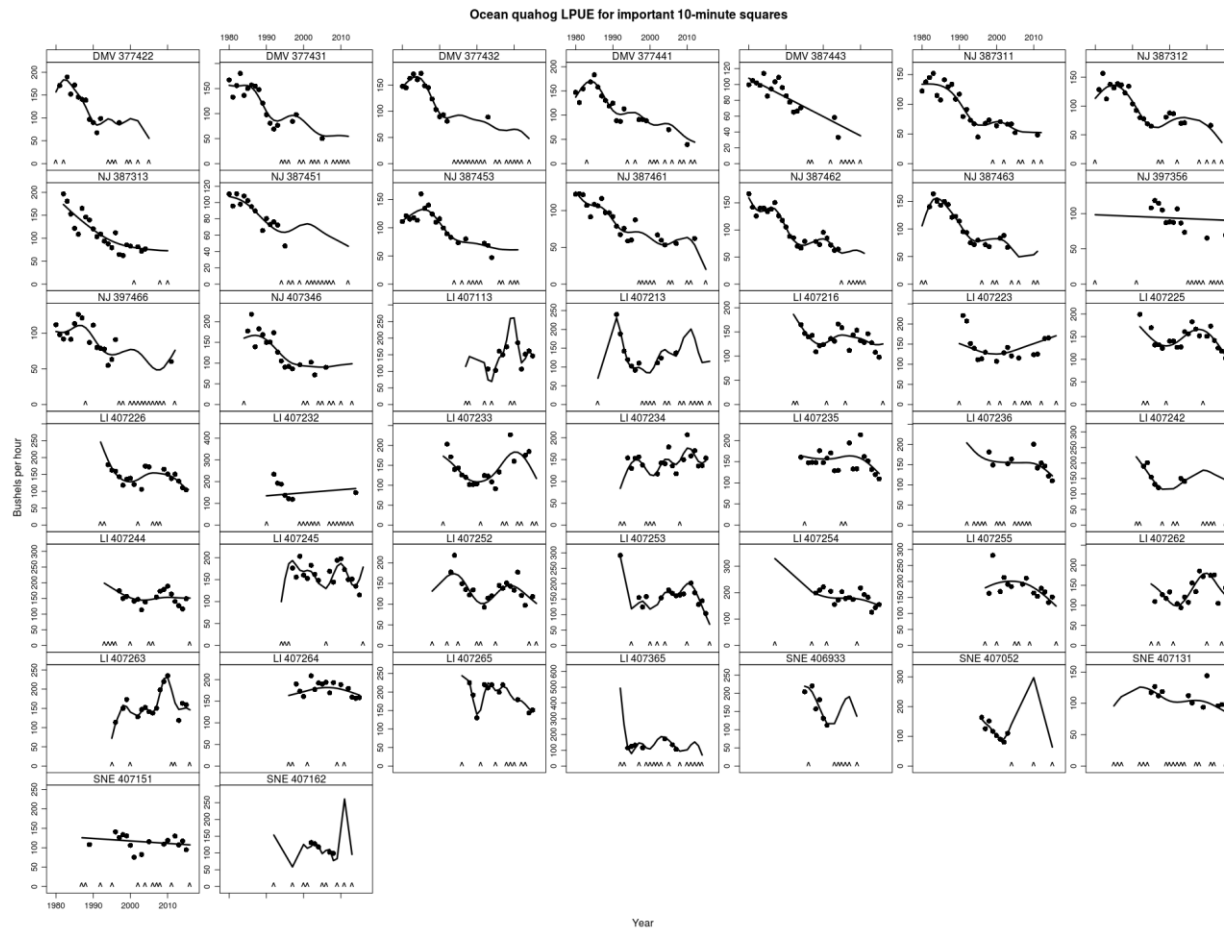
**Figure 8. Average ocean quahog landings by ten-minute square (TMSQ), the finest scale location for landings reported in logbooks, for 2001-2014, and preliminary 2015 (1 kilobushel = 1000 bu y<sup>-1</sup>). Only squares where more than 5 kilo bushels were caught are shown. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



**Figure 9. Annual ocean quahog landings in "important" ten minute squares (TMSQ) during 1980-2015 based on logbook data. Important means that a square ranked in the top 10 TMSQ for total landings during any five-year period (1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2015). Data for 2015 are incomplete and preliminary. To protect the privacy of individual firms, data are not plotted if the number of vessels is less than 2. Instead, a "A" is shown on the x-axis to indicate where data are missing. The solid dark line is a spline intended to show trends. The spline was fit to all available data, including data not plotted. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



**Figure 10. Annual ocean quahog fishing effort ( $\text{h y}^{-1}$ ) in "important" ten minute squares (TMSQ) during 1980-2015 based on logbook data. Important means that a square ranked in the top 10 TMSQ for total landings during any five-year period (1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2015). Data for 2015 are incomplete and preliminary. To protect the privacy of individual firms, data are not plotted if the number of vessels is less than 2. Instead, a '^' is shown on the x-axis to indicate where data are missing. The solid dark line is a spline intended to show trends. The spline was fit to all available data, including data not plotted. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



**Figure 11. Annual ocean quahog LPUE (bushels h<sup>-1</sup>) in "important" ten minute squares (TMSQ) during 1980-2015 based on logbook data. Important means that a square ranked in the top 10 TMSQ for total landings during any five-year period (1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2015). Data for 2015 are incomplete and preliminary. To protect the privacy of individual firms, data are not plotted if the number of vessels is less than 2. Instead, a "A" is shown on the x-axis to indicate where data are missing. The solid dark line is a spline intended to show trends. The spline was fit to all available data, including data not plotted. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



Additional information of the length composition of port sampled ocean quahogs, and their associated sample sizes by area, are available in the data updates (Dan Hennen Pers. Comm., NEFSC 2016) at: [http://www.mafmc.org/s/DataUpdatefromNEFSC\\_OceanQuahog.pdf](http://www.mafmc.org/s/DataUpdatefromNEFSC_OceanQuahog.pdf).

### *Port and Community Description*

When Amendment 13 to the FMP was developed, the Council hired Dr. Bonnie McCay and her associates at Rutgers University to describe the ports and communities that are associated with the surfclam and ocean quahog fisheries. The researchers did an extensive job characterizing the three main fisheries (non-Maine ocean quahog, Maine ocean quahog, and surfclam). The McCay team characterizations of the ports and communities are based on government census and labor statistics and on observations and interviews carried out during the late 1990s and in the fall of 2001. The description of the fishing gear, areas fished, etc. are fully described in Amendment 13. Communities from Maine to Virginia are involved in the harvesting and processing of surfclams and ocean quahogs. Ports in New Jersey and Massachusetts handle the most volume and value, particularly Atlantic City and Point Pleasant, New Jersey, and New Bedford, Massachusetts. There are also landings in Ocean City, Maryland, and the Jonesport and Beals Island areas of Maine. The small scale Maine fishery is entirely for ocean quahogs, which are sold as shellstock for the half-shell market. The other fisheries are industrialized ones for surfclams and ocean quahogs, which are hand shucked or steam-shucked and processed into fried, canned, and frozen products.

Additional information on "Community Profiles for the Northeast US Fisheries" can be found at: <http://www.nefsc.noaa.gov/read/socialsci/communityProfiles.html>

### *Federal Fleet Profile*

The total number of vessels participating in the ocean quahog fisheries outside the state of Maine has experienced a downward trend as the fisheries moved beyond a market crisis in 2005 where major users of clam meats reduced their purchases from industry and stopped advertising products like clam chowder in the media. Industry members reported that imported meat from Canada and Vietnam contributed to an oversupply of clam meats in the marketplace. The costs to vessels harvesting clams have increased significantly, with the greatest component being the cost of diesel fuel (in conjunction with distance traveled). Trips harvesting quahogs have also increased in length as catch rates have declined steadily. The 30 or so vessels that reported landings during 2004 and 2005 has consolidated over time into fewer vessels. The Maine ocean quahog fleet numbers started to decline when fuel prices soared in mid-2008, and a decline in the availability of smaller clams consistent with the market demand (i.e., half-shell market), and totaled 8 vessels in 2015 (Table 2).

**Table 2. Federal Fleet Profile, 2006 through 2015.**

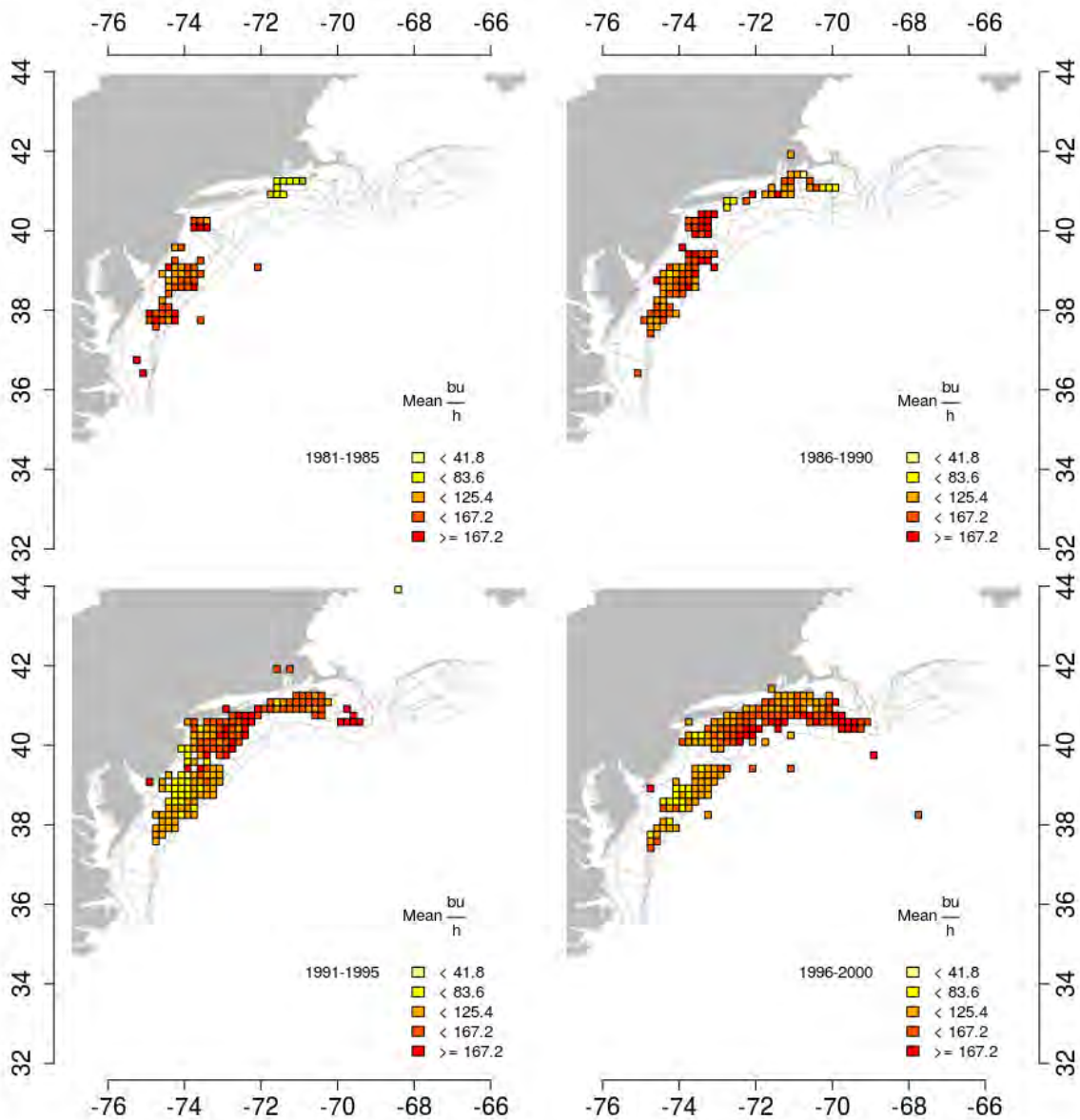
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Non-Maine Vessels Harvesting BOTH surfclams &amp; ocean quahogs</b>	9	9	8	8	12	12	13	7	7	6
<b>Non-Maine Vessels Harvesting only ocean quahogs</b>	9	8	10	7	9	7	6	9	9	10
<b>Total Non-Maine Vessels</b>	18	17	18	15	21	19	19	16	16	16
<b>Maine Ocean Quahog Vessels</b>	25	24	22	19	15	13	12	11	9	8

Source: NMFS clam vessel logbooks.

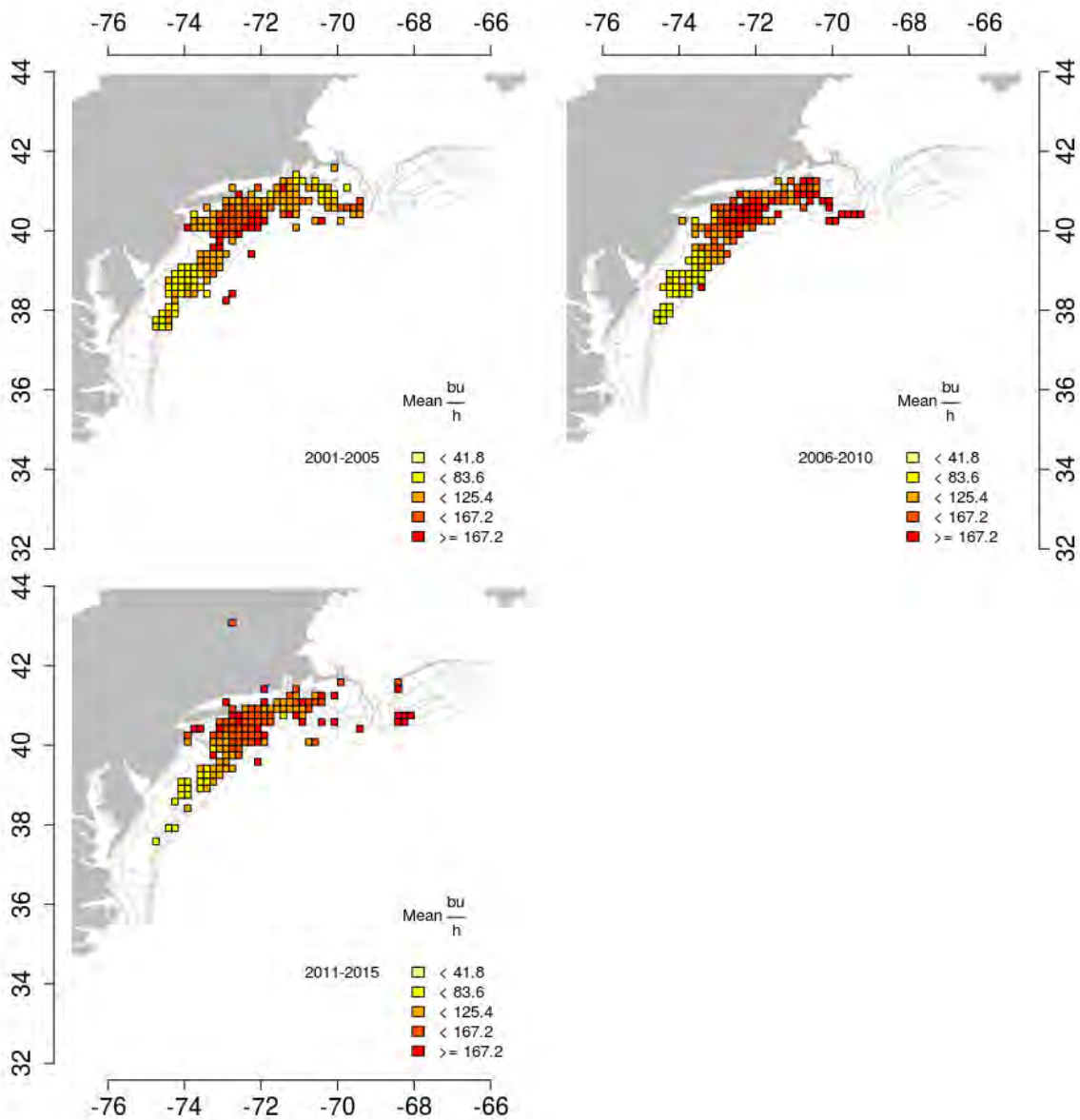
The average ex-vessel price of non-Maine ocean quahogs reported by processors in 2015 was \$7.10 per bushel, a few cents higher than the 2014 price (\$7.02 per bushel). In 2015, about 3.0 million bushels of non-Maine ocean quahog were landed compared to 3.2 million bushels landed in 2014. The total ex-vessel value of the 2015 federal harvest outside of Maine was approximately \$21 million, slightly lower than the \$22 million in 2014.

In 2015, the Maine ocean quahog fleet harvested a total of 41,611 Maine bushels, a 66% decrease from the 121,373 bushels harvested in 2006, and an 11% decrease from the prior year (2014; 46,109 bushels). Average prices for Maine ocean quahogs have declined substantially over the past 10 years. In 2003, there were very few trips that sold for less than \$37.00 per Maine bushel, and the mean price was \$40.66. Prices have since been lower; apparently the result of aggressive price cutting as noted by industry. In 2015, the mean price was \$28.27 per Maine bushel. The value of the 2015 harvest reported by the purchasing dealers totaled \$1.22 million, a decrease of 10% from the prior year.

The distribution of LPUE in bushels per hour over time is shown below in Figures 6, 12 and 13.



**Figure 12. Ocean quahog landings per unit effort (bushels per hour) by ten-minute square (TMSQ), the finest scale location for landings reported in logbooks, for 1981-2000. Only squares where more than 5 kilo bushels were caught are shown. Source: Dan Hennen Pers. Comm., NEFSC 2016.**



**Figure 13. Ocean quahog landings per unit effort (bushels per hour) by ten-minute square (TMSQ), the finest scale location for landings reported in logbooks, for 2001-2014, and preliminary 2015. Only squares where more than 5 kilo bushels were caught are shown. Source: Dan Hennen Pers. Comm., NEFSC 2016.**

### Processing Sector

Even though this document describes the ocean quahog fisheries, the information presented in this section regarding the processing sector is for both surfclams and ocean quahogs as some of these facilities purchase/process both species. In 2014, there were 9 companies reporting purchases of surfclams and/or ocean quahogs from the industrial fisheries outside of Maine. They were distributed by state as indicated in Table 3. Employment data for these specific firms are not available. In 2015, these companies bought approximately \$21 million worth of ocean quahogs and \$30 million worth of surfclams.

### Area Closures

Fishing areas can also be closed for public health related issues due to environmental degradation or the toxins that cause PSP. PSP is a public health concern for surfclams. PSP is caused by saxitoxins, produced by the alga *Alexandrium fundyense* (red tide). Surfclams on Georges Bank were not fished from 1990 to 2008 due to the risk of PSP. There was light fishing on Georges Bank in years 2009-2011 under an exempted fishing permit. The Greater Atlantic Regional Fisheries Office reopened a portion of Georges Bank to the harvest of surfclams and ocean quahogs beginning January 1, 2013 (77 FR 75057, December 19, 2012) under its authority in 50 CFR 648.76. Harvesting vessels have to adhere to the adopted testing protocol from the National Shellfish Sanitation Program.

**Table 3. Companies that reported buying ocean quahogs and surfclams by state (from NMFS dealer/processor surfclam/ocean quahog dealer/processor report database) in 2015.**

Number of Companies	MA	NJ
	7	2

### References

Cargnelli, L., S. Griesbach, D. Packer, and E. Weissberger. 1999. Essential Fish Habitat Source Document: Ocean Quahog, *Arctica islandica*, Life History and Habitat Characteristics. NOAA Tech. Memo. NMFS-NE-148.

Chute A., Hennen D., Russell R. and Jacobson L. 2013. Stock assessment update for ocean quahogs (*Arctica islandica*) through 2011. US Dept Commer, Northeast Fish Sci Cent Ref Doc., in review.

Hennen, Dan. Personal Communication. February 25, 2016. NOAA Fisheries, Northeast Fisheries Science Center, 166 Water St., Woods Hole, MA 02543.

## Estimated Proportion of Undersized Surfclam Landings for 2015

Jay Hermsen, Ph.D.  
Analysis and Program Support Division  
Greater Atlantic Regional Fisheries Office  
National Marine Fisheries Service  
August 25, 2015

### Introduction

The Code of Federal Regulations includes a provision for the suspension of minimum landing size regulations for surfclam (*Spisula solidissima*) [CFR 50, §648.75 (b)(3)]:

*“upon recommendation of the Mid-Atlantic Fishery Management Council (MAFMC), the Regional Administrator may suspend annually, by publication in the Federal Register, the minimum shell-height standard unless discard, catch, and survey data indicate that 30 percent of the surfclams are smaller than 4.75 inches (12.065 cm) and the overall reduced shell height is not attributable to beds where the growth of individual surfclams has been reduced because of density dependent factors.”*

Each year an analysis of the size composition of surfclam landings is conducted to inform any recommendation by the Mid-Atlantic Council to the Regional Administrator concerning surfclam minimum size restrictions. The following report summarizes the analysis of mid-Atlantic surfclam landings in 2015.

### Data Sources and Procedures

Samples of surfclam landings were collected from the Georges Bank, New Jersey and DelMarVa stock areas. These samples were not evenly distributed and, therefore, had to be weighted by stock area and volume.. The coast-wide distribution of undersized surfclams was then calculated.

The estimate for coast wide undersized surfclams landed was determined by calculating a weighted average proportion of undersized surfclams with equation 1:

$$\hat{P}_c = \left( \sum_{i=1}^n W_j \hat{P}_j \right) \quad (1)$$

where

$\hat{P}_c$  is the estimated coast wide proportion of undersized surfclams landed

$W_j$  is the proportion of landings from stock area  $j$  in the coast wide reported landings, as calculated with equation 2:

$$W_j = \frac{L_j}{\sum_1^3 L_j} \quad (2)$$

$L_j$  is the volume landed (bushels) from stock area  $j$

$\hat{P}_j$  is the estimated proportion of undersized surfclams in stock area  $j$ , as calculated with equation 3

$$\hat{P}_j = \left( \sum_{i=1}^n w_{ij} p_{ij} \right) \quad (3)$$

$w_{ij}$  is the proportion of the landings of sample  $i$  to total landings of all samples from stock area  $j$ , as calculated with equation 4:

$$w_{ij} = \frac{l_{ij}}{\sum_{i=1}^n l_{ij}} \quad (4)$$

$l_{ij}$  is the volume (bushels) for sample  $i$  from stock area  $j$

$p_{ij}$  is the proportion of undersized surfclams in sample  $i$  from stock area  $j$ , as calculated with equation 5:

$$p_{ij} = \frac{x_{ij}}{n_{ij}} \quad (5)$$

$n_{ij}$  is the number of surfclams in sample  $i$  from stock area  $j$

$x_{ij}$  is the number of surfclams <121 mm in size from sample  $i$  of stock area  $j$

Once the coast wide weighted average proportion of undersized surfclams was determined, the coast wide variance of the proportional mean was calculated and used to determine the 95% confidence intervals around that estimate.

The variance estimate for the proportion of undersized coast wide landings was calculated using equation 6:

$$\text{var}(\hat{P}_c) = \sum_{j=1}^3 W_j^2 \times \text{var}(\hat{P}_j) \quad (6)$$

where

$W_j$  is the proportion of all landings from stock area  $j$  to the coast wide landings from all three areas (Georges Bank, New Jersey and DelMarVa), as calculated with equation 2

$\text{var}(\hat{p}_j)$  is the variance associated with each stock area  $j$  estimated with equation 7:

$$\text{var}(\hat{p}_j) = \sum_{i=1}^n w_{ij}^2 \times \text{var}(\hat{p}_{ij}) \quad (7)$$

$w_{ij}$  is the proportion of the landings of sample  $i$  to total landings of all samples from stock area  $j$ , as calculated with equation 4

$\text{var}(\hat{p}_{ij})$  is the variance of the proportion of sample  $i$  in stock area  $j$  estimated with equation 8:

$$\text{var}(\hat{p}_{ij}) = \frac{(p_{ij} \times (1 - p_{ij}))}{n_{ij}} \quad (8)$$

The 2015 sampling period extended from January 1, 2015 through August 6, 2015. Surfclam samples were collected from vessels fishing in Georges Bank statistical areas 521, 522, and 526; in New Jersey statistical areas 612, 614, and 615; and in DelMarVa statistical area 621 and 622.

Two types of data were used in the analysis: (1) landings information and (2) biological sampling data. Surfclam landings data were collected as part of the Greater Atlantic Regional Fisheries Office mandatory reporting requirements. Vessel and dealer permit holders reported landed volume (bushels), vessel permit number, and fishing location, as well as other information from each vessel trip. This information provided landings data for the principle stock areas. Stakeholder Engagement Division (SED) field staff collected biological samples from selected vessels upon docking. Each sample consisted of shell height measurements from approximately 30 randomly selected individual surfclams. Bushels landed and fishing location of the sampled catch were recorded by SED field staff from information reported by the vessel operators. For length records that lacked area fished information, area fished was determined from the vessel log report for the trip or from the most recent available surfclam log report that included area fished for a particular vessel.

Oracle tables (sfoqpr and sfoqvr in the sfclam schema on the nero oracle server) were used to query and match vessel trip landings by date and permit number. A total of 54



samples from the 2015 sampling period were used for this analysis. There were several instances where a sampled trip lacked volume landed information. The volume of unmatched samples when a vessel could be identified was estimated using the average number of bushels of surfclams landed on all trips by that vessel in fishing year 2015.

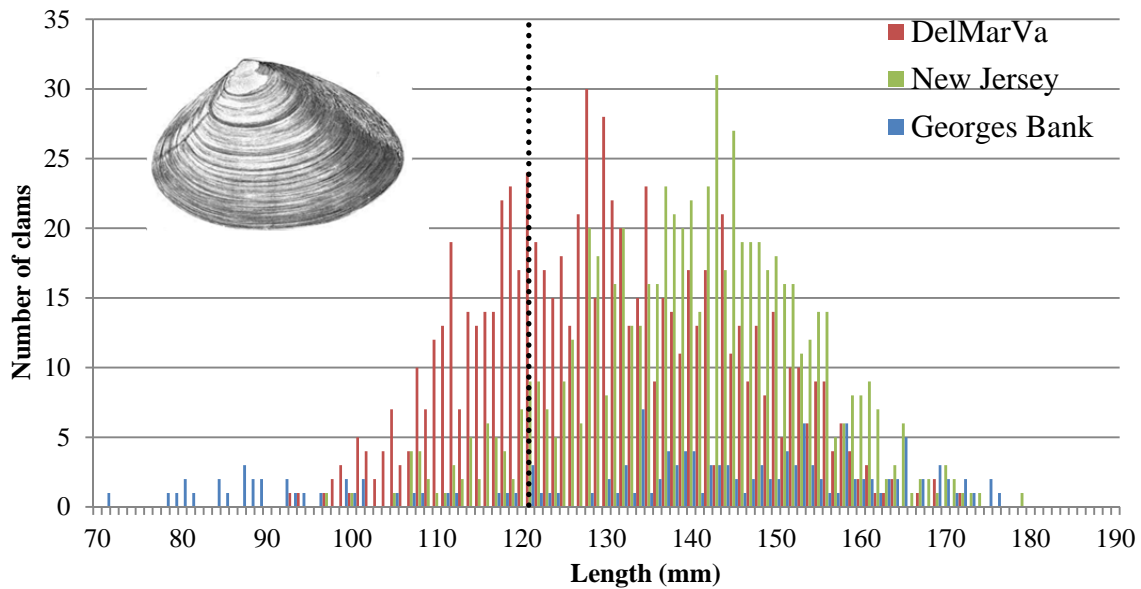
Landings information from the principle stock areas indicated that Georges Bank landings made up approximately 39% of the coast wide catch. The remaining 61% of the catch came from the New Jersey and DelMarVa stock areas (Table 1).

Table 1. FY2015 Landings of surfclams reported by vessels as of August 15, 2015.

<b>Stock area</b>	<b>Reported Landings (bushels) (as of August 15, 2015)</b>	<b>Meat weight of reported landings (lbs.)</b>	<b>Percent of reported landings</b>
Georges Bank	480,619	8,170,523	39%
New Jersey	464,333	7,893,666	38%
DelMarVa	281,986	4,793,757	23%
Grand Total	1,226,938	20,857,946	100%

The nominal length distribution of all biological samples obtained from January 1, 2015 through August 5, 2015 indicated that the overwhelming majority of surfclams sampled were larger than or equal to 121 mm. The mean length of the coast wide samples was 136 mm (Figure 1).

Figure 1. Length frequency distribution of surfclams from dockside sampling for FY2015. The dashed vertical line separates surfclams above and below 121 mm.



The 54 samples used in this analysis contained 1,621 measured surfclams, of which 308 individual surfclams were undersized. Eleven of the 54 samples collected had 30% or more undersized surfclams; one of those samples came from the Georges Bank stock area while the other ten samples with 30% or more undersized surfclams were from the DelMarVa stock area (Table 2).

Table 2. Description of the 54 individual surfclam samples collected in 2015, with the proportion of undersized surfclams in each sample.

Sample number	Stock Area	Number of surfclams in sample	Proportion of undersized surfclams	Volume of catch (bushels)
1	DelMarVa	30	0.27	768
2	DelMarVa	30	0.17	768
3	DelMarVa	30	0.13	<b>592</b>
4	DelMarVa	30	0.27	1472
5	DelMarVa	30	0.40	864
6	DelMarVa	30	0.27	1440
7	DelMarVa	30	0.03	1760
8	DelMarVa	30	0.13	1440
9	DelMarVa	30	0.00	960
10	DelMarVa	30	0.00	<b>1124</b>
11	DelMarVa	30	0.03	832
12	DelMarVa	30	0.00	960

13	DelMarVa	30	0.20	1440
14	DelMarVa	30	0.47	1888
15	DelMarVa	30	0.07	1120
16	DelMarVa	30	0.00	1216
17	DelMarVa	30	0.40	1536
18	DelMarVa	30	0.50	1344
19	DelMarVa	30	0.50	1344
20	DelMarVa	30	0.60	2560
21	DelMarVa	30	0.70	2688
22	DelMarVa	30	0.53	2560
23	DelMarVa	30	0.40	2560
24	DelMarVa	30	0.53	2176
25	DelMarVa	30	0.23	480
26	DelMarVa	30	0.03	3328
27	Georges Bank	30	0.10	<b>534</b>
28	Georges Bank	30	0.03	532
29	Georges Bank	30	1.00	<b>856</b>
30	Georges Bank	31	0.00	<b>856</b>
31	Georges Bank	30	0.00	<b>1013</b>
32	New Jersey	30	0.13	<b>592</b>
33	New Jersey	30	0.03	<b>592</b>
34	New Jersey	30	0.00	1472
35	New Jersey	30	0.17	1376
36	New Jersey	30	0.00	1440
37	New Jersey	30	0.13	1440
38	New Jersey	30	0.00	1440
39	New Jersey	30	0.10	1472
40	New Jersey	30	0.07	1440
41	New Jersey	30	0.00	1440
42	New Jersey	30	0.10	1472
43	New Jersey	30	0.03	1664
44	New Jersey	30	0.10	288
45	New Jersey	30	0.03	160
46	New Jersey	30	0.20	1408
47	New Jersey	30	0.07	800
48	New Jersey	30	0.13	1440
49	New Jersey	30	0.03	1312
50	New Jersey	30	0.00	1184
51	New Jersey	30	0.00	1056
52	New Jersey	30	0.00	640
53	New Jersey	30	0.07	3328

54	New Jersey	30	0.07	1856
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\*volume of catch in bold italics are estimates, samples with more than 30% undersized surfclams are highlighted.

### Estimation Results

An estimated 19.2% of the coast wide surfclam landings to date in 2015 were undersized. The lower and upper 95% confidence bounds for this estimate were 18.3% and 20.1%. These estimates are below the 30% maximum that would preclude the Regional Administrator from suspending the minimum shell height standard (Table 3).

Table 3. Proportional distribution of 2015 undersized surfclams by area and coast-wide.

Area	Estimated percentage of surfclams <121 mm	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Georges Bank	24.46%	24.10%	24.81%
New Jersey	6.54%	6.24%	6.83%
DelMarVa	31.12%	30.95%	31.28%
<b>Coast-wide*</b>	<b>19.21%</b>	<b>18.28%</b>	<b>20.13%</b>

\* weighted mean



## Mid-Atlantic Fishery Management Council

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

# MEMORANDUM

**Date:** 6/2/2016  
**To:** Council  
**From:** Jason Didden  
**Subject:** Blueline Tilefish Recreational Specifications

In addition to the memo below, this tab includes several constituent communications, as well as the Fishery Management Action Team/Staff memo and the Advisory Panel Meeting Summary from the April 2016 meeting. No additional information is available, but those documents may be useful if the Council decides to reconsider its previously-adopted blueline tilefish recreational specifications.

On Wednesday, June 15<sup>th</sup> 2016 the Council is scheduled to “Consider alternatives to proposed blueline tilefish recreational specifications.” Since Council action in April 2016, the Council received several public comments expressing concern about the Council’s action, specifically the recreational specifications: An open season from May 1 – October 31 and per-person recreational bag limits of 7 blueline tilefish on for-hire inspected vessels, 5 blueline tilefish on for-hire uninspected vessels, and 3 blueline tilefish on private vessels. Concern was also expressed that there was insufficient opportunity for the public to comment on these measures. Together with a public webinar at 7pm on June 9, 2016 (<http://www.mafmc.org/council-events/2016/blueline-tilefish-listening-session>), this agenda item provides additional opportunity for public comment on the proposed recreational specifications, and an opportunity for the Council to consider those comments (the Amendment has not yet been submitted).

Staff’s understanding of the Council’s intent behind the adopted recreational specifications was to achieve catch reductions of approximately 50% compared to 2014/2015 catch, in order to stay within the recreational total allowable landings of 62,262 pounds<sup>1</sup>, while accounting for the dependence of several party boats on blueline tilefish and the relative uncertainty of the catch

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<sup>1</sup> Derived from a 73% recreational allocation of the Scientific and Statistical Committee’s Acceptable Biological Catch (ABC) of 87,031 pounds for 2017 and accounting for the small percentage of reported recreational discards

estimates from the charter and private vessel fleet<sup>2</sup>. Given the low limits, if recreational catch is not sufficiently constrained this could cause substantial annual catch limit (ACL) overages and subsequent repayments in future years. Vessel Trip Reports (VTRs) also suggested that party boat trips in 2014-2015 with more than 7 fish per person accounted for 54% of the fish they caught, and that charter boat trips in 2014-2015 with more than 5 fish per person accounted for 58% of the fish they caught, i.e. charter boats had a lower average catch rate per person in recent years. Thus a uniform bag limit like the emergency regulations (7 fish) would appear to impact the party boat segment of the fishery more compared to the charter segment of the fishery. The Delphi workshop also suggested that private boats had fewer trips with high catch rates than charter boats.

The public hearing document considered a range of recreational trip limits of 5-9 fish, with an option for 3 additional fish for party boat trips that lasted longer than 36 hours. The public hearing document also considered seasonal closures, to be implemented in-season by NMFS if it determines that that one fishery's catch or the total catch will exceed 95% of a fishery's ACL or the overall ABC/ACL. While in-season recreational closures were not adopted by the Council, the general approach of closing part of the season to control catch was considered in the public hearing document.

Given the necessary reductions in recreational catch that became apparent after the public hearing document was created, the data on party and charter catches described above, public comment during hearings regarding dependence on the fishery by some for-hire entities, and opposition to relying on in-season closures, staff solicited input from the Advisory Panel on the feasibility of using a mix of differing seasonal trip limits for private, charter, and party boats. Staff used the AP input to draft several options for a memo that was posted to the April 2016 Council briefing documents webpage, and made available for discussion and public comment at the Council meeting. That memo and the Tilefish Advisory Panel Meeting Summary are included later in this tab for reference.

Staff continues to believe that the options recommended by the Council are viable in that they should limit catch compared to 2014/2015, and the accountability measures recommended by the Council will allow management measures to be adjusted if there are future overages. Given the status of blueline tilefish information, all measures will have uncertain results until reporting has been improved. Previous analysis included in the staff memo from the last meeting suggested that a 5 fish per person limit could reduce landings by 29% or more (based on party/charter VTR information), depending on how effort is impacted by a 5 fish per person limit. Public comment has suggested that anglers may not pay for a 5-fish limit trip. A 7 fish limit was associated with a 13% reduction, a 16% difference. Given November-December accounted for about 12.3% of reported catch, moving to a uniform 5-fish per person limit seems likely to approximately balance leaving November-December open. In addition, if (as mentioned in recent comments) substantial discarding occurred during a November-December

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<sup>2</sup> The Council also recommended mandatory universal reporting for blueline and golden tilefish to address this uncertainty.

closure due to black sea bass fishing, closing November-December may not be as effective an option in terms of overall blueline tilefish mortality. Raising the private limit from 3 fish to 5 fish will increase the possibility of overages (once reporting begins), but the degree is difficult to predict given the available information.

May 10, 2016

Fred Akers  
P.O. Box 395  
Newtonville, NJ 08346

Mr. Richard B. Robbins, Chairman  
Mid-Atlantic Fisheries Management Council  
Sent by email to: [richardbrobins@gmail.com](mailto:richardbrobins@gmail.com)

RE: MAFMC Blueline Tilefish Management Amendment Complaint

Dear Chairman Robbins:

Please consider this letter a formal complaint regarding the arbitrary and capricious decision made by the MAFMC under the Blueline Tilefish Amendment to split the recreational fishery into 3 sectors and cut private boat owners access to the fishery by 43% from 7 fish per day to 3 fish per day, while cutting the Party inspected for-hire vessel access to the fishery by 0%, keeping it at 7 fish per day for every angler on their boats.

In addition to the 43% reduction in the daily bag limit for private boat owners to 3 fish, this unfair and discriminatory action will also tend to reduce overall effort by private boat owners as well. During the scoping for this amendment, some party boat owners complained that bag limits less than 7 fish would cause many of their clients to not take trips for blueline tilefish due to the relatively high costs associated with the extended run offshore required for blueline tilefish in their region (PID page 68). 3 fish is a lot lower than 7 fish, so the 3 fish bag limit will significantly reduce private recreational boat effort on a trip basis as well as on a daily basis because of the costs incurred getting out to the tilefish grounds for only 3 fish.

Splitting the blueline tilefish recreational fishery into 3 sectors and unfairly distributing the allocation through different bag limits is arbitrary and capricious because this alternative was not considered, mentioned, discussed or otherwise presented during the entire amendment development process. Furthermore, splitting the recreational fishery into multiple sectors with separate and different management measures is not a customary practice by the MAFMC.

I attended almost every Committee, Council, and Advisory Panel meeting, studied the scoping documents, studied the Public Information Documents, and made written comments on the alternatives communicated to the public under **Alternative Set 12: Recreational bag/possession limits**, and a 7-5-3 recreational split sector bag limit was not proposed until after the public comment period had closed.

Furthermore, if the Council wants to start splitting the recreational sector for FMP species management, then it is very unfair to deny one of the sectors, in this case the private recreational boat owners, a seat on the Advisory Panel to represent that specific interest. I attended the 2/16/16 and 4/5/16 Tilefish AP meetings as an observer, and I observed that private recreational boat owners were targeted by the commercial and for hire AP interests as a big competitive problem for them in the tile



fish fishery, which seems to have ultimately resulted in their lobby to the MAFMC staff for this split sector punishment with a 3 fish bag limit for private recreational boat owners recommended in the 11<sup>th</sup> hour of the process by Council Staff.

As a private recreational boat owner who targets tilefish, I reported my legal catches of blueline tile for 2015 to the Council, and I was subsequently invited to participate in the Delphi Survey Process to help estimate recreational catch in the Mid-Atlantic Region, which I gladly volunteered to do. However, it now looks like my reward for participating in the Delphi Process and reporting my blueline catch for 2015 as a private recreational boat owner was to be targeted by the Party boat owners and the commercial interests on the tilefish AP as a threat to those special interests and to be punished by a last minute staff recommendation to restrict my access and fair share of a Public Trust Resource, blueline tilefish, and to arbitrarily favor the for hire recreational fishing interests by giving them higher bag limits than private recreational boat owners, like me.

One important management consideration that was excluded in this amendment was the regional economic value of the private recreational boat owners. If you are going to split the recreational sector and designate disproportionate catch limits, you should identify the economic value of each separate sector to inform your decisions based on the economic value of each one.

Private recreational boat owners who fish for tile fish invest hundreds of thousands of dollars in boats, tackle, bait, and fuel to fish for tile fish, and perhaps the cumulative economic value generated by private recreational boat owners to the Mid-Atlantic Region is greater than that of the few for hire boats that fish for blueline tile each year.

I am a public volunteer and interested party who currently serves on the Ecosystem and Ocean Planning Advisory Panel, the River Herring and Shad Advisory Panel, a past volunteer on the Bluefish Advisory Panel, and a general public participant who regularly attends Council meetings and participates with public comments.

Overall I am a very strong supporter of the outstanding, progressive, fair, and inclusive work that the MAFMC has done and continues to do to sustainably manage the fisheries under its jurisdiction, but the Council's recent arbitrary and capricious decision to split the recreational blueline tilefish catch with a 7/5/3 bag limit is a substantial disappointment, and seriously out of character.

I sincerely appreciate your leadership as the Chair of the MAFMC, and I appreciate the opportunity to log this complaint to you. Since the MAFMC has made its formal decision to recommend the 7/5/3 split sector recreational blueline tile fish bag limit to the National Marine Fisheries Service for adoption and implementation, I will provide NMFS with this letter and further comments to NMFS to stop the MAFMC's arbitrary and capricious decision on this fisheries management issue for blueline tilefish.

Respectfully,



Fred Akers, private recreational boat owner and tilefish fisherman from NJ

**From:** [Avery, Mike](#)  
**To:** [Robins, Rick](#)  
**Cc:** ["O'Leary, Tom"](#); [O'Leary, Joan](#); [DiDomenico, Gregory](#); [Blount, Frank](#); [O'Reilly, Robert](#); [Staff-MAF](#); [Saunders, Jan](#); [Bullard, John](#); [Pentony, Mike](#); ["Stanley Gold"](#)  
**Subject:** RE: FW: MAFMC April 2016 Council Motions  
**Date:** Tuesday, May 03, 2016 6:59:59 PM

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Rick,

Much appreciate the response. While I fully understand the response, I don't get any satisfaction from it.

The bag limits and seasons are probably the most important part in the development of an FMP and we feel very misrepresented by the process of zero public input on those key decisions. I still believe it's an overall bad policy to give advantages to certain types of boats no matter how well intentioned. The other issue that I hope was considered by the open/closed season is the continued mis-alignment of species that inhabit the same waters. BSB are often mixed in with bluelines. As it is now, many BSB probably die while BSB is closed from Jan-May while targeting bluelines. Now with bluelines closed 1 Nov-31 Dec while BSB is open, many bluelines will probably die while anglers target BSB in those 2 months. Additionally, with a limit of only 3 bluelines, I wonder how much additional culling will take place among recreational anglers. Now instead of boxing the first 7 bluelines and be done, I wonder how many 3 to 5 lb bluelines will get tossed back in search of the 3 bigger bluelines since that is all they can keep. Many will keep tossing back small bluelines in search of the 10-15 lbers. I'm sure you guys know that most of these fish in 300 plus feet of water will not survive the trip back down if released.

I know the MAFMC has already made the decision so I do desire to participate in the public comment period prior to being published in the federal registry. If anyone has the details on when this will be available it would be appreciated

r/ Mike Avery

**From:** Richard Robins [mailto:[richardbrobins@gmail.com](mailto:richardbrobins@gmail.com)]  
**Sent:** Tuesday, May 03, 2016 10:53 AM  
**To:** Avery, Mike <[mike@averys.net](mailto:mike@averys.net)>  
**Cc:** O'Leary, Tom <[tom.oleary@mcgladrey.com](mailto:tom.oleary@mcgladrey.com)>; Joan <[joleary@nefmc.org](mailto:joleary@nefmc.org)>; Gregory <[gregdi@voicenet.com](mailto:gregdi@voicenet.com)>; Frank <[francesflt@aol.com](mailto:francesflt@aol.com)>; Rob O'Reilly (MRC) <[rob.o'reilly@mrc.virginia.gov](mailto:rob.o'reilly@mrc.virginia.gov)>; Staff-MAF <[Staff-MAF@mafmc.org](mailto:Staff-MAF@mafmc.org)>; Saunders, Jan <[jsaunders@mafmc.org](mailto:jsaunders@mafmc.org)>; JohnBullard - NOAA Federal <[John.Bullard@noaa.gov](mailto:John.Bullard@noaa.gov)>; Pentony, Mike <[michael.pentony@noaa.gov](mailto:michael.pentony@noaa.gov)>  
**Subject:** Re: FW: MAFMC April 2016 Council Motions

Mike

Thanks for your earlier email regarding the Council's blueline tilefish amendment. The Council was faced with the impending expiration of existing, emergency measures that would leave the blueline tilefish fishery and resource at least partially exposed to the same type of

unregulated fishing effort that occurred in federal waters in the Mid-Atlantic in 2014. Consequently, we had to take final action at our April meeting in Montauk and we had to make difficult decisions on the technical measures (bag/season) that would achieve a reduction in recreational landings of approximately 50%, relative to the catch estimated in the 2014-2015 period.

We did not have the benefit of knowing the SSC's ABC recommendation when we conducted the public hearings, so the first opportunities we had to discuss the resulting impacts to the technical measures was during the committee meeting on the first day in Montauk, and again on Wednesday during full Council. The quota is extremely low relative to the current fishery, and the Agency indicated they did not expect to be able to implement in-season monitoring of the recreational catch in the first year (2017). Since we do not have an OFL for this stock, the accountability measure in the event of an overage in 2017 would include a payback, which is an outcome we wanted to avoid. Consequently, the Council recommended measures to constrain the recreational landings to the new quota for 2017, and to include measures that would reduce the risk of an overage and the associated negative consequences for the fishery. As constraining as the quota is, I would note that the Delphi workshop that you and others participated in was essential to establishing a characterization of the scale of the recreational fishery in 2015. Without the landings estimates produced by the Delphi workshop, the quota would have likely been a fraction of the ABC that was recommended by the SSC.

This is a starting point for federal management in the Mid-Atlantic, and one that I believe we can improve upon. The SSC highlighted several research priorities, and I anticipate that we will move forward with them as soon as possible. Specifically, they recommended improving the historical time series of the recreational landings, and conducting fisheries independent surveys of the blueline resource in the Mid. The recreational measures that you have expressed concerns about would take effect at the beginning of the 2017 season, on May 1. If the Council is able to develop new information that would be relevant to the specifications, the information can be sent to our SSC for review and, pending any change to the ABC by the SSC, the Council could update the specifications and technical measures to the fishery in the future. Additionally, the specifications will be subject to annual review by the SSC and the Council, which will provide further opportunities to review the tradeoffs associated with specific recreational measures.

If you have further comments specific to the proposed recreational management measures, I would encourage you to send written comments to the Agency when they publish the proposed rule in the Federal Register. Thanks again for your expressed concerns and continued participation in the process as this management plan moves forward.

Best regards,  
Rick Robins

On Thu, Apr 21, 2016 at 11:40 AM, Richard Robins <[richardbrobins@gmail.com](mailto:richardbrobins@gmail.com)> wrote:

Mike

Thanks for forwarding your concerns regarding the Council's final recommendations on the blueline tilefish amendment. I am in a New England Council meeting and will revert next week.

Best regards,  
Rick Robins

On Wed, Apr 20, 2016 at 3:06 PM, Avery, Mike <[mike@averys.net](mailto:mike@averys.net)> wrote:

Dear MAFMC Council Members,

I am deeply troubled by the motions passed regarding Blueline Tilefish at the April council meeting. I have been involved with MAFMC regarding bluelines for almost a year now attending meetings, taking the time to respond to draft documents including the recent draft FMP. Even taking time off traveling significant distances to be involved. The motions passed, particularly 12a which establishes a bizarre, highly discriminatory, and unprecedented limits of 7 per head boat, 5 per charter boat, and 3 per rec anglers did not appear in any of the documents or discussions the entire year 9 month long process. I fail to see the logic in discriminating between an inspected vessel vs non inspected vessel as it show clear and unjustified favoritism towards head boat operators.

And to add insult to injury the open and closed seasons are not justified as there are so few boats that fish for tile in the winter months there would be very little savings yet punish the few boats that can get a little extra income in the winter as NOAA continues to keep BSB closed and very limited striper opportunities off Virginia results in an almost complete shutout of winter fishing opportunities.

I highly encourage the council to delay the press release and reconsider these motions. I intend to energize all the anglers and Captains that took the time to get involved in this process only to have the rug pulled out from under us at the last minute. I don't know if these actions were deliberately deceptive in nature or just the "good idea grenade" got tossed around at the last minute but inserting such measures without public input is not what is expected of our government officials.

Virginia Saltwater Sportfishing Association (VSSA)  
email: [ifishva@gmail.com](mailto:ifishva@gmail.com) phone: [757-329-5137](tel:757-329-5137)  
[ifishva.org](http://ifishva.org)  
[joinvssa.org](http://joinvssa.org)  
<https://www.facebook.com/groups/IfishVA/>

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**From:** Avery, Mike [mailto:[mike@averys.net](mailto:mike@averys.net)]  
**Sent:** Wednesday, April 20, 2016 1:35 PM  
**To:** 'Didden, Jason' <[jdidden@mafmc.org](mailto:jdidden@mafmc.org)>  
**Subject:** RE: MAFMC April 2016 Council Motions

I will be filing complaints with council leadership and HQ NOAA Fishery regarding the process used for the motions in 12a. Not very professional to staff a draft FMP then sneak in new rules the public had no ability to comment on. The 7/5/3 tile per person is bizzare, highly discriminatory, and unprecedented showing

favoritism to head boats for no justification. A paying customer should not be allowed to keep more fish just because the boat is inspected vs not inspected. And the open closed seasons are not justified giving no fishing options for winter fishing.

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**From:** Didden, Jason [<mailto:jdidden@mafmc.org>]  
**Sent:** Wednesday, April 20, 2016 11:40 AM  
**To:** Avery, Mike <[mike@averys.net](mailto:mike@averys.net)>  
**Subject:** FW: MAFMC April 2016 Council Motions

Motions are attached – a summary press release will be coming out soon...

Jason

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**From:** Saunders, Jan  
**Sent:** Tuesday, April 19, 2016 12:14 PM  
**To:** O'Leary, Joan <[joleary@nefmc.org](mailto:joleary@nefmc.org)>; DiDomenico, Gregory <[gregdi@voicenet.com](mailto:gregdi@voicenet.com)>; Blount, Frank <[francesflt@aol.com](mailto:francesflt@aol.com)>; Leo, Arnold G. <[agleo@sover.net](mailto:agleo@sover.net)>; O'Reilly, Robert <[rob.o'reilly@mrc.virginia.gov](mailto:rob.o'reilly@mrc.virginia.gov)>; Staff-MAF <[Staff-MAF@mafmc.org](mailto:Staff-MAF@mafmc.org)>  
**Subject:** MAFMC April 2016 Council Motions

Please see attached.

M. Jan Saunders  
Mid-Atlantic Fishery Management Council  
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[jan.saunders@noaa.gov](mailto:jan.saunders@noaa.gov)  
[jsaunders@mafmc.org](mailto:jsaunders@mafmc.org)



**From:** [jjcboats1976@comcast.net](mailto:jjcboats1976@comcast.net)  
**To:** [Moore, Christopher](#)  
**Cc:** [Didden, Jason](#); [HD](#); [Feller, Skip](#)  
**Subject:** blueline tile  
**Date:** Saturday, April 30, 2016 7:35:06 AM

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Chris thanks in advance for taking the time to read this email. I just received a copy of the proposed blue line tile fish proposal. This new proposal is extremely harmful to two of the three people that provided VTR on tile in the mid Atlantic. Skip Feller and myself catch the bulk of our fish from Nov through April given that the sea bass have been shut down in the winter the only thing we have to fish for are golden tile and blue line tile. We try to target sea bass and golden tile because they create the most interest but the blue line tile we catch with them make the trip. Unfortunately the Blue lines are mixed in with the sea bass and golden tile below 38 degrees where we fish. The depth they are caught in makes it impossible for them to live if we through them back. I personally think the committee for once is headed in the right direction with the separation of the inspected vessels however all private vessels will become charter boats if stopped. I think there should be inspected vessel and uninspected vessels and for the inspected vessels we need the latitude to be able to be able to fish. I believe most of us would rather have a longer season and smaller bag limit if we had to make a choice. I would ask you to reconsider the proposed proposal and please distribute this to the rest of the committee. The handful of head boats left in the business are dying a slow death please help us. Thanks Jim Cicchitti JJC Boats Inc (dba: Starlight Fleet)

**From:** [Skip Feller](#)  
**To:** [Moore, Christopher](#)  
**Cc:** [Didden, Jason](#); [Robins, Rick](#)  
**Subject:** Blue Line Tile  
**Date:** Tuesday, May 03, 2016 11:16:20 AM

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Chris Moore & The Mid Atlantic Council;

To begin with, thank you for taking the time to read this. After receiving a copy of the proposed plan for the Blue Line Tilefish fishery, I can honestly say that these changes are detrimental to the livelihood of many, including myself. As a headboat operator out of Virginia Beach, Virginia my business relies greatly on Blue Line Tilefish and would most likely not survive should the proposed plan be passed. While Seabass are our customer's most desired fish, the Seabass season closures make Blue Line Tilefish what keeps our business afloat during the winter season.

Unfortunately, there are more problems with the proposal than just the possibility of lost business. Another major problem that I see is that these closures are supposed to be helping sustain the fishery, but in turn will cause an inhumane affect on the Tile Fish. Because the Tile Fish are caught in cold, deep water they would not survive being thrown back after being caught. Unfortunately, the Tile Fish presence is still so strong that it would not just be a few being caught and thrown back to die.

While it seems that the council is attempting to do some good by creating a divide between private boats and charter/headboats, the proposal still seems to hurt the headboats who submitted VTR's the most. If these limits and season are to be imposed, the difference in quota numbers should be set between inspected and uninspected vessels as to deter the private boats from becoming charter vessels in order to increase their own bag limits.

It is understood that there needs to be some closures but our hope is that it will remain open November and December and the closure be January through April. Having the season closed January-April means that we will be completely sacrificing 4 months of business and unable to run any sort of trip. One can only imagine what that will do to our business to begin with, but closing the season any longer than those 4 months would undoubtedly sink us altogether. While it is not ideal to drop the bag limit at all, if the toss up was between 6 months of closure and maintaining a 7 fish bag limit or 4 months of closure and decreasing the bag limit to 5 fish we would gladly take the decreased bag limit and 4 month closure.

Again, I want to thank you for taking the time to consider these decisions and

their affect on so many and take my concerns into consideration while deciding on the final plan.

Skip Feller

Rudee Tours





**Mid-Atlantic Fishery Management Council**  
800 North State Street, Suite 201, Dover, DE 19901-3910  
Phone: 302-674-2331 | FAX: 302-674-5399 | www.mafmc.org  
Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman  
Christopher M. Moore, Ph.D., Executive Director

## MEMORANDUM

**Date:** 4/8/16  
**To:** Council  
**From:** J. Didden   
**Subject:** Blueline Tilefish FMAT Summary and Staff Recommendations

The Fishery Management Action Team (FMAT) for Blueline Tilefish met via teleconference on 4/6/2016 to consider recommendations for the Council's Blueline Tilefish Amendment. In attendance were FMAT members Jason Didden (MAFMC), Paul Nitschke (NMFS-NEFSC), Tim Cardiasmenos (NMFS-GARFO-NEPA), and Doug Potts (NMFS-GARFO-SF). T. Cardiasmenos had to leave the call early. Rick Robins was also connected for part of the call.

While the Council will select what (if any) allocation to make in this Amendment, for purposes of analysis/discussion about what limits might sufficiently constrain the recreational and commercial fisheries, the FMAT assumed a 25% commercial and 75% recreational division of the 87,031 pound Acceptable Biological Catch (ABC) recommended by the Council's Scientific and Statistical Committee (SSC). This would lead to a 65,273 pound recreational annual catch limit (ACL) and a 21,758 pound commercial ACL. Assuming that reporting can be obtained from all sectors, there is no information for the FMAT to recommend management uncertainty buffers at this time so the annual catch targets (ACTs) would equal the ACLs. If enforcement reveals ongoing reporting compliance issues or if the ACL is exceeded, then a management uncertainty buffer would likely be recommended in the future. Given the SSC utilized a 2% discard rate for the recreational sector and a 1% discard rate for the commercial sector (both from VTRs), it appears reasonable to the FMAT to apply these rates to the ACTs, which produces recreational total allowable landings (TAL) of 63,968 pounds and commercial TAL of 21,540 pounds.

Under the above assumptions, the FMAT noted that while the emergency regulations appear sufficient to restrain the commercial fishery to its possible TAL, the emergency regulations do not appear sufficient to restrain the recreational fishery to the TAL described above - compared to 2014/2015, catch would have to be approximately reduced by 50%. As described in the public hearing document, it is estimated that the current commercial regulation of 275 pounds gutted fish would have resulted in approximately 14,500 pounds of commercial landings (live weight) from Virginia north in 2015, had the emergency regulations been in effect for the entire year. Given this finding, it appears to the FMAT that the option for 300 pounds gutted fish (slightly more than the current regulations) would constrain the commercial fishery to a TAL of 21,540 pounds, though there is limited data for analysis. Moving up to 500 pounds is likely to lead to reaching the commercial TAL before the end of a fishing year, especially since there has been public comment that additional directed fishing will occur at a trip limit of 500 pounds. The FMAT recommends using even numbers to facilitate compliance/enforcement if possible. There was discussion whether trip limits could be increased near the end of the year if quota was

available, but the FMAT thought that this could be difficult to implement successfully initially, especially without additional data on fishery performance.

The FMAT noted that in 2015 when the emergency regulations went into effect (June 4, 2015), recreational catch apparently increased compared to 2014 (when there were no federal regulations). While partyboat catch did fall from 2014 to 2015, estimated charter boat catch 2014-2015 approximately doubled, which also doubled the assumed private catch. The FMAT noted that additional work on the charter boat time series may be warranted, given the low reporting and possible issues with assuming a constant multiplier though time based on the 2015 Delphi estimated catch and the 2015 Vessel Trip Reports (VTRs). To the degree that under-reporting increases looking back in time, then the charter time series will be under estimated further back in time. Staff noted that the numbers of charter vessels reporting some blueline tilefish catch in 2014 and 2015 did not appreciably change.

The FMAT also noted that to the degree that the Delphi process was in error, or to the extent that future catch reporting is in error, any tracking of future catch by universal mandatory reporting may generate unexpected results.

To begin considering how recreational catch may be limited to avoid ABC overages, staff reviewed VTR data from 2014-2015 trips according to average blueline tilefish caught per angler. For party-charter combined, a large portion of the catch was caught on trips that landed a high number of fish per angler (see Tables 1 and 2).

Table 1. 2014 Party/Charter Trips

Fish/Angler	Total Fish	Percent of total fish
1-2	881	6%
3-5	3196	20%
6-7	3244	20%
8-9	968	6%
10+	7609	48%

Table 2. 2015 Party/Charter Trips

Fish/Angler	Total Fish	Percent of total fish
1-2	601	4%
3-5	1230	9%
6-7	5211	39%
8-9	3616	27%
10+	2776	21%

Staff also reviewed 2014/2015 VTR party and charter data separately, which showed that charter boats had a lower average catch rate per person, with most (62%) of the reported catch coming from trips that caught 3-7 fish, while most (54%) of the party boat catch came from trips where catch rates averaged 8 or more fish per angler.

Table 3. 2014/15 Charter Trips

Fish/Angler	Total Fish	Percent of total fish
1-2	417	15%
3-5	756	27%
6-7	993	35%
8-9	379	13%
10+	285	10%

Table 4. 2014/15 Party Trips

Fish/Angler	Total Fish	Percent of total fish
1-2	1065	4%
3-5	3670	14%
6-7	7462	28%
8-9	4205	16%
10+	10100	38%

These data suggest to staff that compared to 2014 or 2015, even the emergency regulations will be slightly restrictive, and are more restrictive for the party boat segment of the fishery compared to the charter segment of the fishery. Additional restrictions could impact both catches per trip/person and effort so the impacts on catch are difficult to predict. Public/Advisory Panel comments suggest that restrictions below 7 fish would substantially impact party boat effort by discouraging participation (deep drop tilefish trips cost \$220-\$575 per person on party boats). Public comment has also indicated that high-grading/ discarding may become an issue with per person trip limits below 7 fish.

Staff also reviewed party/charter 2014-2015 catch by month – see table 5. While some effort transfer may occur from a month that might be closed to months that remain open, there should be some catch reductions from any closed season. Several members of the AP provided input that a closure Jan-April with a 7-fish limit (per person) would be reasonable. However staff noted that Jan-April only accounted for 6% of VTR reported landings and a larger reduction in catch is likely necessary to adhere to the ABC. Additional comments from some AP members also suggested that a closure and/or per person trip limit reduction in Nov/Dec could be manageable given that many Jan-April trips are canceled due to weather anyway and that black sea bass are available in Nov/Dec.

Table 5. Party-Charter 2014-2015 VTR Catch by Month.

Month	% Catch
Feb	1.7%
Mar	0.6%
Apr	4.0%
May	13.7%
Jun	18.4%
Jul	16.6%
Aug	19.1%
Sep	7.2%
Oct	6.3%
Nov	4.0%
Dec	8.3%

To generate discussion on the AP call, staff solicited input on a system of per person trip limits that vary by season, per table 6. The lower limits for charter versus party were based on the findings that charter boats had lower catch rates per angler to start with (see above), and the lower limit for private anglers was based on a presumption that private anglers also have lower catch rates and that there is more economic dependence on this fishery for party and charter operations (and especially for the 3-4 party boats that specialize in deep-drop fishing). The private catch is also least understood given the lack of MRIP data for blueline tilefish, and until more is understood about the private catch, relatively low limits would help minimize the risk of high private catches shutting down the fishery much more quickly than expected.

Table 6. Initial recreational limits for discussion.

	July 1 - Feb 28	March 1-June 30
Private	3	
Charter (6 or less)	3	5
Party	5	7

Under any scenario of increased restrictions, there is no way to predict how the fishery would proceed other than that catch would be more restricted. In season closures could avoid overages and paybacks but could also discourage reporting. The FMAT was skeptical that reporting compliance could be achieved or that differential per person trip limits by season and segment of the fishery could be effectively communicated. Staff noted that there are reporting options in the document that would provide for compliance checks on reporting. A universal per person trip limit would be simpler to communicate and enforce, but may place more of a burden from the reduction on the party boat segment of the fishery.

The FMAT also had concerns that closing the fishery for Jan-April would have a minimal impact on catch, and even adding in a Nov/Dec closure only covers 19% of catch. A July-October open season would span approximately half of the catch over 2014-2015, and could be an option that had a chance of holding catch to approximately 50% of 2014-2015 without requiring in-season monitoring, especially if combined with a per-person trip-limit restriction. The Council could also combine a seasonal closure with per-person trip limit restrictions, as described in the examples below (Table 7). For all of these options, since the limited data does not allow for quantitative estimates of the resulting catch, the only way to effectively limit catch would be to combine any limits with in-season monitoring/closing and real-time reporting. The more restrictive the measures are, the less likely that in-season closures will be triggered (if selected by the Council). By converting high 2015 per-person catches to 7 or 5 fish person, catch reductions of 13% and 29% would be achieved respectively, assuming the same number of trips. However, if a 5 fish per person limit reduces effort/trips overall, then a greater than 29% reduction would be achieved. Therefore combining a 5 fish per person limit with a closed season from Nov1-Apr30 should have a relatively low risk of substantial in-season closures, and more liberal seasons/per person trip limits would have a relatively higher risk of in-season closures. Given the limited data it is not possible to quantify the differences.

Table 7 – Alternative Season/Bag Limits

	Jan 1-April 30	March 1-Dec 31
Private	Closed	3
Charter (6 or less)	Closed	5
Party	Closed	7

Closure = 6% of catch 2014/2015

	Nov 1-April 30	May 1-October 31
Private	Closed	3
Charter (6 or less)	Closed	5
Party	Closed	7

Closure = 19% of catch 2014/2015

	Nov 1-April 30	May 1-October 31
Private	Closed	5-7
Charter (6 or less)	Closed	
Party	Closed	

Closure = 19% of catch 2014/2015

Finally, during the call Rick Robins noted that if the fishing year began on Jan 1 instead of Nov 1, then Jan 1-Apr 30 could be closed regularly as part of the season, and if in-season closures are used, Nov-Dec would be closed or not depending on how landings progressed during the year. The FMAT noted that there are administrative savings to aligning the golden tilefish and blue line tilefish fisheries from a fishing year perspective, but that it may be possible to have the

two fisheries in the same regulatory action targeted for the golden tilefish fishing season of November 1, but have the blueline tilefish season start January 1.

The FMAT also reviewed the other alternative groups in the document, as described below:

2. Management Unit: The FMAT supports using the VA/NC line (2a), and this is the recommendation of staff.
3. Status Determination Criteria: FMAT/staff supports automatically incorporating the best available science).
4. Commercial Permitting and Reporting: The FMAT sees no strong need to create a separate blueline permit at this time – if limited access is pursued later then landings of blueline tilefish could be examined regardless of whether there is a separate blueline tilefish permit or it is combined with golden tilefish. For other items, standard commercial reporting appears reasonable and electronic (e)VTRs would not appear critical since near real-time reporting occurs through dealer reports. However, eVTRs could facilitate more rapid assignment of catch by area.
5. For-Hire Permitting and Reporting: The same rationale regarding commercial permitting applies to party/charter permitting (no strong advantage apparent for separate permits). However, given the potential need for in-season monitoring, eVTRs are recommended by the FMAT and staff, and to facilitate enforcement/compliance they should have the same real-time requirements for reporting before fish leave the boat (or boat leaves the water if trailered), as described for private reporting.
6. The FMAT discussed a staff recommendation that the HMS system be used to require private anglers to obtain a separate tilefish permit to catch golden or blueline tilefish. This is a hybrid of 6a and 6b. Staff agrees with public comments that a separate private tilefish permit be required rather than just an HMS permit, because this would provide better information on the universe of anglers interested in tilefish fishing. Since many offshore anglers are familiar with the HMS online permit interface, having that site be where tilefish permits are obtained should be relatively convenient. This would likely require that private anglers pay a permit fee to support the system, which is currently \$20.00 for HMS permits. Staff also recommends that reporting of golden/blueline tilefish be required through an ACCSP phone/tablet application before fish are brought off a vessel/water because surveys are unlikely to ever provide precise catch estimates for tilefish, and the only way to check compliance is to require reports to be completed and submitted before fish leave a boat. The FMAT does have concern about how to obtain high compliance and notes that a substantial outreach effort will be necessary. There was no specific FMAT recommendation for these alternatives but NMFS staff may have additional input at the Council meeting.
- 7/8. The FMAT supports using one Monitoring Committee for tilefish, and notes that the Council may also want to specify that one Advisory Panel would be used. The FMAT also supports incorporating the ability to framework actions when appropriate. Staff concurs.
9. The alternatives in group #9 are all necessary to set specifications through the standard Council risk-policy/SSC process.
10. 10a-10c. These alternatives deal with allocations. While the FMAT has no specific allocation alternative recommendations, the FMAT does note that while the catch time series were generated in a reasonable manner given the available data, there is considerable

uncertainty with the recreational time series. 10d or 10e would need to be selected according to whether or not an allocation is made in order to set specifications.

11/12. Trip/Bag limits are discussed above.

13. EFH – no additional comments.

14. The FMAT discussed the proposed accountability measures (AMs) and had no specific recommendations but notes that AMs are required. Issues with in-season closure authority are discussed above, but generally in-season closure authority may be necessary to avoid major impacts to future years from year-end overages.

## 4/5/16 Tilefish Advisory Panel (AP) Meeting Summary

### Afternoon – Blueline Tilefish

#### Attendance (\*AP Members)

\*Dave Arbeitman  
\*Jeff Gutman  
\*Ron Callis  
\*Skip Feller  
\*Jan McDowell  
\*Mike Johnson

Jason Didden (MAFMC Staff)  
EC Newellman/Dan Kulsar  
Dewey Hemilright  
Fred Akers  
Laurie Nolan  
Paul Nitschke  
Rick Robins  
Rob O'Reilly  
Steve Doctor

Jason Didden provided an overview of the Blueline Tilefish Amendment and then the call participants (AP members and others) asked questions and provided comments, summarized below.

#### Summary Comments:

D. Hemilright asked for the numbers of party/charter vessels that have been reporting via vessel trip reports (VTRs) and where the recreational time series came from given the ranges of the Delphi Process results. J. Didden referenced the public hearing document and staff memos that addressed these questions and summarized the available information. D. Hemilright also questioned whether the current emergency/VA/MD regulations had any biological basis. R. O'Reilly offered to distribute relevant Old Dominion University biological research.

S. Feller – What if we closed Jan-April and had a season May 1 – Dec 31, leaving the possession limit at 7 fish for party/head boats? (Don't want random catch estimates from Jan-April hurting fishery in the long run.) He supported a variable trip limit for private/charter/head boats. He doesn't want to see a lower bag limit anytime, but after summertime (Sept-May) he has "diehard" fishermen where 7-fish is more important. If I had to go lower (5 fish) do it June-August but really think limit needs to stay at 7.

J. Gutman – Headboats have concern about minimal data from private and charter sectors and don't want to see any spikes of catch estimates that didn't really happen – this is part of the reason for keeping Jan-April closed. For party boats, having different trip limits across the year would just result in people shifting effort into the part of the year with higher trip limits. Starting the season during better weather allows more of the general public to access the fishery. Since we don't know the extent of the charter boat fleet, consider using the control date as an indicator of who true charters are so that private boats don't "convert" to charter boats in order to get higher trip limits. Agrees with D. Arbeitman regarding daily trip limit (see below) – cited practice in Gulf of Mexico where headboats with two crews can catch a double daily limit for multi-day trips.

The ABC seems to go against the Delphi process. Also, the emergency rules were chosen partly because those rules have worked for a number of years in VA/MD without decimating the population and it seems wrong for some/any participants to have to go to lower trip limits given 7 fish/person is working. If the bag limit gets too low then you will run into issues with people high-grading fish and creating a discard problem.

J. Gutman also has "diehard fishermen" but they also fish in summertime to get decent weather. He would rather give up season rather than bag-limit, and during a closed season you know you won't get any landings. We (NJ) don't have the summer seabass that folks in VA can mix in and can't go below 7 fish. Maybe have Nov or Dec or both closed – all areas have access to black sea bass in Nov/Dec. Perhaps close Nov/Dec and not Jan/Feb since there is nothing else to fish for in Wave 1.

M. Johnson – You have to consider the recreational X-factor and the uncertainty about the recreational sector and what we don't know about them and the potential for real and significant impact re: catch & accountability.

There should be a mechanism (like a 10-20% percentage of a golden tilefish trip) to address circumstances where blueline (grey) tilefish are caught during golden tilefishing. There are some places where you can get 40%-50% catch ratio of bluelines to golden tilefish and you could get a lot of discards. The commercial sector would be in agreement to avoid waste and this needs to be addressed. At 275 pounds there is the potential for a good bit of discards. There's not a big history of large catches but there should be consideration for areas in more southern areas with more bluelines – there were some sets I didn't make last year to avoid throwing away bluelines while golden fishing. Guys won't target for 200 pounds more fish (i.e. ~500 pounds total). Need a mechanism to allow boats on multi-day days trips that are IFQ fishing for goldens to retain a little bit more blueline tilefish to avoid regulatory discarding and wasting the resource.

D. Arbeitman – What about a daily bag limit versus a trip limit – it is not fair for trips that have to run much further (NJ) to only be able to catch what a vessel further south (VA) can catch in one day. For a 2-day trip in NJ you get one trip limit, and two 1-day trips further south can catch double that. The whole ABC is not right. How they [SSC] came up with this in such a data-poor fishery goes beyond reason. How did the SSC determine the ABC for bluelines versus golden tilefish. Based on this ABC it's like saying there are 20 times more golden tilefish and how could they come up with totally different ABCs for species that are both considered to be



sedentary and slow growing? [P. Nitschke noted that Golden Tilefish uses an ASAP model projection & J. Didden noted that at this point there is not sufficient information for a similar assessment off the mid-Atlantic but the goal is to move in that direction and to gather more data.] D. Arbeitman noted that with such a low ABC you may never get the information that tells you more catch is possible, especially when paybacks kick in for any overages, in a similar fashion as black sea bass - this is a no-win situation for anybody and the cart is before the horse.

Ron Callis & D. Arbeitman – In agreement to stay at 7 fish and have a closed season in the early part of the year.

D. Kulsar – At a 275 pound trip limit, what happens to unused quota? (J.Didden noted that there are no provisions for quota roll-over.) Could the limit be raised at the end of the year if there is a substantial amount of quota remaining in the last months of the fishing year? D. Kulsar agreed with M. Johnson regarding avoiding discarding bluelines while fishing for golden tilefish (see above).

# Final Agenda

The agenda is subject to change. The agenda reflects the current estimate of time required for scheduled Board meetings. The Commission may adjust this agenda in accordance with the actual duration of Board meetings. Interested parties should anticipate Boards starting earlier or later than indicated herein.

**Monday, May 2, 2016**

9:00 a.m. – 3:30 p.m.

## **American Lobster Management Board**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia

*Other Members:* NMFS, NEFMC

*Chair:* Borden

*Other Participants:* Cornish, Glenn, Moore, Gwin,

*Staff:* Ware

1. Welcome/Call to Order (*D. Borden*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from February 2016
3. Public Comment
4. Discuss Next Steps for Management of the Southern New England American Lobster Stock

### **Possible Action**

- Technical Committee Report (*B. Glenn*)
- Plan Development Team Report (*M. Ware*)
- Consider Tabled Motion to Initiate an Addendum to Address the Declining Stock Conditions
  - *Motion to begin a new addendum to address the declining lobster stock conditions in Southern New England/Mid-Atlantic (SNE/MA). The Plan Development Team with input from the Lobster Conservation Management Teams is instructed to explore the following alternatives:*
    - a. *Analyzing the plans rebuilding targets and thresholds to account for current environmental conditions;*
    - b. *Work to stabilize and increase spawning stock biomass through changes in management measures*
    - c. *Improve permitting and accountability of SNE/MA lobster fisheries by requesting the National Marine Fisheries Service consider permit endorsement for Area 3 vessels fishing in SNE (west of 70 longitude);*
    - d. *Improve current management and compliance with lowered trap limits of nearshore trap fisheries by proposing a uniform closed season and new trap tag deadlines;*
    - e. *Accelerate trap allocation cuts that are already codified for the next 5 years in Areas 2 and 3; and*
    - f. *Recognize the SNE/MA trap fishery as a bona fide mixed crustacean fishery and develop strategies and policies that recognizes the multispecies nature of the catch.*

5. Discuss Next Steps for Management of Gulf of Maine/Georges Bank American Lobster Stock (*P. Keliher*) **Possible Action**
6. Draft Addendum I to the Jonah Crab FMP for Final Approval **Final Action**
  - Review Options (*M. Ware*)
  - Public Comment Summary (*M. Ware*)
  - Advisory Panel Report (*E. Gwin*)
  - Law Enforcement Committee Report (*M. Robson*)
  - Consider Final Approval of Addendum I
7. Discuss Need to Create a Coastwide Standard for Claw Landings in the Jonah Crab Fishery **Possible Action**
  - NOAA Letter on Current Claw Exemption (*A. Murphy*)
8. Update on New England Fishery Management Council Deep Sea Coral Habitat Amendment and ASMFC Survey to Area 3 Fishermen (*M. Ware*) **Possible Action**
9. Discuss Offshore Monuments Proposal and Board Response (*D. Grout*) **Possible Action**
10. Other Business/Adjourn

2:30 – 3:30 p.m.

**Atlantic Coastal Cooperative Statistics Program (ACCSP) Executive Committee**

***(A portion of this meeting may be a closed session for Committee members only)***

*Members:* Beal, Boyles, Carmichael, Colvin, Cyr, Detlor, Fegley, Laney, Patterson

*Chair:* Boyles, Jr.

*Staff:* Cahall

1. Welcome/Introductions (*Coordinating Council Chair R. Boyles, Jr.*)
2. Public Comment\* (*R. Boyles, Jr.*)
3. Committee Consent (*R. Boyles, Jr.*) **Action**
  - Approval of Agenda
  - Approval of Proceedings from April 2016
4. ACCSP Program Status Updates (*M. Cahall*)
  - Program Status
  - Committee Updates
    - APAIS Update
5. Standard Operating Procedures Approval **Action**
  - PM – 02-06 ACCSP’s Value to Congressional Delegations
  - PM – 13 Collaboration ASMFC
6. Independent Program Review Update
  - Governance Discussion (if needed)
7. Other Business
8. Executive Session (Closed)
9. Adjourn

\*See Public Comment Guidelines: [http://www.accsp.org/documents/ACCSP\\_PublicCommentPolicyOct2013](http://www.accsp.org/documents/ACCSP_PublicCommentPolicyOct2013)

3:45 – 4:45 p.m.

**ACCSP Coordinating Council**

Members: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, PRFC, Virginia, North Carolina, South Carolina, Georgia, Florida, ASMFC, NOAA Fisheries, NEFSC, GARFO, SEFSC, SERO, USFWS, NEFMC, MAFMC, SAFMC

*Chair:* R. Boyles, Jr.

*Staff:* Cahall

1. Welcome/Introductions (*R. Boyles, Jr.*)
2. Public Comment\* (*R. Boyles, Jr.*)
3. Council Consent (*R. Boyles, Jr.*) **Action**
  - Approval of Agenda
  - Approval of Proceedings from February 2016
4. ACCSP Status Report
  - Program Update (*M. Cahall*)
  - Committee Updates (*P. Campfield*)
5. Governance Program Decision (*C. Patterson*) **Action**
  - Executive Committee Recommendation
6. Consider Acceptance of Independent Program Review Package (*R. Boyles, Jr.*) **Action**
  - Standard Operating Procedures
  - Governance Decision
  - Outreach Strategic Plan
  - Long-term Funding Strategy
7. Review and Consider Approval of 2016 Request for Proposals **Action**
8. Other Business
9. Adjourn

\*See Public Comment Guidelines: [http://www.accsp.org/documents/ACCSP\\_PublicCommentPolicyOct2013](http://www.accsp.org/documents/ACCSP_PublicCommentPolicyOct2013)

**Tuesday, May 3, 2016**

8:00 – 10:00 a.m.

*Breakfast to be served*

**Executive Committee**

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

*Members:* Abbott, Blazer, Boyles, Bull, Chanda, Clark, Estes, Gilmore, Grout, Keliher, Kelley, McNamee, Miller, Pierce, Shiels, Simpson, Woodward

*Chair:* Grout

*Staff:* Leach

1. Welcome/Call to Order (*D. Grout*)
2. Committee Consent
  - Approval of Agenda
  - Approval of Meeting Summary from February 2016
3. Public Comment

4. Report of the Administrative Oversight Committee (*J. Gilmore*) **Action**
  - Presentation of the FY17 Budget
5. Discuss State Assessments
  - Level Funded in 2016
  - Confidential vs. Non-confidential Data
6. Discuss Black Sea Bass Management in Maine
7. Discuss Priorities for Saltonstall/Kennedy Research
8. Discuss Plan Development Team Membership
9. Discuss Conservation Equivalency
10. Discuss Offshore Monuments Proposal and Potential Commission Response (*D. Grout*)
11. Future Annual Meetings Update (*L. Leach*)
  - October 23-27, 2016 Bar Harbor, Maine
  - 2017-Virginia
  - 2018-New York
  - 2019-New Hampshire
12. Closed Session
  - Discuss ACCSP Governance
  - Executive Director Performance Review
13. Other Business/Adjourn

10:15 – 11:15 a.m.

**Horseshoe Crab Management Board**

*Member States:* Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Other Members:* PRFC, NMFS, USFWS

*Chair:* Gilmore

*Other Participants:* Doctor, Cooper, Messeck, Lyons

*Staff:* Rootes-Murdy

1. Welcome/Call to Order (*J. Gilmore*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from February 2016
3. Public Comment
4. Update on Adaptive Resource Management Framework Review (*J. Lyons*)
5. Discuss Biomedical Data Confidentiality and Stock Assessment Planning (*K. Anstead*)
6. Review of Alternative Bait Cost Comparison (*K. Rootes-Murdy*)
7. Other Business/Adjourn

11:30 a.m. – 12:15 p.m.

**Shad and River Herring Management Board**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Other Members:* DC, PRFC, USFWS, NMFS

*Other Participants:* Chase, Furlong

*Chair:* Goldsborough

*Staff:* Rootes-Murdy

1. Welcome/Call to Order (*B. Goldsborough*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from May 2015
3. Public Comment
4. Timetable for American Shad and River Herring Stock Assessments (*J. Kipp*) **Action**
5. Report from the Data Standardization Collection Workshop (*K. Rootes-Murdy*)
6. Update on Activities of the River Herring Technical Expert Work Group (*K. Rootes-Murdy*)
7. Consider Approval of 2015 Shad and River Herring FMP Review and State Compliance (*K. Rootes-Murdy*) **Action**
8. Elect Vice-Chair **Action**
9. Other Business/Adjourn

1:00 – 5:30 p.m.

**Law Enforcement Committee (LEC)**

***(A portion of this meeting will be a closed session for Law Enforcement Committee members only to discuss ongoing enforcement activities)***

*Members:* Anthony, Blanchard, Cornish, Eastman, Frampton, Furlong, Gordon, Green, Gregory, Hettenbach, Hogan, Huss, Jordan, Kersey, King, Lauderman, Lynn, Messeck, Moore, Moran, Overturf, Santiago, Schlaht, Shuster, Snellbaker

*Chair:* Eastman

*Staff:* Robson

1. Call to Order/Roll Call of the LEC Representatives (*M. Eastman*)
2. Approval of Agenda and Minutes from November 2015
3. Public Comment
4. Review Jonah Crab Addendum I LEC Comments and Follow-Up
5. Presentation of Maine's Lobster Trap Tag Transferability Program
6. American Lobster Enforcement Subcommittee Update
7. Discuss Other ISFMP Species (tentative)
8. Review and Discuss Ongoing Enforcement Activities (**Closed Session**)
9. Joint Enforcement Agreement Update/Federal Agency Reports
10. Review and Update of Dual Landings Allowances
11. Review and Discuss 2016 Action Plan Tasks for the LEC
12. Report of Other Enforcement Committees and LEC Coordination

13. Other Business/Recess

1:15 – 3:45 p.m.

**Climate Change Workshop**

1. Review and Discuss Northeast Fish and Shellfish Climate Vulnerability Assessment (*J. Hare*)
2. Review and Discuss NOAA Climate Science Action Plans
  - North East Climate Science Action Plan (*J. Hare*)
  - South East (Atlantic) Climate Science Action Plan (*H. Lovett*)
3. Begin Discussion of Next Steps for Commission Action in Response to the Climate

4:00 – 5:00 p.m.

**American Eel Management Board**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida  
*Other Members:* NMFS, DC, PRFC, USFWS  
*Other Participants:* Cornish, Wildman  
*Chair:* Clark  
*Staff:* Waine

1. Welcome/Call to Order (*J. Clark*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from February 2016
3. Public Comment
4. Discuss Timing of 2017 Stock Assessment for American Eel (*M. Waine*)
5. Discussion to Consider Changes to Addendum IV Yellow Eel Allocations (*J. Gilmore*) **Possible Action**
6. Progress Report on North Carolina's Approved Glass Eel Aquaculture Plan (*M. Duval*)
7. Other Business/Adjourn

6:00 – 8:00 p.m.

**Annual Awards of Excellence Reception**

**Wednesday, May 4, 2016**

8:00 – 10:00 a.m.

**Atlantic Menhaden Management Board**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida  
*Other Members:* NMFS, PRFC, USFWS  
*Chair:* Boyles, Jr.  
*Other Participants:* Kersey, McNamee  
*Staff:* Waine

1. Welcome/Call to Order (*R. Ballou*)
2. Board Consent
  - Approval of Agenda

- Approval of Proceedings from February 2016
3. Public Comment
  4. Consider Extension and Revision to Episodic Event Set Aside Program (*R. Ballou*) **Final Action**
  5. Consider Draft Addendum I for Public Comment (*M. Waine*) **Action**
  6. Provide Guidance to the Technical Committee Regarding Stock Projections (*R. Ballou*)
    - Review Stock Projection Methodology (*J. McNamee*)
  7. Biological Ecological Reference Points (BERP) Working Group Progress Report (*S. Madsen*)
  8. Consider Approval of 2016 FMP Review and State Compliance (*M. Waine*) **Action**
  9. Elect Vice-Chair **Action**
  10. Other Business/Adjourn

8:30 – 11:30 a.m. **Law Enforcement Committee (continued)**

14. Social (Open to Commissioners and Staff)
15. Aerial Enforcement Issues and Subcommittee Formation
16. State Agency Reports
17. Review and Update of Safe Harbor Issues
18. Tautog Tagging Program Update and Subcommittee Review
19. Review Other ISFMP Species (as needed)
20. LEC Webpage Review and Discussion
21. Information Exchange on Enforcement Grants and Funding Opportunities
22. New Business
23. Adjourn

10:15 – 11:45 a.m. **Interstate Fisheries Management Program (ISFMP) Policy Board**  
*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida  
*Other Members:* DC, NMFS, PRFC, USFWS  
*Chair:* Grout  
*Staff:* Kerns

1. Welcome/Call to Order (*D. Grout*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from February 2016
3. Public Comment
4. Executive Committee Report (*D. Grout*)
5. Discuss Request from South Atlantic Fishery Management Council to Consider a Cobia Interstate Fishery Management Plan (*G. Waugh*) **Possible Action**
6. Discuss Recommended Changes to the Conservation Equivalency Guidance Document (*T. Kerns*)
7. Joint Management and Science and Assessment Science Committee Reports (*S. Madsen*) **Action**
  - Review and Approve the Stock Assessment Schedule
8. Discuss Next Steps for Commission Action in Response to the Climate Change Workshop



(D. Grout)

9. Update on the Sturgeon Stock Assessment (*K. Drew*)
10. Law Enforcement Committee Report (*M. Robson*)
11. Other Business/Adjourn

11:45 a.m. – 1:00 p.m.

**Northern Shrimp Section**

*Member States:* Maine, New Hampshire, Massachusetts

*Chair:* Abbott

*Other Participants:* Whitmore, Eastman

*Staff:* Appelman

Webinar: <https://attendee.gotowebinar.com/register/7449292807203785220>;

Conference Call: [888-394-8197](tel:888-394-8197); passcode [8157277](tel:8157277)

1. Welcome/Call to Order (*D. Abbott*)
2. Board Consent
  - Approval of Agenda
3. Public Comment
4. Review Summary of Maine's Industry Meetings Held in March (*T. Stockwell*)
5. Resume Development of Draft Amendment 3 for Public Comment (*D. Abbott*)
6. Other Business/Adjourn

1:00 – 5:00 p.m.

**Commissioner Parliamentary Workshop**

**Thursday, May 5, 2016**

8:00 – 10:00 a.m.

**Weakfish Management Board**

*Member States:* Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Other Members:* NMFS, PRFC, USFWS

*Chair:* Allen

*Other Participants:* Anthony, Cimino, Brust

*Staff:* Ware

1. Welcome/Call to Order (*R. Allen*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from November 2015
3. Public Comment
4. 2016 Weakfish Benchmark Stock Assessment **Action**
  - Presentation of Stock Assessment Report (*J. Brust*)
  - Presentation of Peer Review Panel Report (*P. Campfield*)
  - Consider Acceptance of Benchmark Stock Assessment and Peer Review Report for Management Use
5. Discuss Next Steps for Management of Weakfish (*R. Allen*) **Possible Action**

6. Other Business/Adjourn

8:00 a.m. – 4:30 p.m.

**ACCSP For-Hire Inventory Workshop**

*Lunch to be served*

1. Welcome/Introductions (*G. White*)
2. Review Results of Updated “Atlantic and Gulf Coast Inventory of For-Hire Data Collection Programs” (*E. Wyatt*)
3. Set Up Focus Questions (*A. Loftus*)
  - Discuss Survey Results and Means to Identify and Reduce Duplicate Reporting
4. Focus Questions
  - Identify Preferred Timeliness of Reporting For-Hire Data Collection Programs
  - Identify Core Common data Elements Necessary for For-Hire Reporting
  - Discuss the Capabilities of Existing Programs Moving to Electronic Reporting
  - Identify Opportunities for Reducing Duplicate Reporting for State and Federal Permitted Vessels, all Charter Boats and Head Boats
  - Develop Recommended Measures to Modify Existing Reporting Mechanisms to Develop Greater Convergence Between For-Hire Reporting on the Atlantic and Gulf Coasts
5. Status of Related Projects
  - South Carolina For-Hire Logbook Validation Methodology (*B. Floyd*)
  - SAFMC and MAFMC Mandatory For-Hire Reporting (*G. Waugh; J. Didden*)
6. Adjourn

10:15 – 11:00 a.m.

**Coastal Sharks Management Board**

*Member States:* Maine, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Other Members:* NMFS, USFWS

*Chair:* Nowalsky

*Other Participants:* Belcher, Frampton

*Staff:* Harp

1. Welcome/Call to Order (*A. Nowalsky*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from February 2016
3. Public Comment
4. Review and Consider Approval of Addendum IV for Public Comment (*A. Harp*) **Action**
5. Other Business/Adjourn

11:15 a.m. – 2:00 p.m.

**South Atlantic State/Federal Fisheries Management Board**

*Member States:* New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Other Members:* PRFC, DC, NMFS, USFWS, SAFMC

*Other Participants:* Lynn, McDonough, Rickabaugh, Murphy, Brust

*Chair:* Estes

*Staff:* Ware

1. Welcome/Call to Order (*J. Estes*)

2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from February 2016
3. Public Comment
4. 2016 Red Drum Benchmark Stock Assessment **Action**
  - Presentation of Stock Assessment Report (*J. Kipp; M. Murphy*)
  - Presentation of Peer Review Panel Report (*J. Brust*)
  - Consider Acceptance of Benchmark Stock Assessment and Peer Review Report for Management Use
5. Discuss Next Steps for Management of Red Drum (*J. Estes*) **Possible Action**
6. Progress Report on the Spot and Atlantic Croaker Benchmark Stock Assessments (*J. Kipp*)
7. Review North Carolina Report on Spanish Mackerel Commercial Pound Net Landings as Required by the FMP (*C. Batsavage*)
8. Elect Vice-Chair **Action**
9. Other Business/Adjourn

2:00 – 2:30 p.m.

**Business Session (if necessary)**

*Member States:* Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida

*Chair:* Grout

*Staff:* Beal

1. Welcome/Introductions (*D. Grout*)
2. Board Consent
  - Approval of Agenda
  - Approval of Proceedings from February 2016
3. Public Comment
4. Review Non-compliance Findings (if necessary)
5. Other Business/Adjourn

NEW ENGLAND  
FISHERY  
MANAGEMENT  
COUNCIL

The Council Report summarizes major actions approved at NEFMC meetings or highlights items of interest.

At its April 19-21 meeting in Mystic CT, the Council approved actions related to the development of its fishery management plans.

The issues involved:

- ◆ Development of a Deep Sea Coral Amendment
- ◆ Atlantic Herring Amendment 8
- ◆ The Industry-Funded Monitoring Amendment
- ◆ Sea Scallops and the NGOM Area
- ◆ EBFM
- ◆ Spiny Dogfish
- ◆ At-Sea Monitoring
- ◆ Small Mesh Multispecies

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# Council Report

April/May 2016

## Habitat

**Work on Coral Amendment Continues** As development of the NEFMC's Deep-Sea Coral Amendment moves ahead, the Council received an update on the Habitat Committee's work to date on the action. Several motions forwarded by the committee were approved for the purpose of conducting in-depth analyses based on new information provided by researchers over the past several years.

These included revised and new coral zone boundaries for a number of canyons south of Georges Bank and for locations in the Gulf of Maine, as well as a provision that would allow modifications to the coral management areas in the future through framework adjustments.

Significantly, Council members approved by a unanimous vote the following statement that will guide work on the amendment as the draft is refined over the next 6-7 months prior to public hearings.

"The Council is utilizing its discretionary authority under Section 303(b) in the MSA to identify and implement measures that reduce, to the extent practicable, impacts of fishing gear on deep sea corals in New England.

This amendment contains alternatives that aim to identify and protect concentrations of corals in select areas and restrict the expansion of fishing effort into areas where corals are likely to be present.

Deep sea corals are fragile, slow-growing organisms that play an important role in the marine ecosystem and are vulnerable to various types of disturbance of the seafloor. At the same time, the importance and value of commercial fisheries that operate in or near areas of deep sea coral habitat is recognized by the Council. As such, measures in this amendment will be considered in light of their benefit to corals."



**Next Council Meeting**  
**June 21-23, 2016**  
**Portland, ME**

**How much haddock is allocated to the Atlantic herring midwater trawl fishery?**

The herring fishery is allocated one percent of the haddock total acceptable biological catch for each of the two stocks located off the New England coast (Gulf of Maine and Georges Bank) each year.

**What happens when the catch cap is reached?**

When the catch cap for a particular haddock stock has been caught, it triggers an accountability measure. All herring vessels fishing with midwater trawl gear are prohibited from fishing for, possessing, or landing more than 2,000 pounds of herring from the particular haddock accountability measure area (Gulf of Maine or Georges Bank) for the remainder of the multispecies fishing year (May 1 – April 30). Also, the overage deduction is subtracted from the TAC during the following fishing year.

**Atlantic Herring**

**Amendment 8 Takes Shape** In discussing Amendment 8 to the Atlantic herring fishery management plan, the Council addressed two issues related to the development of management measures:

- ◆ The NEFMC will host a May 16-17 herring workshop in Portland, ME, during which participants will share their ideas about developing catch strategies that will more explicitly account for the role of Atlantic herring in the ecosystem; staff will share the workshop outcomes at the June Council meeting in Portland, ME.
- ◆ It approved the problem statement below that will guide the development of management measures to address concerns about localized depletion; Herring Committee work on this issue will be reviewed again at the September 2016 Council meeting.

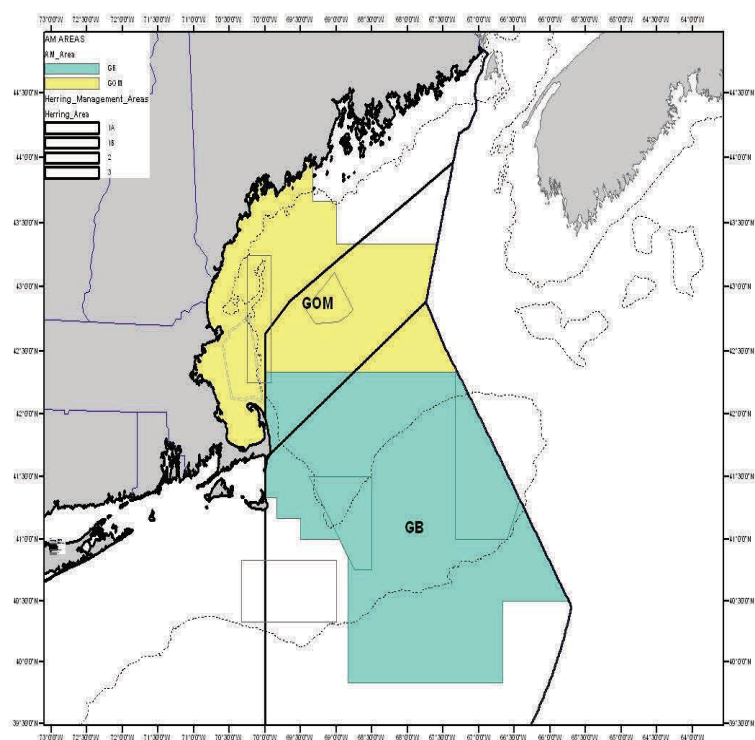
“Scoping comments for Amendment 8 identified concerns with concentrated, intense commercial fishing of Atlantic herring in specific areas and at certain times that may cause detrimental socioeconomic impacts on other user groups (commercial, recreational, ecotourism) who depend upon adequate local availability of Atlantic herring to support business and recreational interests both at sea and on shore.

The Council intends to further explore these concerns through examination of the best available science on localized depletion, the spatial nature of the fisheries, reported conflicts among users of the resources and the concerns of the herring fishery and other stakeholders.”

As a final matter of business under the herring agenda item, the Council initiated a framework adjustment to the FMP in which it will consider revising the Georges Bank haddock catch cap and associated accountability measures (AMs), and their implementation.

The issue becomes complicated when looking at the details. Haddock, particularly on Georges Bank, is a robust stock. This is also the case with the Atlantic herring resource --- it is not overfished, overfishing is not occurring, and catches have remained steady, between 70 and 95,000 metric tons, since 2010.

*Continued on page 3*



## Atlantic Herring - *continued*

Because of interactions between the two stocks, the mid-water trawl fleet is faced with a potential out-sized problem if the AM is triggered again. The fleet was not allowed to fish in a large portion of Herring Areas 3 and 1B because the six-month long Georges Bank AM was triggered in October 2015 (see aqua-colored areas on the map, p. 2). The result has been a six-month long closure that was just lifted on May 1, 2016. A repeat of the same situation would likely produce substantial negative impacts on the herring fleet, the majority of which are mid-water trawlers.

In seeking a remedy, the Council initiated the frame-

work with the following goal:

*To incentivize the midwater trawl fleet to minimize the incidental catch of haddock in the herring fishery while providing the opportunity to fully harvest the sub-ACL of herring for herring management Areas 3 and 1B.*

In June, the Council will review the Herring Committee's progress on developing measures, with final action planned later this year and implementation during fishing year 2017. Depending on the specific measures included, the action will likely involve the Groundfish Committee and its PDT.

## Industry-Funded Monitoring

**IFM Herring Fishery Alternatives Receive Further Attention** The Council refined the herring fishery monitoring alternatives now under consideration in the Industry-Funded Monitoring (IFM) Amendment. The NEFMC plans to select preferred alternatives and to review and approve the draft Environmental Assessment associated with this action at its June meeting in Portland, ME.

Approved motions in April addressed: A.) slippage restrictions and consequence measures on trips selected for monitoring (exceptions would be allowed for safety, mechanical failure, or excessive amounts of dogfish in the net); and B.) slippage reporting requirements (affidavit or VMS) on herring trips selected for at-sea monitoring and electronic monitoring/portside sampling coverage.

The Council also approved two types of approaches that would apply to the percent monitoring target levels. A "combined" approach for the at-sea monitoring alternatives would allow coverage through the Standard Bycatch Reporting Methodology, or SBRM, to count towards the overall selected coverage target level. The second, an "additive" approach for the electronic monitoring/portside sampling alternatives would mean that the selected coverage target level would not include the SBRM coverage.

Proposed refinements were made to catch and biological sampling protocols for at-sea monitors who would collect information on any retained catch (kept and incidental) and discarded catch, to better meet the objectives identified for the herring coverage target alternatives. In addition, at-sea monitors would collect information on fish lengths, but not on marine mammals, sea birds, and sea turtles. Finally, more training was recommended for monitors of high-volume fisheries, as well as analyses on impacts related to ports not currently available for portside sampling.

**How Does SBRM Relate to IFM?** In June 2015, NOAA Fisheries, implemented a revised SBRM amendment that was developed in coordination with the New England and Mid-Atlantic Councils. The action implemented 1.) a new prioritization process for the allocation of observers if agency funding is insufficient to achieve target observer coverage levels; 2.) bycatch reporting and monitoring mechanisms; 3.) analytical techniques and allocation of at-sea fisheries observers; 4.) a precision-based performance standard for discard estimates; 5.) a review and reporting process; 6.) framework adjustment and annual specifications provisions; and 7.) provisions for industry-funded observers and observer set-aside programs.

The Omnibus IFM Amendment proposes to establish a standardized administrative structure that could apply to any new industry-funded monitoring programs. Currently, provisions include monitoring coverage targets for the herring and mackerel fisheries, which are under development as described above. Industry funding would be used in conjunction with, not instead of, federal funding to pay for *additional* monitoring to meet FMP-specific monitoring coverage targets that would be determined by each Council.

## Sea Scallops

### Scallop Advisory Panel Meeting

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Tuesday  
June 7  
9:30 a.m.

Hilton Garden Inn  
Logan Airport  
Boston, MA

Tentative Topics  
2017 Management  
Priorities  
Research Priorities  
Scallop Wkshop  
Review  
Five-Year IFQ  
Report

### Scallop Committee Meeting

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Wednesday  
June 8  
9:30 a.m.

Location and  
tentative topics  
same as above.

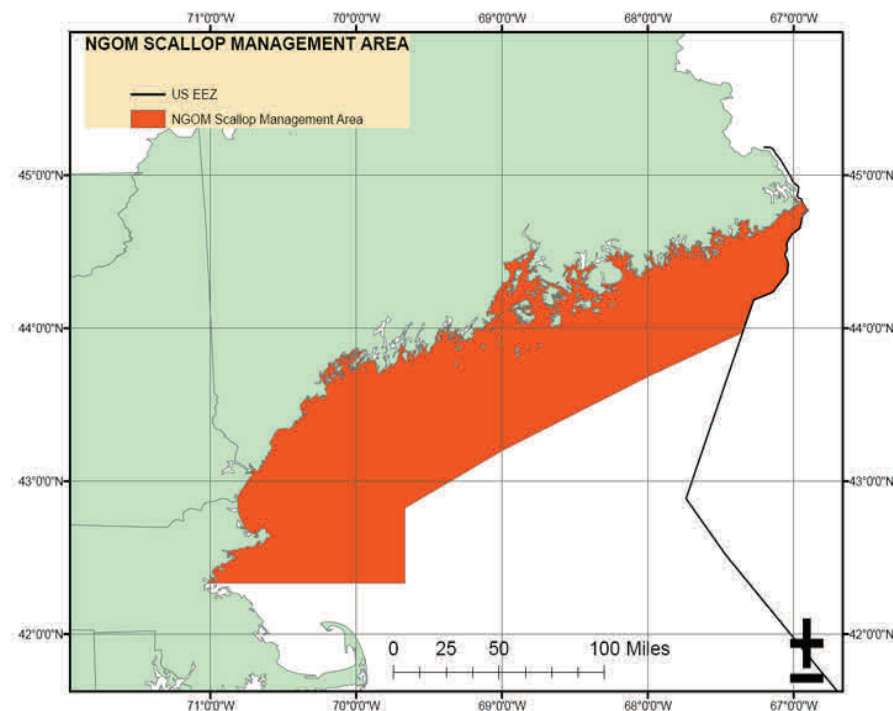
**Resolution to NGOM Area Issues Sought** At the request of the Council's Scallop Committee, the Council staff provided a summary concerns that scallop fishing has increased in the southern part of the Northern Gulf of Maine (NGOM) Area since the fishing year began this March.

Two major issues were identified:

- An increase in limited access general category (LAGC) fishing effort in southern portion of NGOM Area, exacerbating the potential that the total allowable catch, or TAC, would be reached well before winter and close the fishery before many of the LAGC NGOM permitted vessels participate in the federal fishery.
- An increase in limited access (LA) vessel effort in the same area within the NGOM. Both the LAGC IFQ and NGOM vessels are concerned that limited access fishing activity in the NGOM Area may not be sustainable considering the amount of resource in that area. Another sticking point is that limited access vessel landings do not count toward the 70,000 NGOM TAC and LA vessels are not subject to the 200 pound possession limit. However, LA vessels operate under days-at-sea limits.

The NGOM Area management program was implemented in 2008 through Amendment 11 to the Scallop Fishery Management Plan. The program was developed with separate measures and qualification criteria to preserve a fishery that formerly existed in the area and would hopefully return in the future.

The abundance of scallops in the area has fluctuated widely over the years, and although resource distribution was "patchy," it supported profitable if sporadic fishing. That situation was generally temporary as the heavily fishery beds became rapidly depleted.



## Sea Scallops - *continued*

The NGOM Area management measures established fishing controls appropriate for the scale of the fishery while protecting the resource from overharvest if and when scallops were present in the area. Measures were developed to recognize the unique characteristics of the fishery, while allowing (largely Maine) scallop fishermen to qualify for the program that might not have been able to do so under the Scallop IFQ program for general category boats.

Based on the information provided as well as fishermen's testimony, the Council responded with two approved motions as a start to address the above concerns.

It approved development of a measure that would prohibit limited access vessels from possessing 50 or more bushels of in-shell scallop product when inside the vessel monitoring system (VMS) demarcation line

when fishing north of 42 degrees 20 minutes. This would mirror the regulations for limited access boats south of the line. The measure original was put in place to accommodate shore-side processing for several live scallop markets. As discussed at the meeting, the markets for in-shell scallop landings no longer exist.

The Council also, by a unanimous vote, approved modifications to the management of the NGOM Area as a potential priority for 2017 with the intent of having remedies in place by the beginning of the scallop fishing year in 2018. The Scallop Committee will discuss and make recommendations for priorities later this year. As a start, issues that could be addressed might include a change to the opening date of the NGOM Area, gear restrictions, scallop possession limits, and effort controls throughout the area for all permit types fishing.

## Ecosystem-Based Fisheries Management

**Development of Prototype Moving Ahead** The Council received an update from its EBFM Committee and Plan Development Team on their efforts to develop an example Fishery Ecosystem Plan (eFEP). Since late 2015, the PDT has inventoried and categorized the various types of ecosystem models that have been applied to New England waters, developed a goals and objectives strawman, and developed a rough outline of an eFEP. Other eFEP sections that provide more detail are still under development.

The committee reported that it had refined the goals and objectives for this action and directed the PDT to focus on the development of an operating model for a management strategy evaluation. This exercise is intended to help describe the framework for setting eFEP catch advice by functional groups of similar species, as well as identify models to be used to analyze strategic outcomes and tactical catch advice.

Because of the number of ecosystem models available for Georges Bank, the eFEP will initially focus on this area. A report on the topic is tentatively scheduled for the September Council meeting.

The Council is developing its eFEP as a prototype to engage the public in evaluating goals and objectives and defining various management strategies to be tested and verified. If effective, the Council would prepare a Fishery Ecosystem Plan or may apply parts of the eFEP to existing management plans.

## Spiny Dogfish

**Spiny Dogfish Request for Increased Possession Limit Approved** The Council voted to request that NMFS increase the federal spiny dogfish possession limit to 6,000 pounds --- up from the current 5,000 pound limit --- for fishing years 2016-2018.

Agreeing with the Mid-Atlantic Council and the Atlantic States Marine Fisheries Commission, the NEFMC approved the change, based on the condition of the stock, which is at 106 percent of its biomass target, and the fact that the fishery is currently underutilizing its quota by a substantial amount. Other considerations included a reduction in regulatory discards, and adoption of a conservative approach toward catch increases that could cause a change in stock status and, accordingly, disrupt markets.



The New England Fishery Management Council is one of eight regional organizations created by the Magnuson-Stevens Fishery Conservation and Management Act, initially enacted in 1976.

The Council develops rules for both commercial and recreational fisheries that operate between three and 200 miles off the region's coastline. NEFMC management authority extends to fishing grounds in the Gulf of Maine, Georges Bank and southern New England and overlaps with the Mid-Atlantic Council for some species.

## Groundfish

**Work on Monitoring Continues** The Council received an update from its Groundfish Committee on progress to date on its 2016 management priorities, in particular revisions to the at-sea monitoring program, windowpane flounder management measures, and the process to develop recreational management measures.

Discussion on monitoring, however, was the focus of the groundfish discussion. For purposes of digging deeper into the entire monitoring program to make improvements, as the Council's Groundfish Plan Development Team has been asked to do, the NEFMC asked NOAA Fisheries for detailed information on compliance with groundfish catch reporting.

Through formal motions, the NEFMC requested that the Fisheries Service provide baseline information on compliance relative to harvester and dealer reporting, given this information may not be accessible to the Groundfish PDT.

As it proceeds with work on improvements to the monitoring program, the Council made clear it places importance on information that would best inform where and how accuracy and precision in groundfish catch reporting can be achieved.

Such a program is not just dependent on system design, but on the actual performance of the current harvester/dealer verification system. For example, Council members indicated their interest in understanding such issues as the frequency of the reconciliation between harvester and dealer reports (VTR and SAFIS), measures that verify and improve the accuracy of VTR locations, and the enforcement of and compliance with reporting requirements.

## Small Mesh Multispecies

**Amendment 22 Future Unclear** In reviewing progress to date on Amendment 22 to the Northeast Multispecies FMP, an action that would limit vessel access to the small-mesh multispecies (whiting and red hake) fishery, Council staff summarized the landings history of the small-mesh multispecies fleet for a five-year period (2008-2012) as part of an effort to evaluate potential limited access qualification alternatives and other information.

During the ensuing Council discussion, members focused on questions about criteria that would differentiate qualifying and non-qualifying vessels, qualification criteria equivalency for the northern and southern management areas, and the need for further analysis of fleet history based on trip landing thresholds, among other matters.

While further PDT work will proceed, the Council discussed whether to continue to work on Amendment 22 based on the information provided. Members' primary concerns were about whether the action justifies further work on limited access given its stated purpose and need, and if the fishery is even performing anywhere near capacity now. No decision was made to discontinue development of the amendment in April, but the topic will be on the Council's June agenda. Additionally, the Whiting Committee will meet on June 20 in Portland, the day before the Council meets on June 21-23.

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# SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

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Dr. Michelle Duval, Chair | Charlie Phillips, Vice Chair  
Gregg T. Waugh, Executive Director

## AGENDA

Hilton Cocoa Beach Oceanfront  
1550 N. Atlantic Avenue  
Cocoa Beach, Florida 32931

June 13 – 17, 2016

Phone: 1-800-445-8667 or 321-799-0003 and Fax: 321-799-0344

Except for advertised (scheduled) public hearings and public comment sessions, the times indicated on the agenda may be adjusted as necessary to accommodate the completion of agenda items. Interested parties should be aware that meetings may start earlier or later than indicated.

Written comments received by close of business the Monday before the meeting (6/6) will be compiled, posted to the website as part of the meeting materials, and included in the administrative record. Please use the online comment form at "[http://safmc.net/CommentForm\\_June2016Council](http://safmc.net/CommentForm_June2016Council)" to ensure your comments are posted immediately to the Council's website and available for Council consideration.

Individuals that wish to submit comments after 6/6 must use the Council's online form at "[http://safmc.net/CommentForm\\_June2016Council](http://safmc.net/CommentForm_June2016Council)". Comments will automatically be posted to the website and available for Council consideration. Comments received prior to noon on Thursday of the Council meeting (6/16) will be a part of the meeting administrative record.

### **Monday, June 13**

**1:30 P.M. to 5:30 P.M.**

### **COMMITTEE MEETINGS**

#### **Habitat Protection and Ecosystem-Based Management Committee/ Doug Haymans) (TAB 1)**

1. Fishery Ecosystem Plan II Status Report
2. Ocean Technology Session
  - Next Generation AUV
  - Toward Autonomous and 3D Mapping
  - ROV Advancements and Acoustics
  - Unmanned Aircraft Systems (Drones) as Tools in the Ocean
3. Ocean Investment and Collaborative Sustainability - Emerging Role of Citizens, Business, Non-profits, and Government in Conservation
4. Applying Emerging Technologies and 21st Century Data Gathering and Presentation
  - iAngler Tool
  - SAFMC Habitat and Ecosystem Tools
  - Ocean Adapt Climate Tool
5. Council actions on Habitat– **ACTION**

**Industry and Regional Partner Sponsored Reception – 6:00 – 7:00 pm**

**Tuesday, June 14**

**8:30 A.M. to 9:00 A.M.**

**COMMITTEE MEETINGS**

**SSC Selection Committee/Charlie Phillips (CLOSED) (TAB 2)**

1. Review & Appoint SSC Members – **ACTION**

**9:00 A.M. to 10:00 A.M.**

**SEDAR Committee/Dr. Michelle Duval (PARTIALLY CLOSED) (TAB 3)**

1. Blueline Tilefish Benchmark & Red Grouper Assessment Participants  
(CLOSED)
2. Blueline Tilefish & Red Grouper Assessment Timing & TORs –  
**ACTION**
3. SEDAR Projects Update – **ACTION**
4. Future Cobia Assessments – **ACTION**
5. SEDAR Steering Committee update – **ACTION**
6. NMFS Assessment Priority Process: SSC results – **ACTION**

**10:00 A.M. to 10:30 A.M.**

**AP Selection Committee/Chester Brewer (TAB 4)**

1. Review options to allow for fishing representation on the Law  
Enforcement AP and the Information and Education AP – **ACTION**
2. Discuss modifications to the current AP application for SEDAR applicants  
and requirements for applicants relative to email accounts and Internet  
access – **ACTION**

**10:30 A.M. to 12:00 Noon**

**Joint Dolphin Wahoo/Snapper Grouper Committee/Anna Beckwith and  
Dr. Michelle Duval (TAB 5)**

1. Overview of Commercial & Recreational Dolphin Wahoo Catches versus  
ACLs/NMFS SERO – **ACTION**
2. Status of Dolphin Regulatory Amendment 1 – **ACTION**
3. Dolphin/Yellowtail Snapper Allocation Amendment – **ACTION**

**12:00 Noon to 1:30 P.M.**

**Lunch**

**Tuesday, June 14**

**1:30 P.M. to 5:30 P.M.**

**COMMITTEE MEETINGS**

**Snapper Grouper Committee/Dr. Michelle Duval (TAB 6)**

1. Status of commercial catches versus quotas for species under  
ACLs/NMFS SERO – **ACTION**
2. Status of recreational catches versus quotas for species under  
ACLs/NMFS SERO – **ACTION**
3. Status of actions under formal review/NMFS SERO
  - Amendment 35 (species removal and golden tilefish endorsements)
  - Regulatory Amendment 16 (Black Sea Bass Traps)
  - Amendment 36 (Spawning SMZs)
4. SERFS (MARMAP) Update for 2015/Dr. Joey Ballenger
  - Discuss and take action as appropriate – **ACTION**
5. S-K Projects (Catch & Discards and Bottom Longline Survey/Frank  
Helies
  - Discuss and take action as appropriate – **ACTION**
6. Advisory Panel Report/Kenny Fex

**Tuesday, June 14**

**1:30 P.M. to 5:30 P.M.**

**COMMITTEE MEETINGS**

**Snapper Grouper Committee cont./Dr. Michelle Duval (TAB 6)**

7. Scientific & Statistical Committee Report/Dr. Marcel Reichert
8. SEFSC Report on Red Snapper Mortality in 2015 and 2016 Fishing Season/NMFS SERO

- Discuss and take action as appropriate – **ACTION**

**Wednesday, June 15**

**COMMITTEE MEETINGS**

**8:30 A.M. to 12:00 Noon**

**Snapper Grouper Committee cont./Dr. Michelle Duval (TAB 6)**

9. Overview of Snapper Grouper Amendment 37 (hogfish)
  - Discuss and modify document as appropriate, and approve all actions – **ACTION**
10. Overview of Snapper Grouper Amendment 41 (mutton snapper)/Myra Brouwer
  - Discuss and modify document as appropriate, and approve for public hearings – **ACTION**

**12:00 Noon to 1:30 P.M.**

**Lunch**

**1:30 P.M. to 5:30 P.M.**

**Snapper Grouper Committee cont./Dr. Michelle Duval (TAB 6)**

11. Overview of Snapper Grouper Amendment 43 (Red Snapper)
  - Overview of Options – Gregg Waugh
  - Discuss and consider Emergency Action – **ACTION**
  - Discuss and provide guidance to staff – **ACTION**
12. Vision Blueprint Amendment(s)
  - Overview of Options – Myra Brouwer
  - Discuss and provide direction to staff – **ACTION**
13. Control Date/Limited Entry for the For-Hire Permits in Snapper Grouper, Coastal Migratory Pelagics, and Dolphin Wahoo FMPs
  - Background – Dr. Brian Chevront
  - Discuss and provide direction to staff – **ACTION**

**5:30 P.M.**

**Public comment will first be accepted on items before the Council for approval for public hearings:**

- Snapper Grouper Amendment 41 (Mutton Snapper)
- Coastal Migratory Pelagics Framework Amendment 4 (Atlantic Cobia)

**Public comment will then be accepted regarding any of the other items on the Council agenda. The Council Chair, based on the number of individuals wishing to comment, will determine the amount of time provided to each commenter.**

**Thursday, June 16**

**8:30 A.M. to 9:30 A.M.**

**COMMITTEE MEETINGS**

**Law Enforcement Committee/Mark Brown (PARTIALLY CLOSED)**  
(TAB 7)

1. 2015 Law Enforcement Officer of the Year (**CLOSED**) – **ACTION**
2. Discussion of Items for Joint AP/Committee Meeting – **ACTION**

**9:30 A.M. to 10:30 A.M.**

**Spiny Lobster Committee/Jessica McCawley (TAB 8)**

1. Spiny Lobster Landings Review/Dr. Kari MacLauchlin – **ACTION**
2. Review Panel Report/Dr. Kari MacLauchlin – **ACTION**
3. Advisory Panel Report/Bruce Irwin – **ACTION**
4. Study on spiny lobster traps in closed areas in the Florida Keys /Jessica McCawley – **ACTION**
5. Regulations for spiny lobster traps outside of Florida/SERO – **ACTION**

**10:30 A.M. to 11:30 A.M.**

**Protected Resources Committee/Dr. Wilson Laney (TAB 9)**

1. Update from SERO/NMFS SERO – **ACTION**
2. TED Skimmer Trawl Updates/NMFS SERO – **ACTION**
3. Nassau Grouper 12-Month Determination/NMFS SERO – **ACTION**
4. Update from USFWS/Dr. Wilson Laney – **ACTION**

**11:30 A.M. to 1:00 P.M.**

**Lunch**

**1:00 P.M. to 2:30 P.M.**

**Data Collection Committee/Doug Haymans (TAB 10)**

1. CE-BA 3 (Bycatch) Status Update – **ACTION**
2. Commercial Logbook Electronic Reporting Status & Pilot Update – **ACTION**
3. South Atlantic For-Hire Reporting Amendment Update & Core Variables Consideration – **ACTION**
4. Citizen Science Program Update – **ACTION**

**2:30 P.M. to 3:30 P.M.**

**Executive Finance Committee/Dr. Michelle Duval (TAB 11)**

1. CY 2016 budget – **ACTION**
2. Council Follow-up and 2016 Priorities – **ACTION**
3. Standards and Procedures for Public Comments – **ACTION**
4. Standards and Procedures for Participating in Council Webinar Meetings and Council Meetings via Webinar – **ACTION**
5. CCC Meeting Report – **ACTION**
6. Visioning for Other Species – **ACTION**
7. ACCSP Data for Developing FMP Amendments – **ACTION**
8. Commercial Logbook Data and Headboat Data to ACCSP – **ACTION**

**3:30 P.M. to 5:30 P.M.**

**Mackerel Committee/Ben Hartig (TAB 12)**

1. Status of recreational and commercial catches vs. ACLs/NMFS SERO – **ACTION**
2. Status of CMP Amendment 26 (King Mackerel)/NMFS SERO
3. April 2016 Gulf Council Meeting Report – Dr. Kari MacLauchlin/ Chris Conklin
4. Updates on State and ASMFC Decisions Regarding Atlantic Cobia
  - Overview/Dr. Kari MacLauchlin
  - Discuss and take action as needed/Ben Hartig – **ACTION**

**Thursday, June 16**  
**3:30 P.M. to 5:30 P.M.**

**COMMITTEE MEETINGS CONTINUED**

**Mackerel Committee Contd./Ben Hartig (TAB 12)**

5. Review of Public Input on Atlantic Cobia
  - Summary/Dr. Kari MacLauchlin
  - Discuss and take action as needed/Ben Hartig – **ACTION**
6. CMP Framework Amendment 4 (Atlantic Cobia)
  - Overview of Decision Document/Dr. Kari MacLauchlin
  - Review and Approve Actions and Alternatives; Modify as Needed; Select Preferred Alternatives; and Approve for Public Hearings/Ben Hartig – **ACTION**
7. CMP Framework Amendment 5 (Modify Permit Restrictions)
  - Overview of Decision Document/Dr. Kari MacLauchlin
  - Review and Approve Action and Alternatives; Modify as Needed/Ben Hartig – **ACTION**
8. CMP Amendment 29 (Gulf King Mackerel Allocations)
  - Overview of Decision Document/Dr. Kari MacLauchlin
  - Discuss and Take Actions as Needed/ Ben Hartig – **ACTION**

**Friday, June 17**  
**8:30 A.M. to 1:00 P.M.**

**COUNCIL SESSION (TAB 13)**

- |               |   |
|---------------|---|
| 8:30 - 8:45   | Call to Order, Adoption of Agenda and Approval of March 2016 Minutes/Dr. Michelle Duval   |
| 8:45 - 9:30   | <u>Snapper Grouper Committee Report/Dr. Michelle Duval (TAB 6)</u> <ul style="list-style-type: none"><li>• Approve/Disapprove Snapper Grouper Amendment 41 (Mutton Snapper) for Public Hearings – <b>ACTION</b></li><li>• Consider other Committee recommendations and take action as appropriate – <b>ACTION</b></li></ul>       |
| 9:30 - 10:00  | <u>Mackerel Committee Report/Ben Hartig (TAB 12)</u> <ul style="list-style-type: none"><li>• Approve/Disapprove Coastal Migratory Pelagics Framework Amendment 4 (Atlantic Cobia) for Public Hearings – <b>ACTION</b></li><li>• Consider other Committee recommendations and take action as appropriate – <b>ACTION</b></li></ul> |
| 10:00 - 10:10 | <u>Spiny Lobster Committee Report/Jessica McCawley (TAB 8)</u> <ul style="list-style-type: none"><li>• Consider Committee recommendations and take action as appropriate – <b>ACTION</b></li></ul>  |
| 10:10 - 10:30 | <u>Joint Dolphin Wahoo/Snapper Grouper Committee Report/Anna Beckwith and Dr. Michelle Duval (TAB 5)</u> <ul style="list-style-type: none"><li>• Consider Committee recommendations and take action as appropriate – <b>ACTION</b></li></ul>  |
| 10:30 - 10:40 | <u>Protected Resources Committee Report/Dr. Wilson Laney (TAB 9)</u> <ul style="list-style-type: none"><li>• Consider Committee recommendations and take action as appropriate – <b>ACTION</b></li></ul>  |

**Friday, June 17**

**8:30 A.M. to 1:00 P.M.**

**COUNCIL SESSION CONTINUED (TAB 13)**

- 10:40 - 10:50      AP Selection Committee Report/Chester Brewer (TAB 4)  
• Consider Committee recommendations and take action as appropriate – **ACTION**
- 10:50 - 11:00      SSC Selection Committee Report/Charlie Phillips (TAB 2)  
• Consider Committee recommendations and take action as appropriate – **ACTION**
- 11:00 - 11:10      SEDAR Committee Report/Dr. Michelle Duval (TAB 3)  
• Consider Committee recommendations and take action as appropriate – **ACTION**
- 11:10 - 11:20      Data Collection Committee Report/Doug Heymans (TAB 10)  
• Consider Committee recommendations and take action as appropriate – **ACTION**
- 11:20 - 11:25      Habitat Committee Report/Doug Heymans (TAB 1)  
• Consider Committee recommendations and take action as appropriate – **ACTION**
- 11:25 - 11:30      Law Enforcement Committee Report/Mark Brown (TAB 7)  
• Consider Committee recommendations and take action as appropriate – **ACTION**
- 11:30 - 11:40      Executive Finance Committee Report/Dr. Michelle Duval (TAB 11)  
• Approve Council Follow-Up and Priorities – **ACTION**  
• Approve CY 2016 Budget – **ACTION**  
• Consider other Committee recommendations and take action as appropriate – **ACTION**
- 11:40 - 11:50      SERO Report/Dr. Roy Crabtree (Attachment 1)  
• Revisions to the BRD Testing Manual – **ACTION**
- 11:50 – 12:00      Review Experimental Fishing Permit requests as appropriate (**Attachment 2**) – **ACTION**
- 12:00 - 12:10      SEFSC Report/Dr. Bonnie Ponwith (Attachment 3) – ACTION  
• Regional Implementation Plan for Climate Change – **ACTION**
- 12:10 - 12:20      MREP Presentation/Kim Iverson (Attachment 4) – ACTION
- 12:20 - 12:40      Agency and Liaison Reports and additional information (**Attachment 5**) – **ACTION**
- 12:40 – 1:00      Other Business and Upcoming Meetings (**Attachment 6**) – **ACTION**
- 1:00 P.M.            **ADJOURN**



## 2016 Planned Council Meeting Topics

February 9-11, 2016 — Doubletree by Hilton New Bern Riverfront, New Bern, NC

- Omnibus Industry Funded Monitoring Amendment – *Select preferred Omnibus alternatives for public hearings*
- Draft EAFM Interactions White Paper – *Review*
- Collaborative Research Program – *Review committee progress*
- Scup GRA Framework – *Meeting 2*
- Unmanaged Forage Fish Amendment – *Discuss FMAT, AP, and EOP Committee recommendations*
- Data Modernization Amendment – *GARFO update*

April 12-14, 2016 — Montauk Yacht Club, Montauk, NY

- 2017 Golden Tilefish Specifications – *Review*
- Golden Tilefish Framework – *Meeting 2*
- Unmanaged Forage Amendment – *Approve Public Hearing Document*
- Blueline Tilefish Amendment – *Final action*
- 2013 River Herring/Shad White Paper – *Review Committee recommendations for TORs for October action*
- Omnibus Industry Funded Monitoring Amendment – *Select preferred mackerel alternatives for public hearings*
- Draft EAFM Guidance Document – *Review*
- Spiny Dogfish Trip Limits

June 14-16, 2016 — Courtyard Marriott Newark / University of Delaware Clayton Hall, Newark, DE

- 2017 Squid and Butterfish Specifications – *Review*
- Longfin/Butterfish Mesh/Strengthener Analyses- *Review*
- 2017 Atlantic Mackerel Specifications – *Review*
- RH/S Cap and RH/S management progress - *Review*
- 2017 and 2018 Surfclam/Ocean Quahog Specifications – *Adopt*
- Surfclam and Ocean Quahog Excessive Shares Amendment – *Discuss next steps*
- Summer Flounder Amendment – *Update*
- Squid Capacity Amendment – *Update*
- [eVTR framework – Meeting 1](#)
- [Omnibus Industry Funded Monitoring Amendment – Select preferred mackerel alternatives for public hearings](#)
- [Blueline tilefish recreational specifications – Review](#)

August 8-11, 2016 — Hilton Virginia Beach Oceanfront, Virginia Beach, VA

- Swearing-in of new and reappointed Council members
- Election of Officers
- 2017 Summer Flounder, Scup, Black Sea Bass Specifications – *Review*
- 2017 Bluefish Specifications – *Review*
- Summer Flounder Amendment – *Consider FMAT recommendations for draft range of alternatives*
- [Black Sea Bass Amendment – Adopt scoping document \(postponed until early 2017\)](#)
- Habitat policies on fishing impacts – *Review and approve*
- Unmanaged Forage Amendment – *Final action*
- eVTR framework – *Meeting 2*



- Collaborative Research Program – *Final action*
- EAFM Guidance Document – *Review and approve*

October 4-6, 2016 — Stockton Seaview Hotel, Galloway, NJ

- 2017 Spiny Dogfish Specifications – *Review*
- RH/S Stocks in the Fishery Decision
- NJ SMZ Recommendation – *Final action*
- Risk Policy Omnibus Framework – *Meeting 1*
- Council Communications Plan – *Review*
- Omnibus Industry Funded Monitoring Amendment – *Adopt final alternatives*
- New Jersey Special Management Zone (SMZ) request – *Review Monitoring Team Report*

December 13-15, 2016 — Royal Sonesta Harbor Court Baltimore, Baltimore, MD

- 2017 Summer Flounder, Scup, Black Sea Bass Recreational Specifications – *Adopt*
- Summer Flounder Amendment – *Approve range of alternatives for public hearing document*
- Risk Policy Omnibus Framework – *Meeting 2*
- Golden Tilefish 5 year IFQ program review – *Approve final document*
- Squid Capacity Amendment – *Approve public hearing document*



## 2016 Council Coordination Committee Meeting

Frenchman's Reef & Morning Star Marriott Beach Resort • St. Thomas, USVI

May 24-26, 2016

### AGENDA

#### Tuesday - May 24, 2016

TIME	DISCUSSION ITEM	PRESENTER
9:00 - 4:00	Meeting Registration	
4:00	- Registration Closed -	

#### Wednesday - May 25, 2016

TIME	DISCUSSION ITEM	PRESENTER
9:00 - 10:00 (20 min)	<b>Welcome/Introductions</b> <ul style="list-style-type: none"> <li>NMFS Update</li> <li>NMFS Science Update on Coral Work in the Caribbean</li> </ul>	<b>Carlos Farchette</b> <b>Eileen Sobeck</b>
10:00 - 10:20 (20 min)	<b>Recreational Fisheries Update</b>	<b>Russell Dunn</b>
10:20 - 10:35	- BREAK - (15 min)	
10:35 - 11:30 (55 min)	<b>FY16-17 Budget Updates</b>	<b>Brian Pawlak</b>
11:30 - 12:00 (30 min)	<b>Legislative Update</b>	<b>Dave Whaley</b>
12:00 - 1:30	- LUNCH - (90 min)	
1:30 - 2:00 (30 min)	<b>EBFM Road Map (Plan for Implementation)</b>	<b>Sam Rauch</b> <b>Heather Sagar</b>
2:00 - 3:00 (60 min)	<b>Council Definition of OY and Update on NSI</b>	<b>CCC</b> <b>Sam Rauch</b>
3:00 - 3:15	- BREAK - (15 min)	
3:15 - 4:15 (60 min)	<b>Catch Share Update Review</b>	<b>Alan Risenhoover</b> <b>Kelly Denit</b>
4:15 - 5:00 (45 min)	<b>Bycatch Discussion</b> <ul style="list-style-type: none"> <li>SBRM Rule Status Update</li> <li>Council Discussion &amp; Comments on Bycatch Strategy</li> </ul>	<b>Sam Rauch</b> <b>CCC</b>
5:00	- ADJOURN -	



## Thursday - May 26, 2016

<b>8:30 - 9:15</b> (45 min)	<b>New Operational Guidelines and the Regional Operation Agreements</b>	<b>Chuck Tracy</b> <b>Alan Risenhoover</b>
<b>9:15 - 10:00</b> (45 min)	<b>EM &amp; ER Regional Implementation Update</b>	<b>Jane DiCosimo</b> <b>CCC</b>
<b>10:00 - 10:15 - BREAK - (15 min)</b>		
<b>10:15 - 11:00</b> (45 min)	<b>EFH Summit Update</b>	<b>Bill Tweit</b> <b>Terra Lederhouse</b>
<b>11:00 - 11:30</b> (30 min)	<b>Update on Conflict of Interest Regulations Project</b>	<b>Adam Issenberg</b>
<b>11:30 - 12:00</b> (30 min)	<b>Communications Group Report</b>	<b>Kitty Simonds</b>
<b>12:00 - 1:30 - LUNCH - (90 min)</b>		
<b>1:30 - 3:00</b> (90 min)	<b>Compliance with NS2: BSIA used by Council/NMFS for stock status determination, specifications (OFL/ABC/ACL), and model selection</b> <ul style="list-style-type: none"> <li>• Issue and examples</li> <li>• Agency process to determine BSIA for Stock Status</li> </ul>	<b>Tom Nies</b> <b>Greg Waugh</b> <b>Jane DiCosimo</b>
<b>3:00 - 3:15 - BREAK - (15 min)</b>		
<b>3:15 - 3:45</b> (30 min)	<b>SSC Subcommittee</b> <ul style="list-style-type: none"> <li>• Agenda Items for 2017 Meeting</li> </ul>	
<b>3:45 - 4:15</b> (30 min)	<b>Other Business</b>	
<b>4:15 - 4:45</b> (30 min)	<b>Next CCC Meeting (2017)</b>	<b>Tom Nies</b>
<b>4:45 - ADJOURN -</b>		



**IN GRATITUDE AND APPRECIATION  
THE  
COUNCIL COORDINATION COMMITTEE  
RECOGNIZES**

**RICHARD B. ROBINS, JR.**

**FOR HIS DEDICATED SERVICE AS A  
MEMBER OF THE COMMITTEE**

*MAY 2016*

A handwritten signature in black ink, appearing to read "Ernest Stockwell".

Ernest Stockwell  
New England Fishery Management Council

A handwritten signature in black ink, appearing to read "Michelle A. Duval".

Michelle Duval  
South Atlantic Fishery Management Council

A handwritten signature in blue ink, appearing to read "Kevin Anson".

Kevin Anson  
Gulf of Mexico Fishery Management Council

A handwritten signature in black ink, appearing to read "Carlos Farchette".

Carlos Farchette  
Caribbean Fishery Management Council

A handwritten signature in black ink, appearing to read "Dorothy Lowman".

Dorothy Lowman  
Pacific Fishery Management Council

A handwritten signature in blue ink, appearing to read "Dan Hull".

Dan Hull  
North Pacific Fishery Management Council

A handwritten signature in black ink, appearing to read "Edwin Ebisui".

Edwin Ebisui  
Western Pacific Fishery Management Council



**IN GRATITUDE AND APPRECIATION  
THE  
COUNCIL COORDINATION COMMITTEE  
RECOGNIZES**

**LEE G. ANDERSON**

**FOR HIS DEDICATED SERVICE AS A  
MEMBER OF THE COMMITTEE**

*MAY 2016*

A handwritten signature in black ink, appearing to read "R B Robins Jr".

Richard B. Robins, Jr.  
Mid-Atlantic Fishery Management Council

A handwritten signature in black ink, appearing to read "Ernest Stockwell".

Ernest Stockwell  
New England Fishery Management Council

A handwritten signature in black ink, appearing to read "Michelle A. Duval".

Michelle Duval  
South Atlantic Fishery Management Council

A handwritten signature in blue ink, appearing to read "Kevin Anson".

Kevin Anson  
Gulf of Mexico Fishery Management Council

A handwritten signature in black ink, appearing to read "Carlos Farchette".

Carlos Farchette  
Caribbean Fishery Management Council

A handwritten signature in black ink, appearing to read "Dorothy M. Lowman".

Dorothy Lowman  
Pacific Fishery Management Council

A handwritten signature in blue ink, appearing to read "Dan Hull".

Dan Hull  
North Pacific Fishery Management Council

A handwritten signature in black ink, appearing to read "Edwin Ebisui".

Edwin Ebisui  
Western Pacific Fishery Management Council



# Fishery Management Action Teams

## Overview

A Fishery Management Action Team (FMAT) is a team formed by the Council to develop alternatives and provide technical analysis in support of a specific, major Council action. FMATs help plan and execute the procedural and technical steps needed to complete an action, and collaborate to create the supporting documents for Council actions (e.g., white papers, environmental assessments, environmental impacts statements, etc.). FMATs work closely with Council Committees to refine options and evaluate management proposals to ensure they are consistent with Council goals and any statutory or regulatory requirements.

Specific responsibilities of FMATs include:

- Development of Action Plans for amendments and frameworks;
- Development of the scope of issues that will be considered in the development of the action;
- Incorporation of recommendations of the Council and its committees or other groups, into management alternatives development, as appropriate; and
- Guidance, and technical and analytical expertise, and/or review of proposed measures during the development and preparation of FMP actions.

## Membership

Membership on FMATs can include scientists, managers, and other experts with knowledge and experience relevant to the Council action under development. FMATs are chaired by Council staff as designated by the Council Executive Director.

## Meetings

FMAT meetings are working meetings of the Council, NOAA Fisheries, and Atlantic States Marine Fisheries Commission staff. Information on FMAT meeting locations and how to connect via phone or webinar (if available) may be obtained by contacting Council staff prior to the meeting. This information is not posted to the Council's website. The date and time of FMAT meetings are generally posted to the calendar on the Council's website, sometimes with very little notice. FMAT members may discuss topics listed on the agenda in any order and may also discuss topics not listed. Members of the public may attend FMAT meetings, or listen to the meetings if they are broadcast, but should not expect to participate in the discussion unless the FMAT chair invites public input during a specified public comment period to be noted at the beginning of the meeting. Work carried out by the FMAT is considered during committee and/or Council meetings, during which public comments are encouraged.



**Comprehensive Summer Flounder Amendment to the  
Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan  
Draft Action Plan (updated as of 6/2/16)**

<http://www.mafmc.org/actions/summer-flounder-amendment>

**Council:** Mid-Atlantic (joint with Atlantic States Marine Fisheries Commission)

**Title of Action:** Comprehensive Summer Flounder Amendment to the Summer Flounder, Scup, and Black Sea Bass FMP

**Applicable Fisheries:** Summer Flounder (commercial and recreational)

**Purpose and Need:** The purpose of this amendment is to complete a comprehensive review of all aspects of the Summer Flounder, Scup, and Black Sea Bass FMP related to summer flounder. This will include revisiting and updating the goals and objectives of the plan for summer flounder, as well as re-examining and modifying as necessary any and all fishery management strategies necessary to achieve those goals and objectives.

**Type of NEPA Analysis Expected:** Environmental Impact Statement (EIS)

**Additional Expertise Sought:** The Fisheries Management Action Team (FMAT) for this action will be composed of Council staff and management partners from the Greater Atlantic Regional Fisheries Office, the Atlantic States Marine Fisheries Commission, the Northeast Fisheries Science Center, with input from other organizations as appropriate. The FMAT will serve as the primary team for amendment development and analysis, but will work with several working groups to address specific issues.

Agency	Fishery Management Action Team (FMAT) Role	Person(s)
MAFMC	Council Staff (Plan Coordinator)	Kiley Dancy
ASMFC	Commission Staff (Plan Coordinator)	Kirby Rootes-Murdy
ASMFC	Commission Staff (Plan Coordinator)	Max Appelman
NMFS GARFO	Sustainable Fisheries (Plan Coordinator)	Moira Kelly/Emily Gilbert
NMFS GARFO	NEPA	Katherine Richardson
NMFS GARFO	Habitat	David Stevenson
NMFS NEFSC	Stock Assessment/Technical	Mark Terceiro
NMFS NEFSC	Socioeconomics	Scott Steinback
NMFS GARFO	General Counsel (consulted as needed)	Kevin Collins

**Working Groups:** The FMAT will work with topic-specific working groups that will be formed to complete technical work and analyses related to specific aspects of summer flounder management. These working groups are envisioned as a means to more efficiently address many important and complicated issues within a large and complex amendment. Two issue-specific working groups will be formed during initial development of alternatives: one for commercial issues and one for recreational issues. The working groups will be populated with individuals with technical expertise relevant to the issue, who are available and willing to actively participate in document development and technical analysis. For each working group, this will include a subset of the FMAT, several Technical/Monitoring Committee members, and potentially additional experts (state or federal agency, academic, or other) with relevant expertise (subject to the availability of funding, if necessary).

**Types of Measures Expected to be Considered:** In December 2014, the Council and Board identified several general categories of issues to be addressed by this amendment. The FMAT will develop a wide range of management options for the Council to consider. These could include alternatives to address issues including, but not limited to:

- FMP goals and objectives for summer flounder
- Quota allocation between the commercial and recreational fisheries
- Commercial summer flounder management measures and strategies (some changes can be made through the annual specifications process and would not require an amendment):
  - Commercial fishing gear requirements and restrictions, including, but not limited to: mesh requirements, net dimensions, bycatch reduction devices, etc.
  - Minimum fish size requirements
  - Possession limit and trigger requirements
  - Time/area closures and exemption programs
  - Licensing/permits
  - Commercial quota allocation strategies
  - Landings flexibility (regional, coastwide, other)
- Recreational summer flounder management measures and strategies:
  - Recreational bag limits, size limits, and seasonal limits
  - Recreational fishing gear requirements and restrictions
  - Inter-jurisdictional management processes and strategies (including use of state-by-state or regional Conservation Equivalency vs. Coastwide measures)
  - Management strategies specific to the party/charter (for-hire) recreational fleet
  - Management strategies specific to private recreational anglers
  - Recreational quota allocation strategies (by state, fishing sector, other)

Under the umbrella of the above categories, the Council and Board have indicated that they may also explore alternatives related to the following:

- Summer flounder discards in the commercial and recreational fisheries
- Ecosystem, habitat, bycatch, and protected species issues
- Data collection requirements and protocols
- Other issues not listed above



**Applicable laws/issues:**

Magnuson-Stevens Act	Yes
Administrative Procedures Act	Yes
Regulatory Flexibility Act	Yes
Paperwork Reduction Act	Possibly; depends on data collection needs
Coastal Zone Management Act	Possibly; depends on effects of the action on the resources of the coastal states in the management unit
Endangered Species Act	Possibly; level of consultation, if necessary, depends on the actions taken
E.O. 12866 (Regulatory Planning and Review)	Yes
E.O. 12630 (Takings)	Possibly; legal review will confirm
E.O. 13123 (Federalism)	Possibly; legal review will confirm
Essential Fish Habitat	Possibly
Information Quality Act	Yes

**Current Amendment Timeline (as of 6/2/16; subject to change):**

<i>December 2013</i>	<i>Council initiates amendment</i>
<i>April-June 2014</i>	<i>Draft action plan developed; Fishery Management Action Team (FMAT) formed</i>
<i>June 2014</i>	<i>Council's Demersal Committee meets to discuss scoping process</i>
<i>August 2014</i>	<i>Joint Council and Commission draft scoping document developed; Council and Commission review and approve draft document for public comment</i>
<i>September/ October 2014</i>	<i>Scoping hearings and public comment period</i>
<i>December 2014</i>	<i>Council and Commission identify priority issues for inclusion in the amendment</i>
<i>April 2015</i>	<i>FMAT meeting (webinar)</i>
<i>August 2015</i>	<i>Status update at August joint Council/Board meeting; intro to Fisheries Forum goals &amp; objectives project</i>
<i>Fall 2015</i>	<i>Fisheries Forum project to synthesize Council/Board input on FMP goals and objectives; FMAT meeting for goals and objectives recommendations</i>
<i>December 2015</i>	<i>Council and Commission workshop on FMP goals and objectives (with Fisheries Forum); amendment status update</i>
<i>Winter 2016</i>	<i>Issue-specific working groups established; FMAT and working group meetings</i>
Spring/Summer 2016	FMAT begins development of range of alternatives, develops tasks for working groups; Advisory Panel feedback sought on potential alternatives.
Summer/Fall 2016	FMAT and working groups continue development of alternatives; Council and Commission review FMAT and working group recommendations and draft alternatives; Draft Environmental Impact Statement (DEIS) development begins
Late 2016/Early 2017	Range of options refined and approved for public hearings; analysis of alternatives; approval of DEIS
Spring/Summer 2017	Public hearings
Summer/Fall 2017	Council and Commission consider public comments; final action
Late 2017/Early 2018	Final Environmental Impact Statement developed; rulemaking and comment periods (5-7 months)
Spring/Summer 2018	Final rule effective

\**Italics* = complete



# 2016 IMPLEMENTATION PLAN

MID-ATLANTIC FISHERY MANAGEMENT COUNCIL

*APPROVED DECEMBER 10, 2015*

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# INTRODUCTION

The Council initiated its Visioning and Strategic Planning Project in 2011 in an effort to address current and future challenges and secure a more stable and sustainable future for Mid-Atlantic fisheries. Between September 2011 and February 2012, the Council collected input for the strategic plan from more than 1,500 stakeholders through surveys, roundtable meetings, and position letters. Their input was summarized in the *Stakeholder Input Report*, released by the Council in June 2012.

In August 2012, the Council established a Visioning and Strategic Planning Working Group composed of Council members, stakeholders, and regional leadership. Through a series of meetings from August-December 2012, the working group crafted a vision, mission, goals, and objectives for the strategic plan. The framework developed by the working group was further refined by Council staff and approved by the Council in August 2013. The final 2014 – 2018 Strategic Plan is available at [www.mafmc.org/strategic-plan](http://www.mafmc.org/strategic-plan), along with other related documents and background information.

The Council's strategic plan provides the first comprehensive strategic approach for fisheries management in federal waters off the Mid-Atlantic coast. Over the next five years, the strategic plan will guide the Council's efforts to achieve sustainable and productive fisheries, a healthy marine ecosystem, and stable coastal communities.

Implementation of the strategic plan will be a long-term process supported through the annual development of one-year implementation plans that identify specific tasks necessary for achieving the Council's goals and objectives. Annual implementation plans are designed for use as a planning tool by the Council and staff and as a way to update the public on progress toward achieving the goals and objectives of the strategic plan. Each year's plan is designed to provide a comprehensive and realistic framework for merging the Council's ongoing projects with new initiatives.

## STRATEGIC PLAN OVERVIEW

### Vision

Healthy and productive marine ecosystems supporting thriving, sustainable marine fisheries that provide the greatest overall benefit to stakeholders.

### Mission

The Council manages marine fisheries in federal waters of the Mid-Atlantic region for their long-term sustainability and productivity consistent with the National Standards of the Magnuson-Stevens Fishery Conservation and Management Act. The Council is committed to the effective stewardship of these fisheries and associated habitats by incorporating scientific information and informed public input in transparent processes that produce fishery management plans and programs.

### Core Values

- ❖ Stewardship
- ❖ Integrity
- ❖ Effectiveness
- ❖ Fairness
- ❖ Competence
- ❖ Clear Communication

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# 2014 – 2018 GOALS, OBJECTIVES, AND STRATEGIES

## Communication

**Goal:** Engage, Inform, and educate stakeholders to promote public awareness and encourage constructive participation in the Council process.

- Objectives:**
- Develop and implement a strategic communications plan to provide clear and accurate information to a broad range of stakeholders
  - Engage a diverse audience of stakeholders
  - Increase stakeholder trust and facilitate greater stakeholder engagement by making the Council process accessible and transparent
  - Increase awareness and understanding of fishery science and management
  - Increase stakeholder involvement in the development of fishery management actions

## Science

**Goal:** Ensure that the Council's management decisions are based on timely and accurate scientific data that are analyzed and modeled in a manner that improves management performance and builds stakeholder confidence

- Objectives:**
- Promote the collection and analysis of accurate and timely scientific data to support the Council's management plans and programs
  - Improve our understanding of the social and economic dimensions of Mid-Atlantic fishing communities
  - Promote the collection and analysis of data needed to support the Council's transition to an Ecosystem Approach to Fisheries Management
  - Encourage effective stakeholder participation in data collection and analysis
  - Promote efficient and accurate methods of monitoring and reporting

## Management

**Goal:** Develop fishery management strategies that provide for productive, sustainable fisheries.

- Objectives:**
- Evaluate the Council's fishery management plans
  - Incorporate economic and social analysis of management alternatives into the decision-making process
  - Develop management strategies that enable efficient operation of commercial and recreational fishing businesses
  - Develop innovative management strategies for recreational and commercial fisheries
  - Advance ecosystem approaches to fisheries management in the Mid-Atlantic

## Governance

**Goal:** Ensure that the Council's governance structures and practices fairly represent stakeholder interests, are coordinated with the Council's management partners, and include a clear and well-defined decision-making process.

- Objectives:**
- Establish a formal decision-making process for the development and evaluation of management actions
  - Develop and strengthen partnerships to promote greater efficiency and enhance coordination among management partners and other relevant organizations
  - Ensure that stakeholder interests are accurately understood and meaningfully considered in the Council process

# PROPOSED 2016 DELIVERABLES

*This section provides an overview of deliverables expected by the end of the implementation plan period. Since many of the proposed implementation activities cannot be measured with traditional metrics, the list of deliverables establishes a mechanism for measuring the Council's progress toward achieving the goals and objectives of the strategic plan.*

## SUMMER FLOUNDER, SCUP AND BLACK SEA BASS

- 2017 specifications (review)
- 2017 recreational management measures
- Advisory Panel fishery performance reports
- Comprehensive summer flounder amendment (ongoing)
- Black sea bass amendment (initiate)
- Scup gear restricted area framework
- Summer flounder allocation project
- Black sea bass assessment (contract)

## MACKEREL, SQUID, AND BUTTERFISH

- 2017 squid and butterfish specifications (review)
- Squid capacity amendment
- 2017 specifications for Atlantic mackerel (review)
- Advisory Panel fishery performance reports
- Longfin squid mesh increase review
- Butterfish cap review

## RIVER HERRING AND SHAD

- RH/S cap for Atlantic mackerel fishery for 2017 (review)
- RH/S progress update
- Stock in fishery issue

## BLUEFISH

- 2017 specifications (review)
- Advisory Panel fishery performance report

## GOLDEN AND BLUELINE TILEFISH

- 2017 specifications (review)
- Advisory Panel fishery performance report
- 5 year IFQ review
- Framework 2
- Blueline tilefish amendment
- Blueline tilefish genetics study (contract)
- Blueline recreational landings workshop

## SURFCLAMS AND OCEAN QUAHOGS

- 2017-2018 specifications (develop and approve)
- Advisory Panel fishery performance reports
- Excessive shares amendment (ongoing)
- ITQ review project (contract)

## SPINY DOGFISH

- 2017 specifications (review)
- Advisory Panel fishery performance report

## ECOSYSTEM AND OCEAN PLANNING/HABITAT

- Council habitat policy documents
- Habitat objectives for EAFM approaches
- EFH review paper

## GENERAL

- EAFM guidance document
- Omnibus observer funding amendment (GARFO lead)
- Unmanaged forage fish action (ongoing)
- NJ SMZ request

## COMMUNICATION AND OUTREACH

- General Council communications plan
- Council action web pages
- Fact sheets and outreach materials
- Website FAQ page
- Virtual workshop on website utility
- Public comment policy/guidelines

## SCIENCE AND RESEARCH

- Mid-Atlantic collaborative research program review
- 2016 – 2017 Mid-Atlantic collaborative research projects
- For-hire fisheries eVTR framework
- Framework to modify Council's risk policy
- Omnibus amendment for data modernization (GARFO lead)

## POSSIBLE ADDITIONS

- Black sea bass adaptive management project (contract)
- Black sea bass allocation project (contract)
- Scup quota period framework
- Goals and objectives for MSB
- Add Deep Sea Coral protection areas to national MPA network
- Develop a mechanism to notify the Council of landings of unmanaged species



# ACTION DEVELOPMENT CHECKLIST

*A significant portion of the strategies included in the Council's strategic plan cannot be "completed" because they relate to tasks that should be considered an intrinsic part of every project or action. This section is the companion to the Proposed Deliverables section—it provides a mechanism for ensuring that the Council is upholding the standards included in its strategic plan. The Action Development Checklist was designed to be used by the Council and Staff as a guide for integrating the Council's strategic goals into the development and evaluation of management alternatives.*

## COMMUNICATION

- Ensure that communication materials meet the federal plain language guidelines
- Provide conference lines or webinar access to meetings whenever possible
- Ensure that meetings and events are posted on Council website calendar in a timely manner and with relevant information and documents
- Follow Council guidelines for collection and summarization of public comments
- Ensure that background information about the action is included with briefing materials each time the issue is discussed at a Council meeting
- Consider the feasibility and appropriateness of a workshop as part of the action development process
- Ensure that scoping and public hearings are held in locations with high concentrations of interested individuals
- Use targeted communication to inform stakeholders and solicit public input from individuals and groups that are most likely to be interested in or affected by the potential action

## SCIENCE

- Fully consider species interactions in the assessment process and in the determination of catch limits
- Effectively communicate stakeholders' concerns or recommendations regarding monitoring/observing to the NEFSC

## MANAGEMENT

- Evaluate the cumulative social and economic impacts of proposed and existing management alternatives
- Consider energy efficiency in the development of management measures
- Account for uncertainty in recreational catch estimates
- Support the development of models and analyses that evaluate alternative bag, size, and seasonal limits
- Reduce regulatory discards
- Ensure fair access to recreational fisheries throughout their range
- Incorporate species interactions into fishery management plans and coordinate these considerations across appropriate management plans
- Consider the relationship between essential fish habitat and productivity of marine resources into management decisions
- Minimize adverse ecosystem impacts

## GOVERNANCE

- Follow Council guidelines for evaluation of stakeholder input
- Use advisory bodies and stakeholder input to inform the decision-making process and actively monitor changing conditions in the fisheries and ecosystem

# SCIENCE AND RESEARCH NEEDS

*This section summarizes the specific science and research needs that were identified in the strategic plan. These strategies are handled differently because they require additional planning in coordination with NOAA's Northeast Fisheries Science Center and other research institutions. The Science Center has already played a significant role in the development of the strategic plan, but since the Council has little control over how and when the science-related tasks of the strategic plan will be addressed, the implementation of these strategies requires a unique approach.*

## DATA NEEDS

- Timeline for completion of acceptable benchmark assessments for all of the Council's managed fisheries
- Oceanographic data related to climate change and ocean acidification
- Regional evaluation of species interactions within the marine ecosystem
- Climate change risk assessment for the Northeast marine ecosystem
- Habitat data—particularly data to link habitat protection with fishery productivity
- Relevant and up-to-date social and economic data about Mid-Atlantic communities
- Real-time commercial fisheries data
- Bioeconomic models

## RESEARCH METHODOLOGY, FUNDING, AND PROGRAM ADMINISTRATION

- Electronic VTRs / log books in the commercial and for-hire sectors
- Innovative technologies (e.g., electronic monitoring, smart phones, etc.) to improve the accuracy and/or efficiency of data collection
- Evaluation of potential uses for volunteer angler data in recreational management decisions
- Additional observer program funding options
- Cooperative and collaborative research program expansion

## MANAGEMENT STRATEGY INNOVATION

- Management strategies that account for uncertainty in recreational catch estimates
- Management strategies that reduce regulatory discards
- Management strategies that minimize adverse ecosystem impacts
- Management strategies that ensure fair access to recreational fisheries

# 2016 IMPLEMENTATION ACTIVITIES

This section identifies the specific activities and projects that the Council plans to begin or complete in 2016. The matrix is organized around the four goal areas identified in the strategic plan and includes anticipated timelines for completion of each task. Please note that the matrix below does not include routine or annual activities such as development of advisory panel fishery performance reports or annual specifications.

Implementation Activity	Year				
	14	15	16	17	18
<b>COMMUNICATION &amp; OUTREACH</b>					
1. General council communication and outreach plan		•	•		
2. Website FAQ page			•		
3. Virtual workshop on website utility			•		
4. Public comment policy/guidelines		•	•		
<b>SCIENCE &amp; RESEARCH</b>					
5. Mid-Atlantic collaborative research program review		•	•		
6. 2016-2017 Mid-Atlantic collaborative research projects			•	•	
7. For-hire fisheries eVTR framework			•		
8. Framework to modify Council's risk policy			•		
9. Omnibus amendment for data modernization (GARFO lead)			•	•	
10. Convene Scientific and Statistical Committee Meetings (as needed)	•	•	•	•	•
<b>MANAGEMENT</b>					
<b>Mackerel, Squid, Butterfish and River Herring/Shad</b>					
11. Squid Capacity Amendment		•	•	•	
12. Longfin squid mesh increase review			•		
13. Butterfish cap review		•	•		
<b>Summer Flounder, Scup, Black Sea Bass</b>					
14. Comprehensive summer flounder amendment	•	•	•		
15. Black sea bass amendment			•	•	
16. Scup gear restricted area framework	•	•	•		
17. Summer flounder allocation project		•	•		
18. Black sea bass assessment (contract)		•	•		
<b>River Herring and Shad</b>					
19. Address additional conservation of river herring and shad through an interagency working group	•	•	•	•	
20. Review RH/S Cap for Atl. mackerel fishery for 2017			•		
21. RH/S Progress Update		•	•		
22. Stock in fishery issue			•		

Implementation Activity	Year				
	14	15	16	17	18
<b>Surfclam and Ocean Quahog</b>					
23. Excessive Shares Amendment		•	•	•	
24. 5 Year ITQ Review (contract)			•	•	
<b>Golden and Blueline Tilefish</b>					
25. 5-year IFQ review	•	•	•		
26. Framework 2		•	•		
27. Blueline tilefish amendment		•	•		
28. Blueline tilefish genetics study (contract)		•	•		
29. Blueline recreational landings workshop			•		
<b>Ecosystems and Ocean Planning/Habitat</b>					
30. Council Habitat Policy Documents		•	•		
31. Habitat Objectives for EAFM Document		•	•		
32. EFH Review Paper		•	•		
<b>General</b>					
33. EAFM Guidance Document	•	•	•		
34. Omnibus Observer Funding Amendment (GARFO Lead)	•	•	•		
35. Unmanaged forage action		•	•		
36. New Jersey SMZ Request			•		
<b>GOVERNANCE</b>					
37. Complete advisory panel fishery performance reports for each fishery	•	•	•	•	•
38. Participate on Seafood Marketing Committee		•	•	•	•
39. Participate in Partnership for Mid-Atlantic Fisheries Science	•	•	•	•	•
40. Participate in Atlantic Coastal Cooperative Statistics Program	•	•	•	•	•
41. Marine Recreational Information Program	•	•	•	•	•
42. Mid-Atlantic Regional Association for Coastal Ocean Observing System	•	•	•	•	•
43. Participate on the Chesapeake Bay Goal Implementation Team	•	•	•	•	•
44. Participate in Coastal and Marine Spatial Planning activities through coordination with Bureau of Ocean Energy Management (BOEM) and the Mid-Atlantic Regional Planning Body	•	•	•	•	•
45. Participate in Protected Resources Take Reduction meetings	•	•	•	•	•
46. Continue to coordinate with the NEFSC, particularly in relation to the goals, objectives, and strategies of the NEFSC strategic plan	•	•	•	•	•



## NOAA Issues Proposed Rules Designating Critical Habitat for Atlantic Sturgeon

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FOR IMMEDIATE RELEASE:  
June 2, 2016

NOAA Fisheries today announced two proposed rules to designate critical habitat for five distinct population segments of federally listed [Atlantic sturgeon](#).

NOAA Fisheries is proposing to protect important river habitat for the threatened Gulf of Maine population segment and the endangered population segments of the New York Bight, Chesapeake Bay, Carolina and South Atlantic. NOAA Fisheries listed the Atlantic sturgeon under the Endangered Species Act in 2012.

“Protecting endangered and threatened species, including sturgeon, is one of our core missions,” said Eileen Sobeck, assistant NOAA administrator for fisheries. “Sturgeon need this habitat to recover, and these designations give us an important additional conservation tool. Fully recovering Atlantic sturgeon in the future will take partnerships with state and federal agencies, the scientific community, and the public, but designating critical habitat is another step in the right direction.”

The ESA requires that NOAA Fisheries designate critical habitat when a species is listed as threatened or endangered. Under the ESA, critical habitat is defined as geographic areas that are occupied by the species, and that contain features essential to the conservation of that species. Critical habitat can also include geographical areas that are not currently occupied by the species, but that are essential to its conservation.

Critical habitat does not create preserves or refuges. Instead, when a federal agency is carrying out funding or authorizing an activity that may affect the critical habitat, the federal agency works with NOAA Fisheries to avoid or minimize potential impacts to the species’ habitat. The activity of the federal agency may need to be modified to avoid destroying or adversely modifying the critical habitat.

The proposed designation of critical habitat does not include any new restrictions or management measures for recreational or commercial fishing operations.

The Atlantic sturgeon is an anadromous species that remains primarily in coastal and estuarine waters during much of the year, and travels to rivers to spawn or lay their eggs. Unlike some anadromous fish, sturgeon do not die after spawning and will return to spawn again in future years. They can grow up to 14 feet, weigh up to 800 pounds, and live up to 60 years.

Historically, Atlantic sturgeon were present in approximately 38 rivers in the United States from St. Croix, Maine to the Saint Johns River, Florida. Scientists identified 35 of those as spawning rivers. Atlantic sturgeon are currently present in approximately 32 of these rivers, and spawning occurs in at least 20 of them. Overfishing was one of the primary factors that led to the widespread decline in the abundance of Atlantic sturgeon. Atlantic sturgeon was valued particularly for its roe or eggs, which were in high demand as caviar.

“The proposed critical habitat identifies areas that provide important spawning and rearing grounds, plus migratory corridors for the Atlantic sturgeon,” added Sobeck. “By protecting the sturgeon’s habitat, we are helping preserve this important species for future generations of Americans.”

The Atlantic States Marine Fisheries Commission (ASMFC) manages Atlantic sturgeon under a Fishery Management Plan. In 1998, the Commission instituted a coast-wide moratorium on the harvest of Atlantic sturgeon, in effect until there are at least 20 protected age classes in each spawning stock (anticipated to take up to 40 years). NOAA Fisheries followed the ASMFC moratorium with a similar moratorium for Federal waters.

For the rule covering the Gulf of Maine, New York Bight, and Chesapeake Distinct Population Segments, you may submit comments, identified by the NOAA-NMFS-2015-0107, by one of the following methods:

- **Electronic Submissions:** Submit all electronic public comments via the Federal eRulemaking Portal. Go to [www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2015-0107](http://www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2015-0107), Click the “Comment Now!” icon, complete the required fields, and enter or attach your comments.
- **Mail:** Kimberly B. Damon-Randall, Assistant Regional Administrator, Protected Resources Division, NMFS, Greater Atlantic Regional Office, 55 Great Republic Drive, Gloucester, MA 01930
- **Public Hearing:** The July 21, 2016, public hearings will be held at the NMFS, Greater Atlantic Region Fisheries Office, 55 Great Republic Drive, Gloucester, MA 01930.

*NOAA’s mission is to understand and predict changes in the Earth’s environment, from the depths of the ocean to the surface of the sun, and to conserve and manage our coastal and marine resources. Join us on [Twitter](#), [Facebook](#), [Instagram](#) and our other [social media channels](#).*



## Executive Summary

NOAA Fisheries has long recognized the importance of implementing ecosystem-based fisheries management (EBFM) in order to explicitly account for environmental changes and make trade-off decisions for actions that impact multiple species. These decisions would otherwise be made implicitly with strictly single-species management. The explicit treatment, transparent examination, and analytical exploration among the trade-offs across the many objectives in a given region are key outcomes resulting from the execution of EBFM.

NOAA Fisheries recently formalized its commitment to doing EBFM through the release of its EBFM Policy. The Policy defines EBFM, describes its benefits, discusses how it relates to existing living marine resource management legal authorities and requirements, establishes a framework of six Guiding Principles to enhance and accelerate the implementation of EBFM within NOAA Fisheries, and builds on past progress and clarifies the agency's commitment to integrating its management programs for living marine resources and their habitats.

The NOAA Fisheries EBFM Road Map builds upon the Policy by providing a national implementation strategy for the Policy. This Road Map describes how to operationalize the Policy's six Guiding Principles through a series of core components for each guiding principle.

The six Guiding Principles, with their associated core components, are:

1. Implement ecosystem-level planning
  - Engagement Strategy
  - Fishery Ecosystem Plans
2. Advance our understanding of ecosystem processes
  - Science to Understand Ecosystems
  - Ecosystem Status Reports
3. Prioritize vulnerabilities and risks to ecosystems and their components
  - Ecosystem-Level Risk Assessment
  - Managed Species, Habitats and Communities Risk Assessment
4. Explore and address trade-offs within an ecosystem
  - Modeling Capacity
  - Management Strategy Evaluations
5. Incorporate ecosystem considerations into management advice
  - Ecosystem-Level Reference Points
  - Ecosystem Considerations for Living Marine Resources
  - Integrated Advice for Other Management Considerations
6. Maintain resilient ecosystems
  - Resilience
  - Community Well Being

These Guiding Principles and the actions contained within them are the actionable steps for the implementation of EBFM within NOAA Fisheries.

NOAA Fisheries will review and, as appropriate, update the Road Map every five years. This will enable NOAA Fisheries to meet further NOAA guidance on EBFM or as the needs of NOAA Fisheries and its partners evolve. Key to the successful implementation of EBFM will be trade-off analyses regarding prioritization of various activities in each region.



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*2.1.2 Support development of Fishery Ecosystem Plans*

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*2.2.1 Conduct Science to Understand Ecosystems*

*2.2.2 Provide Ecosystem Status Reports for each Large Marine Ecosystem*

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*2.3.2 Identify the individual and cumulative pressures that pose the most risk to vulnerable resources and dependent communities*

*2.4 Guiding Principle 4 - Explore and address trade-offs within an ecosystem*

*2.4.1 Analyze trade-offs on optimizing benefits from all fisheries within each ecosystem or jurisdiction, taking into account ecosystem-specific policy goals and objectives, cognizant that ecosystems are composed of interconnected components*

*2.4.2 Develop Management Strategy Evaluation capabilities to better conduct ecosystem-level analyses to provide ecosystem-wide management advice*

*2.5 Guiding Principle 5 - Incorporate ecosystem considerations into management advice*

*2.5.1 Develop and monitor Ecosystem-Level Reference Points*

*2.5.2 Incorporate ecosystem considerations into appropriate LMR assessments, control rules, and management decisions*

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*2.6.2 Evaluate community well-being*

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#### ***Attachments:***

***Figure 1*** *The location of Regional Offices, Fishery Science Centers, Fishery Management Councils, Interstate Fishery Commissions, Large Marine Ecosystems, and the US Economic Exclusive Zone for which NOAA Fisheries and*

*its partners have jurisdiction and are mandated to manage LMRs and marine ecosystems.*

**Figure 2** *Inter-relationships among NOAA Fisheries programs and plans that support EBFM.*

**Box 1** *NOAA's Integrated Ecosystem Assessment (IEA) Program: An analytical framework to deliver management advice in an ecosystem context*

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**List of Acronyms**

## ***1.0 Background, Purpose, and Scope of the EBFM Road Map***

### ***1.1 Background***

It is NOAA's National Marine Fisheries Service (NOAA Fisheries) policy to implement Ecosystem-based Fisheries Management (EBFM). This policy is formalized in the EBFM Policy Statement<sup>1</sup>. The EBFM Policy recognizes the importance of EBFM and articulates NOAA Fisheries' commitment to it.

The EBFM Policy describes the background, definition, rationale, legislative context, and major Guiding Principles for executing EBFM. NOAA Fisheries defines EBFM as:

*“a systematic approach to fisheries management in a geographically specified area that contributes to the resilience and sustainability of the ecosystem; recognizes the physical, biological, economic, and social interactions among the affected fishery-related components of the ecosystem, including humans; and seeks to optimize benefits among a diverse set of societal goals.”*

### ***1.2 Purpose***

This EBFM Road Map is intended to guide the implementation of the EBFM Policy over the next 5 years. It describes recommended Actions to address each of the Policy's six Guiding Principles for near-term work. Given the breadth and magnitude of implementing EBFM, the Road Map is an initial national articulation of priorities that the agency will continue to review, revising and building on the efforts noted herein, with another installment of the Road Map planned in five years.

The EBFM Road Map calls for increased coordination across all the Living Marine Resource (LMR) science and management efforts in each U.S. marine region (Figure 1). This Road Map is intended to ensure that: no major pressures affecting LMRs and their habitats are omitted; NOAA Fisheries executes the correct analytical level of assessment, addresses relevant ecosystem linkages, accounts for ecosystem-level features and cumulative impacts; and the frequency and scope of LMR assessments align with the broader ecosystem and fishing community dynamics. A major objective of this Road Map is to identify complementary efforts that would benefit from additional coordination; NOAA Fisheries will ensure that its various efforts are well coordinated among NMFS Science Centers, Regions, and Headquarter Offices, Regional Fishery Management Councils, States, and key stakeholders. Ultimately, all factors affecting fisheries resources or, in turn, are affected by them need to be considered in a systematic manner in the science and management pertaining to these resources.

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<sup>1</sup> [https://www.st.nmfs.noaa.gov/Assets/ecosystems/ebfm/Draft\\_EBFM\\_Policy\\_9.9.2015\\_for\\_release.pdf](https://www.st.nmfs.noaa.gov/Assets/ecosystems/ebfm/Draft_EBFM_Policy_9.9.2015_for_release.pdf)

The NOAA Fisheries EBFM implementation is guided by six Guiding Principles outlined in the EBFM Policy Statement:

1. Implement ecosystem-level planning
2. Advance our understanding of ecosystem processes
3. Prioritize vulnerabilities and risks to ecosystems and their components
4. Explore and address trade-offs within an ecosystem
5. Incorporate ecosystem considerations into management advice
6. Maintain resilient ecosystems

These Guiding Principles help NOAA Fisheries prioritize and coordinate across a range of management objectives to more fully adopt a systematic, integrated approach based on a solid, continually advancing, and innovative science foundation. Adopting and meeting these Guiding Principles is an ongoing effort that will harmonize our endeavors to meet myriad mandates in a more integrated, systematic manner.

This Road Map describes how NOAA Fisheries will translate these Guiding Principles into actionable steps to implement EBFM. The Road Map provides greater detail for each of the Guiding Principles and delineates, in broad terms, what is required to make EBFM operational. This Road Map describes operational EBFM from a national perspective while allowing for flexibility in regional application.

### *1.3 Scope*

The implementation of EBFM must be scalable and flexible with respect to geographic scope and extent. The Road Map recognizes that, because of the many major jurisdictions in the United States for LMR management (Figure 1), management must occur at multiple spatial, temporal, and governance scales. NOAA Fisheries needs communication and coordination with multiple partners to execute EBFM at all these jurisdictional levels.

This Road Map acknowledges the multiple scales at which NOAA Fisheries could be involved to execute EBFM. The components of each Guiding Principle are established to be flexible enough to accommodate varying geographic or governance scales. The primary emphasis and focus of the Road Map is on the regional Fishery Management Councils (FMCs) and the associated Large Marine Ecosystems (LMEs) in each region. This approach capitalizes on NOAA Fisheries' Fisheries Science Centers (FSCs) and Regional Offices (ROs) existing structures and strengths, but also allows for the requisite flexibility to address other jurisdictions that are germane to specific regions and locales.

NOAA Fisheries recognizes that many of these jurisdictions have already made significant progress toward many of the components of the Road Map. With this Road Map, we provide a set of Actions to further support advances in EBFM.

This Road Map recognizes the need for a framework to integrate and synthesize a wide range of information. The Integrated Ecosystem Assessment (IEA<sup>2</sup>) approach is an appropriate and increasingly adopted framework to provide a coherent theme for integrating all the various inputs, products, and efforts requisite for EBFM (Box 1-IEAs). IEAs are an internationally accepted framework for translating marine ecosystem science into a range of management advice. Although able to address multiple ocean-use sectors—and originally intended for the multiple ocean-use, multi-sector Ecosystem-based Management (EBM; Box 2-EBM Levels)—IEAs also serve as a basis for implementing EBFM. There is no need to develop a new framework or process; rather, NOAA Fisheries will adopt the IEA approach to execute the Guiding Principles for achieving EBFM, and insert outputs from the IEA process into existing jurisdictional governance venues.

NOAA Fisheries recognizes that implementing EBFM requires explicit action to advance both science and management considerations. Certainly NOAA Fisheries aims to advance the science capability at its FSCs, but recognizes that it also needs inputs from a wide array of partners to further advance the science necessary to support EBFM. NOAA Fisheries also recognizes that management actions and decisions occur in its ROs/FSCs and in its partner organizations like FMCs, Interstate Fishery Commissions, States, Tribal governments, and others. NOAA Fisheries acknowledges that advances are also needed in management to implement EBFM, and this Road Map identifies supportive actions where LMR management is led by partners external to NOAA Fisheries. This Road Map aims to clarify that actionable steps are recommended in both the science and management contexts.

NOAA Fisheries executes many interrelated efforts to monitor, model, and manage the nation's LMRs and marine ecosystems (Figure 2). NOAA Fisheries has been working toward EBFM for many years, with recognition of the need for ecosystem considerations in the Stock Assessment Improvement Plan (SAIP), the establishment of the Fisheries and the Environment Program (FATE), development of programs for IEA efforts, the Habitat Assessment Improvement Plan (HAIP), a recent NOAA Fisheries National Climate Science Strategy (NCSS), and a Protected Species Improvement Plan (PR-SAIP), among other efforts. NOAA Fisheries recognizes that these efforts are complementary, and that they collectively advance EBFM. This EBFM Road Map calls for increased coordination across the analytical and management efforts in each region to ensure that no major pressures affecting LMRs are omitted, that we apply the correct analytical level of assessment, that cumulative and synergistic system-level effects are not overlooked, and that the frequency of assessments done for LMRs aligns with the broader dynamics of the ecosystem and fishing communities.

## ***2.0 Implementation of EBFM Guiding Principles***

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<sup>2</sup> <https://www.st.nmfs.noaa.gov/ecosystems/iea/index>

NOAA Fisheries views the EBFM Road Map not as an additional requirement for meeting our mandates, but rather as a shift in how it meets them. NOAA Fisheries also recognizes that many of these efforts are already underway. A key point for developing this EBFM Road Map is to leverage these extant efforts and more effectively coordinate among them.

This is an internal NOAA Fisheries document intended to outline a process for our employees, as well as how NOAA Fisheries hopes to work with our partners and stakeholders. NOAA Fisheries recognizes the role that Councils, Commissions, and other critical partners play in shaping priorities, policy, and management approaches for our fisheries with respect to EBFM implementation.

Upon finalization of this document, the afore-mentioned programs will determine whether additional funding will be needed for this important work and develop suitable requests, if necessary. Until these requests have been funded, the action items below will be done where current funding permits. As noted above, trade-off analyses will be an important component of the decision process for deciding on whether funding for existing programs should be reprogrammed to support new efforts contributing to EBFM. NOAA Fisheries is committed to making EBFM a priority via the execution of this Road Map, while remaining committed to address regionally established needs and emphases.

## *2.1 Implement ecosystem-level planning– Guiding Principle 1*

Guiding Principle 1 calls for the use of Fishery Ecosystem Plans (FEPs), or similar documents, to describe and integrate ecosystem goals, objectives, and priorities across multiple fisheries and the effects of various pressures on fisheries within an ecosystem. NOAA Fisheries cannot fully implement EBFM without significant engagement from its partners and interested stakeholders. To implement ecosystem-level planning, Guiding Principle 1 calls for NOAA Fisheries to:

- Facilitate continued participation of external federal, state (including territories), council, commission, tribal, industry, and other non-governmental partners in the EBFM process
- Support and provide guidance or assistance to execute FEPs that are used as umbrella strategic planning documents to guide coordination and trade-off evaluation among Fishery Management Plans (FMPs), related documents, and other ecosystem components.

Such ecosystem-level planning would address long-term ecological, economic, and social goals, objectives, and priorities across NOAA Fisheries' multiple mandates and in partnership with its diverse stakeholders.

### *2.1.1 Develop engagement strategies to facilitate the participation of partners and stakeholders in the EBFM process (Guiding Principle 1a)*

After requesting and receiving stakeholder input, NOAA Fisheries will develop national and regional EBFM engagement strategies to further this initial phase of awareness and engagement on EBFM. This will start with the launch of the Policy and Road Map for public review and comment. NOAA Fisheries will initiate and maintain a national dialogue on EBFM with its partners to ensure that we communicate underlying principles as well as the needs for and benefits from EBFM, while being open to input from those audiences and adjusting its efforts accordingly. Additionally, NOAA Fisheries will build on extant engagement efforts from the IEA program ([Box 3- Engagement](#)), the National Climate Science Strategy and its Regional Action Plans, Fishery Management Council (FMC) visioning processes, regular Council Coordination Committee meetings, NOAA's Aquaculture Policy, and similar efforts that serve as part of the ongoing engagement with partners and stakeholders regarding EBFM. Other engagement approaches will also be necessary, including webinars and other vehicles, to reach beyond the usual set of stakeholders.

Engaging with partners and stakeholders will allow NOAA Fisheries to better identify the management actions required to achieve agreed-upon results, identify those management actions that are not working, and address the management decisions that are currently made with large uncertainty. A useful tool for engagement is the development and use of conceptual models ([Box 3- Engagement](#)), which have helped to promote and support feedback on ecosystem modeling when developing objectives for a region. A transparent venue for all stakeholders to provide input and feedback on EBFM analyses will improve the implementation of EBFM. While FEPs are a good initial source to identify ecosystem-level goals and objectives for FMCs, it is important that multiple stakeholders and jurisdictions (not just FMCs) engage in this process.

### *2.1.2 Support development of Fishery Ecosystem Plans (Guiding Principle 1b)*

Fishery Ecosystem Plans (FEPs) are policy planning documents that the FMCs or NOAA Fisheries may use to describe ecosystem objectives and priorities for fishery science and management, and to inform development of FMPs or FMP amendments ([Box 4-FEPs](#)). FEPs provide fisheries management with ecosystem-scale information on fundamental physical, chemical, biological, and socio-economic structures and functions of LMEs. They are valuable for describing the relationships between LMRs, human uses of those resources, and other human activities that affect LMRs and their habitats. By exploring fishery management options that simultaneously address multiple objectives, they may help the FMCs, NOAA Fisheries, and other agencies better address the cumulative effects of our actions on the environment.

FEPs have already been developed in several FMCs, primarily to explore ecosystem-wide issues under the Magnuson-Stevens Fishery Conservation and Management Act. A recent inventory documents the national progress made in the development of FEPs. Many FMCs are also implementing EBFM through FMPs. To better understand the scale and scope of EBFM activity within our multiple FMC processes, an inventory of best FMC practices for EBFM is needed.

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NOAA Fisheries will build on a recently completed review of FEPs and conduct an inventory and gap analysis of EBFM efforts in FMPs across regions to establish a baseline understanding of existing approaches nationally and to identify areas ripe for further guidance. To a large extent, future FEPs will be designed *inter alia* to identify prioritized information to promote the implementation of EBFM.

### Recommended Actions

EBFM Policy Statement Guiding Principles	#	EBFM Road Map Components	Overarching Goal	Action Items	Timing
<b>Implement Ecosystem Level planning</b>					
	1a	Engagement Strategy	Have EBFM Engagement Strategy for each region	Establish EBFM Point of Contact at each Regional Office, Fisheries Science Center, and Headquarters Offices	Short
		<i>Develop engagement strategies to facilitate the participation of partners and stakeholders in the EBFM process</i>		Develop National and Regional EBFM engagement strategies	Short
				Develop Standardized EBFM Policy and Road Map Materials for widespread use (e.g. NOAA Fisheries personnel, Sea Grant extension agents)	Short
				NOAA Fisheries supports any Ecosystem Plan Development Teams, Ecosystem Committees (or equivalent groups) that FMCs establish	Ongoing
				Explore more detailed facets of all Authorities, Mandates and Governance calling for EBFM, providing any necessary guidance to clarify or augment extant authorities and institutions	Mid
	1b	Fishery Ecosystem Plans	Assist Councils in the development of their FEPs for most of our 12 LMEs	Establish FEP Coordinator/Analyst for each NOAA Fisheries Region and in appropriate Headquarters Office	Short
		<i>Support development of Fishery Ecosystem Plans</i>		Review and develop inventory of existing FEPs and Ecosystem Considerations in FMPs, documenting best practices	Short
				Assist FMCs, as requested, in their development of new, or revision of existing FEPs	Ongoing



## *2.2 Advance our understanding of ecosystem processes– Guiding Principle 2*

Ecosystem-level advice requires ecosystem-level science. Here, ecosystem-level science can be characterized by multidisciplinary information, collaborations and heightened coordination, and a drive to understand processes important to fishery resources. The holistic approach of EBFM recognizes the physical, biological, economic, and social complexities of managing living resources as an integrated system. As NOAA Fisheries moves toward implementation of EBFM, additional information will be required from many disciplines. Implementation of EBFM will result in better awareness of ecosystem status and trends as well as new understanding of the ecosystem processes relevant to fishery resources.

NOAA Fisheries will work to better understand the broader suite of ecosystem processes, drivers, threats, status, and trends of the nation’s marine ecosystems to inform all levels of management advice, including:

- Conduct science to understand ecosystems
- Provide Ecosystem Status Reports for each Large Marine Ecosystem

### *2.2.1 Conduct science to understand ecosystems (Guiding Principle 2a)*

The science programs within NOAA Fisheries are critically important for advancing the understanding of ecosystem processes—as are partnerships with universities, states, tribes, FMCs, other NOAA line offices, and other federal agencies. Modeling the processes, drivers, threats, status, and trends of our ecosystems is not possible without data collection programs to ensure that we have the requisite data to populate those models. As NOAA Fisheries implements EBFM, additional information will be needed from an array of scientific disciplines. A national review of the data collection programs is needed on a wide range of disciplines, including but beyond the typical abundance and basic biological data. For instance, needs that warrant inventory to identify gaps include diet identification and predator-prey interactions for LMR species, lower trophic level data, ecosystem productivity, interactions between protected and other species, habitat data and LMR species’ habitat use, oceanographic data, and climate data.

An important challenge as we implement EBFM is to advance our understanding of processes as we discern the relative importance to fishery resources. NOAA Fisheries will work to better understand a broader suite of ecosystem processes, drivers, and threats, including:

- Measurable biogeochemical, biophysical, and ecological factors, processes, and interactions, such as:
  - Population dynamics and spatiotemporal distributions of LMRs
  - Trophic relationships (including predator-prey relationships and forage fish dynamics)

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- Oceanographic features and other environmental factors (including climate change and ocean acidification)
- Habitat distribution status and predominant threats to ongoing habitat quality, and linking habitat to ecosystem productivity patterns
- Effects of invasive species on ecosystem function
- Social and economic considerations, such as:
  - Social and economic factors that influence fishermen, seafood farmers, and other users of the marine environment
  - Economic welfare and social well-being of resource users and dependent communities
  - Community vulnerability and resilience
  - Non-market and existence values of marine mammals, turtles, seabirds, forage species, corals, and other marine species
  - Seafood production
  - Employment
  - Long-term social and economic impacts of resource depletion and recovery
  - Gear-specific location and intensity of fishing effort
  - Changes in domestic seafood supply and security
  - Changes in recreational fishing opportunities
- Interactions between fisheries, protected species, and habitats

Results of end-to-end research efforts for EBFM enhance our scientific advice. These results complement the stock assessments that are a mainstay of the fishery and protected species management process. Such studies need to cut across scientific disciplines and accelerate the application of ecosystem research results to NOAA Fisheries scientific advice. NOAA Fisheries will evaluate current investments in system-level research, utilize existing mechanisms to support an appropriate balance between traditional stock oriented research and more interdisciplinary end-to-end studies, and develop budget initiatives to bolster this research.

In addition, NMFS proposes to convene a biennial conference dedicated to EBFM research and management. This venue will provide an environment to exchange research results, communicate best practices, and gather experts to address scientific and management challenges to EBFM. The development of a biennial conference will build off of regular and extant FATE, National Habitat Assessment Workshops (NHAW), National Stock Assessment Workshops (NSAW), National Ecosystem Modeling Workshops (NEMoW), and IEA meetings and will elevate NOAA Fisheries science and management needed to implement EBFM.

### *2.2.2 Provide Ecosystem Status Reports for each Large Marine Ecosystem (Guiding Principle 2b)*

Ecosystem Status Reports (ESRs) for specific LMEs will be produced periodically and are intended to provide a brief summary of the status of ecosystem dynamics, including pressures and responses ([Box 5](#)-ESRs). These reports are informational products that

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provide overall system context using the status and trends of leading indicators. Additionally, by identifying data useful for further analytical effort, ESRs can highlight key data gaps and support future technological development and data collection efforts.

Developing and regularly updating ESRs in each region require an efficient process and sufficient resources. ESRs are maturing conceptually and being used by NOAA Fisheries partners, such as by various FMCs within Stock Assessment and Fisheries Evaluation reports. Their use to inform a plethora of other LMR management needs (e.g., bycatch reports, Status of Stocks, stock assessment reviews, status reviews, 5-year ESA and EFH reviews) is not yet fully realized. To implement EBFM, ESRs need to advance in sophistication and diagnostic capability. An effective system for delivering the reports and related advisories will enhance efficiencies in their production time and relevance to stakeholders.

### Recommended Actions

EBFM Policy Statement Guiding Principles	#	EBFM Road Map Core Components	Overarching Goal	Action Items	Timing
<b>Advance our understanding of ecosystem processes</b>					
	2a	Science to Understand Ecosystems	Have robust, innovative, Internationally-recognized science programs to support management	Advance resources to conduct EBFM	Ongoing
		<i>Conduct Science to Understand Ecosystems</i>		Develop National EBFM Performance measures	
				Develop capacity for NOAA Fisheries to conduct end-to-end ecosystem studies	Short
				Conduct biennial EBFM Science & Management Conference	Short
				Develop and maintain core data and information streams	Ongoing
					Ongoing
	2b	Ecosystem Status Reports	Have ESRs for most of our 12 LMEs	Conduct a national review of existing ESRs to assess Fisheries Science Center (FSC) indicator information needs to identify where ESRs address similar indicators across LMEs	Short
		<i>Provide Ecosystem Status Reports for each Large Marine Ecosystem</i>		Establish routine, regular and dynamic reporting of ESRs for each LME	Mid

### *2.3 Prioritize vulnerabilities and risks of ecosystems and their components— Guiding Principle 3*

Resources to manage our nation's LMRs and their ecosystems are finite. NOAA Fisheries and its partners must identify and prioritize which ecosystems, habitats, or LMRs warrant additional attention. Rapid evaluation of key pressures, drivers, and threats is needed to identify and mitigate them, both to rebuild depleted species, produce additional seafood, and to improve resilience of the ecosystems in which they live. Attempting such triage exercises can be daunting, but is warranted to best capture the risks facing the nation's managed species and ecosystems. Building off work and information from the previous two Guiding Principles, prioritization through existing risk and vulnerability analyses will help to focus responses to the ever-changing and increasingly dynamic pressures that managers responsible for marine ecosystem management face.

NOAA Fisheries needs to evaluate and address the individual and cumulative drivers for threats to and pressures on the physical, chemical, biological, social, and economic components of marine ecosystems. This should take into account the comprehensive and systematic risk, vulnerability, and susceptibility of LMRs and ecosystems, including:

- Identify the ecosystem-level, cumulative risk (across LMRs, habitats, ecosystem functions, and associated fisheries communities) in each region and the relative vulnerability to human and natural pressures
- Identify the individual and cumulative pressures that pose the most risk to those vulnerable resources and dependent communities

This starts at an ecosystem level to identify those overarching, common risks across all taxa. Doing so will allow for efficiency of effort, as those major risks can then be explored for individual taxa or habitats, fishery participants, and dependent communities.

#### *2.3.1 Identify ecosystem-level, cumulative risk (across LMRs, habitats, ecosystem functions, and associated fisheries communities) and vulnerability to human and natural pressures (Guiding Principle 3a)*

NOAA Fisheries will conduct comprehensive, ecosystem-level risk assessments. These analyses will allow jurisdictions (i.e., fishery management authorities such as NOAA Fisheries, Councils, Commissions, etc.) to explore multiple pressures and drivers, including climate and other abiotic factors specific to each jurisdiction, to better understand the cumulative effects on the ecosystem and its fisheries. Ideally, this initial suite of products would be developed and evaluated at an ecosystem-level. The analyses help prioritize the management and scientific needs in each region. Taking a systemic, or aggregate approach, helps to identify overarching, common risks across all habitats, taxa, ecosystem functions ([Box 6](#) -Agg Risk), fishery participants and dependent communities. It also helps to capture the potential cumulative or synergistic effects of multiple pressures.

*2.3.2 Identify the individual and cumulative pressures that pose the most risk to vulnerable resources and dependent communities (Guiding Principle 3b)*

Risk assessments need to be conducted to evaluate the vulnerability of the 800+ US managed and non-managed LMR species with respect to their exposure and sensitivity to ecological and environmental factors affecting their populations. Habitat risk assessments are also needed to identify those species that are habitat-limited and locales that will be most stressed by human activities and changes in oceanographic conditions and that are most important for conservation. These assessments will be useful in prioritizing which of the LMRs and habitats need to be examined in more detail or more frequently, or where conservation actions are most needed, and for which LMRs routine (even trend or survey data) updates are adequate. Although they must be comprehensive in scope, risk assessment methods can use a wide range of readily available qualitative and ordinal data, to rapidly and systematically assess those factors that affect managed species or habitats. An example of an existing rapid risk assessment tool is the Productivity and Susceptibility Analysis (PSA). Another example is the fisheries Climate Vulnerability Assessment, first implemented in the Northeast region and now planned for other regions as part of the NMFS Climate Science Strategy (NCSS). Habitat assessment prioritization processes have been completed in three NOAA Fisheries regions. Additionally, a comprehensive stock assessment prioritization effort is ongoing ([Box 7](#)- SA Priority). Programmatic analyses that will satisfy the requirements of the National Environmental Policy Act (NEPA) need to be conducted to plan for major projects such as aquaculture production in federal waters (for regions where offshore aquaculture is most likely to occur) or coastal and offshore development and infrastructure. The overall outcome of these risk assessments is to identify the LMRs and habitats for which broader ecosystem considerations are highest priority.

Fisheries communities are also at risk as LMR dynamics change in response to a range of human and natural factors. Risk assessment of fleets, ports, and related communities is warranted as those human elements of the ecosystem will need to adapt to changing ecosystem and management conditions, and face related economic and social consequences.

Recommended Actions

EBFM Policy Statement Guiding Principles	#	EBFM Road Map Core Components	Overarching Goal	Action Items	Timing
<b>Prioritize vulnerabilities and risks</b>					
	3a	Ecosystem-level Risk assessment	Evaluate majority of main risks, including Climate Change, for most of our 12 LMEs	Conduct Systematic Risk Assessments for relevant NOAA regional ecosystems	Long
		<i>Conduct comprehensive ecosystem-level risk assessment</i>		Explore protocols for conducting regional habitat risk assessments for those areas known to serve important ecological functions for multiple species groups or will be especially vulnerable or important in the face of climate change	Mid
				Ensure more integrated, systematic risk assessments are used to coordinate regional NEPA analyses	Long
	3b	Managed species, Habitats & Communities Risk Assessment	Evaluate risks for all of our managed species	Ensure that factors which impact 800+ US managed species are being considered	Ongoing
		<i>Conduct risk assessment for each of NOAA Fisheries' Managed Species, Habitats and Fishing Communities</i>		Conduct Habitat Assessment Prioritization for all NOAA Fisheries regions	Mid
				Conduct Fishing Community vulnerability assessments for all NOAA Fisheries regions	Short

2.4 Explore and address trade-offs within an ecosystem— Guiding Principle 4

Once priorities have been established following the risk and vulnerability assessments, trade-offs need to be evaluated within and between activities and components in the associated systems, including those related to alternate management strategies and evaluation of potential impacts. In close cooperation with its partners, NOAA Fisheries supports the consideration of and efforts to take into account various trade-offs when considering the independent and the cumulative effects of natural and human pressures on the ecosystem, including:

- Analyze trade-offs to optimize total benefits from all fisheries within each ecosystem or jurisdiction. This will be done by taking into account regional socio-

- economic considerations and ecosystem-specific policy goals and objectives (e.g., MSA, MMPA, ESA, National Aquaculture Act, etc.) that may apply
- Develop management strategy evaluation capabilities to better conduct ecosystem-level analyses that provide ecosystem-wide management advice

NOAA Fisheries recommends using management strategy evaluations (MSEs) to explore trade-offs among the objectives identified in Guiding Principle 1 above, and remaining cognizant of the statutory obligations under the ESA, NEPA, MMPA, National Aquaculture Act, MSA, et seq. as noted in the EBFM Policy. These need to be contrasted with ecosystem-level reference points and benchmarks, so that cumulative impacts or specific objectives are not overlooked.

*2.4.1 Analyze trade-offs for optimizing benefits from all fisheries within each ecosystem or jurisdiction, taking into account ecosystem-specific policy goals and objectives, cognizant that ecosystems are composed of interconnected components (Guiding Principle 4a)*

NOAA Fisheries needs to establish sufficient EBFM modeling capacity to analyze trade-offs. Before establishing reference points against which objectives can be measured, and before establishing MSE protocols and processes, the quantitative basis for exploring ecosystem dynamics is required. While NOAA Fisheries has some existing capacity, it still needs to bolster this capability, including both complex and simple models and tools. Fully coupled, end-to-end models capturing the entire Earth-system, physical, chemical, geological, biological, and socio-economic facets of ecosystem dynamics are not always possible or necessary in every locale. Other models of intermediate complexity also can be used and should be developed. However, a suite of data-poor tools, techniques, and models exists to begin modeling for EBFM practically everywhere. Development of an EBFM analytical toolbox is needed, particularly one that includes ecosystem modeling tools and best practices; data-poor qualitative and semi-quantitative tools; and related decision support tools. This toolbox would be used in conjunction with Fisheries and Protected Species toolboxes and in conjunction with risk assessment tools. NOAA Fisheries needs to bolster its ecosystem modeling capacity and harmonize its ecosystem modeling efforts with its fish assessment and protected species modeling efforts. Comparisons across multiple models are ongoing, but expansion of multi-model inference is prudent.

*2.4.2 Develop Management Strategy Evaluation capabilities to better conduct ecosystem-level analyses to provide ecosystem-wide management advice (Guiding Principle 4b)*

Assessing and appropriately accounting for uncertainty when making management decisions for LMRs is critical. MSEs allow jurisdictions to test management options under various ecological and environmental conditions. As such MSEs are an important tool to help develop robust management alternatives in the face of difficult conditions. A wide range of simulations using MSEs will help determine which management options will most likely accomplish desirable outcomes and are most robust to accommodate a range of considerations. MSEs help evaluate trade-offs among different management scenarios and can highlight key gaps in data and understanding of ecosystem processes

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and human impacts. Executing MSEs at the ecosystem level can capture major drivers, pressures, and responses, as well as emergent properties that would be missed if explored on a taxa-by-taxa basis. NOAA Fisheries will ensure that Ecosystem MSEs link to multispecies and single species MSEs, inclusive of economic, socio-cultural, and habitat conservation measures.

Innovative means for visualizing complex MSE and model output also are needed. The use of social media, interactive graphics, and engaging storytelling has become commonplace and is now almost expected. Typically we present model results in complex, static graphic format. As technologies and tools continue to develop, the ability to more interactively allow stakeholders to “play” possible fishing, aquaculture, mitigation, or other management scenarios not only seems warranted, but better captures the truest sense of partnership when making multi-objective decisions.

### Recommended Actions<sup>3</sup>

EBFM Policy Statement Guiding Principles	#	EBFM Road Map Core Components	Overarching Goal	Action Items	Timing
<b>Explore and address trade-offs within an ecosystem</b>					
	4a	Modeling Capacity	Have sufficient analytical capacity to evaluate a full range of tradeoffs	Assess and bolster ecosystem and LMR modeling needs in each FSC	Ongoing
		<i>Establish sufficient EBFM modelling capacity to analyze trade-offs</i>		Encourage and expand the use of multi-model inference	Ongoing
				Establish suitable review venues and deliberative bodies for ecosystem models and associated information in each FSC region	Mid
	4b	Management Strategy Evaluations	Have MSEs that cover most our 12 LMEs and Fisheries	Develop functional system-level MSEs	Mid
		<i>Developing Management Strategy Evaluation Capabilities</i>		Explore novel Harvest Control Rules (HCRs) and develop associated guidelines, especially to test & explore robust Ecosystem Level strategies	Long
				Create "X-prize" like competition for visualizing and communicating complex ecosystem model and MSE outputs	Long

<sup>3</sup> In conjunction with NGS/SAIP and from SA Program reviews, each FSC to get one FTE for conducting MSEs as operating models. This increase in MSE capacity will augment this EBFM effort in coming years.



## *2.5 Incorporate ecosystem considerations into management advice – Guiding Principle 5*

The EBFM Policy notes that implementing EBFM will assist the agency in better meeting its mandates to sustainably manage the nation’s trust LMRs and maintain resilient ecosystems. NOAA Fisheries recognizes the value of placing its resource management efforts into a broader ecosystem context. LMR management should consider best available ecosystem science in decision-making processes (within our legal and policy frameworks), in order to:

- Develop and monitor ecosystem-level reference points
- Incorporate ecosystem considerations into appropriate LMR assessments, control rules, and management decisions
- Provide integrated advice for other management considerations, particularly applied across multiple species within an ecosystem

Implementation of this principle will focus on three areas. First, NOAA Fisheries will clarify the concept of ecosystem-level reference points and how they could be used in the context of already required species or fisheries reference points. This will require close coordination among FSC, RO, FMC, States, and other key stakeholders. Second, NOAA Fisheries has already begun work to incorporate ecosystem information into species and stock assessments used to implement statutorily required reference points. NOAA will continue to advance that work. Third, NOAA has several mandates that are not reference point-driven but whose implementation could either contribute information about ecosystem status or could be bolstered with additional ecosystem information. This includes requirements to minimize bycatch and impacts to habitat as practicable. It also includes the well-being of coastal communities and participating persons in the fisheries. Fourth, NOAA Fisheries will use ecosystem information in regional studies of federal waters where offshore aquaculture operations (e.g. for use in NEPA analyses) are likely to occur and in studies of ecosystem carrying capacity important to seafood farming in coastal areas.

Evaluating cumulative impacts of proposed management actions for LMRs and their ecosystems and identifying alternative actions that achieve societal goals will further inform EBFM decisions. Cumulative and synergistic impacts are difficult to identify on a species-by-species basis, and systemic analyses will help to identify any such impacts. The NEPA process will be utilized to better evaluate these cross-cutting potential impacts. In conjunction with results of systemic risk assessments (sect. 2.3.1), these analyses will help delineate those facets that result in the most pressure or largest constraints for achieving desired stock, seafood production, and ecosystem status.

### *2.5.1 Develop and monitor Ecosystem-Level Reference Points (Guiding Principle 5a)*

Ecosystem-level reference points (ELRPs) and thresholds can inform the use of statutorily required reference points. These reference points could help to identify key dynamics, emergent ecosystem properties, or major ecosystem-wide issues that impact

multiple species, stocks, and fisheries over the long term that could be missed if decision criteria were developed and examined only on a species-by-species basis. These ecosystem or aggregate level decision criteria will also be used to track major structural or systemic issues that impact all LMRs. A number of options for developing and using ELRPs could be applicable under different scenarios, including measures of aggregate or system level yield. Evaluation of simple summations of LMR reference points in the context of total ecosystem productivity can aid in evaluating overall fisheries performance in an ecosystem.

*2.5.2 Incorporate ecosystem considerations into appropriate LMR assessments, control rules, and management decisions (Guiding Principle 5b)*

NOAA Fisheries uses a variety of reference points to manage fisheries. Reference points that incorporate ecosystem considerations may be helpful in the management of at least some fisheries or species in the near term, and all fisheries in the long term. These considerations may include factors impacting stock structure, dynamics, and production that are considered important for those LMRs, particularly as identified by risk assessments (c.f. Section 2.3.2) for stocks which have been identified as imperative to account for ecosystem considerations factors ([Box 9](#)-Incl. ecosystem info). NOAA Fisheries is clear that incorporating ecosystem considerations may not be necessary or feasible for all 800+ US managed species, but it will be increasingly worth monitoring for those species identified in such risk assessments, particularly in the context of a changing climate (as in conjunction with the NCSS). Ecosystem factors may be incorporated directly into parameters in stock assessment calculations, considered in stock assessment plan team reviews of actions, or accounted for when setting harvest control rules (HCR; [Box 10](#)-MS HCR), or even reviewed by FMCs' Scientific and Statistical Committees (SSCs). Ecosystem considerations for these LMRs will provide a more comprehensive understanding of the uncertainty associated with estimating biological reference points, and stock status that lead to management advice.

*2.5.3 Provide systematic advice for other management considerations, particularly applied across multiple species within an ecosystem (Guiding Principle 5c)*

Ending and preventing overfishing and rebuilding overfished stocks are required under the MSA, and the ESA and MMPA have requirements pertaining to the conservation and recovery of protected species. There are also other required management considerations that would benefit from coordination across all taxa in an ecosystem.

NOAA Fisheries is required under the MSA to identify and describe essential fish habitat (EFH) for managed species and under the ESA to designate critical habitat for endangered species. In conjunction with the NOAA Habitat Blueprint, NOAA Fisheries Habitat Assessment Improvement Plan (HAIP), and regional habitat assessment prioritization processes within the next ten years NOAA Fisheries will support each FMC in considering EFH at a system level by 1) updating EFH information in FMPs or FEPs (NOAA Fisheries recommends that EFH information be reviewed every five years), 2) identifying habitat areas of particular concern that are known to support important ecological functions for multiple species or species groups or may be especially

vulnerable or provide essential functions in a changing climate, and 3) establishing habitat conservation objectives for those areas and indicators to measure progress in achieving those objectives.

NOAA Fisheries is required under MSA, to the extent practicable, to minimize bycatch of fish, and, to the extent bycatch cannot be avoided, minimize the mortality of bycatch (16 U.S.C. §1851(a)(9))<sup>4</sup>. In conjunction with the NOAA Fisheries Bycatch Reduction Strategy, NOAA Fisheries will integrate bycatch-related efforts with the EBFM Policy and this Road Map. NOAA Fisheries will also take into account Take Reduction Plans under the MMPA. Information resulting from work to implement the Bycatch Reduction Strategy will contribute to NOAA Fisheries' implementation of the EBFM policy.

NOAA Fisheries assists in the development of aquaculture under the National Aquaculture Act, which calls for increasing U.S. seafood production, and directly permits aquaculture in federal waters for species regulated under MSA or covered by an aquaculture FMP. The agency consults with federal permitting agencies under ESA and MSA essential fish habitat provisions for aquaculture activities in both state and federal waters, and develops and uses aquaculture techniques in the restoration of species and habitats. Under both NEPA and the National Aquaculture Act, NOAA Fisheries will evaluate the ecosystem-level effects of aquaculture.

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<sup>4</sup> Fish are defined under the MSA as finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds, and would include deep-sea corals and sponges (16 U.S.C. §1802(12)).

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### Recommended Actions<sup>5</sup>

EBFM Policy Statement	#	EBFM Road Map Core Components	Overarching Goal	Action Items	Timing
<b>Incorporate Ecosystem Considerations into Management Advice</b>					
	5a	Ecosystem-level reference points	Establish and use Ecosystem Level Reference Points	Explore best practices for estimating and using system-wide or aggregate group harvest limits, in context of OY, Annual Catch Limits (ACL), and Harvest Control Rules (HCR)	Mid
		<i>Develop and Monitor Ecosystem-Level Reference Points</i>			Short
				Explore best measures of cross-pressure, cumulative impacts in an ecosystem (in conjunction with Section 2.3.)	Short-Mid
				Develop Ecosystem-level reference points and Thresholds	Mid
	5b	Ecosystem considerations for LMRs	Appropriately include ecosystem-factors in crafting advice for managed species	Develop and track fishery stock status indices that denote when ecosystem considerations are used	Mid
		<i>Incorporate Ecosystem Considerations into Appropriate LMR Assessments, Control Rules, and Management Decisions</i>			
	5c	Integrated Advice for other Management Considerations	Systematically evaluate advice provided	Explore protocols for considering ecosystem-level information in EFH reviews, identifying ecosystem-level habitat areas of particular concern, and setting habitat conservation objectives and/or indicators	Short
		<i>Provide Systematic Advice for other Management Considerations, particularly Applied Across Multiple Species within an Ecosystem</i>		Finalize National Bycatch Reduction Strategy	Short
				Evaluate the ecosystem effects of offshore aquaculture	Long
				Review long-term protected species recovery and rebuilding plans to ensure they account for the potential effects of near-term and long-term climate change, particularly relating to alterations to food web structure	Long

<sup>5</sup>In conjunction with NGS & SAIP update, NCSS, and HAIP



## *2.6 Maintain resilient ecosystems— Guiding Principle 6*

NOAA Fisheries recognizes that its mandates are intended to sustain resilient and productive LMR populations and habitats, maintain overall ecosystem structure and function, and support the contributions that fisheries make to the socio-economic resiliency of coastal communities. Implementation of EBFM will require NOAA Fisheries to develop operating protocols that maintain resilient ecosystems. Actions in support of these mandates include:

- Evaluate ecosystem-level measures of resilience to maintain core ecosystem structure, biodiversity, production, energy flow, and functioning
- Evaluate coastal fishing community well-being

### *2.6.1 Evaluate ecosystem-level measures of resilience (Guiding Principle 6a)*

Ultimately, humans are part of marine ecosystems and human communities need the ecosystem goods and services provided by the nation's managed species and functioning marine ecosystem. Maintaining and monitoring the status of marine ecosystems, as well as supporting the coastal communities that rely on them, are critical for evaluating the success of EBFM. To this end, NOAA Fisheries will track those ecosystem-level reference points that can be used as measures of ecosystem-level resilience.

### *2.6.2 Evaluate community well-being (Guiding Principle 6b)*

NOAA Fisheries is required, consistent with the conservation requirements of the MSA, to take into account the importance of fishery resources to fishing communities by using the best available social and economic data, in order to provide for the sustained participation of such communities and, to the extent practicable, mitigate adverse economic impacts on such communities (16 U.S.C. §1851(a)(8)). NOAA Fisheries will also track those ecosystem-level reference points that can be used as measures of community well-being.

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### Recommended Actions

EBFM Policy Statement Guiding Principles	#	EBFM Road Map Core Components	Overarching Goal	Action Items	Timing
<b>Maintain Resilient Ecosystems</b>					
	6a	Evaluate Resilience	Develop and achieve ecosystem performance measures	Track Ecosystem-level reference point to assess changes in ecosystem-level resilience	Ongoing
		<i>Evaluate Ecosystem-Level Measures of Resilience</i>		Track and conduct valuation of Ecosystem Goods and Services relative to benchmarks	Long
	6b	Community Well-being	Maintain well-being of coastal communities	Track community health socio-economic metrics	Medium-Ongoing
		<i>Evaluate Community Well-being</i>		Establish National EBFM Coordinator	Immediate

### ***3.0 Execution of the EBFM Road Map and Effective Dates***

The elements of the EBFM Policy and EBFM Road Map afford the opportunity to improve how we manage our nation's living marine resources. Actions noted herein have longer-term timelines built into them that can help track progress toward EBFM implementation. NOAA Fisheries will review and amend this guidance on a five-year basis. Road Map implementation will start one month after the final clearance date of the Road Map. This Road Map will provide the metrics by which Agency progress is evaluated.

This Road Map includes recommended actions to guide NOAA Fisheries as it implements EBFM. These require active management. Some of the recommended actions are on-going and will continue. Some of the recommended actions constitute new activities, where existing or new resources would have to be allocated to accomplish the actions. Close cooperation among the FSC, RO, FMCs, Tribes and States will be required to complete the trade-off analyses needed to inform NOAA Fisheries decision makers. This Road Map will help direct the activities of NOAA Fisheries staff at a large number of offices and laboratories. For successful implementation, the connection between the actions recommended herein and the many laboratories, divisions, and branches of NOAA Fisheries is critical, as well as connections among NOAA Fisheries and key stakeholders

Within each Financial Management Center within NOAA Fisheries over the next one to two years, NOAA Fisheries Leadership will begin to develop a specific set of milestones to address EBFM elements in this Road Map. As part of regular strategic planning and annual planning processes, these milestones will be prioritized. Implementation of EBFM activities will therefore be an integral part of the annual allocation of appropriated funding for each region. Within fifteen months of the release of this Road Map, each NOAA Fisheries region, using the development of their regional engagement strategies (section 2.1) as an organizing theme, will combine ongoing facets of NCCS Regional Action Plans, NGS Stock Assessment Priorities, HAIP Habitat Prioritization, and specific systematic EBFM elements noted herein, into a regional EBFM implementation plan with specific milestones.

As noted earlier, NOAA Fisheries will convene a biennial meeting regarding EBFM. Participants will include staff representing the NOAA Fisheries science and regulatory enterprises. The primary focus of this meeting will be to review progress in implementing EBFM in NOAA Fisheries and exchange best practices for doing so. The metrics identified in this Road Map will form the basis for this evaluation.

Once the Road Map is finalized, a protocol for providing national oversight among the FSCs, ROs, and Headquarters will be developed and implemented. Oversight for EBFM implementation will be based on best practices developed nationally and the principles codified in this document. Annual updates will provide an evaluation of EBFM progress. This coordination of efforts to implement EBFM will provide an agency-level



understanding of progress toward these goals; to facilitate this, a national EBFM coordinator will be established, along with POCs in each FSC, RO, and HQ office. The application of best practices, identified during the annual updates and the biennial meetings, should provide for an efficient and effective way for NOAA Fisheries to improve on its stewardship responsibility for its trust resources. This will be an evolutionary process, where progress will be based on previous accomplishments. EBFM is only achievable with broad support, yet NOAA Fisheries and its many partners will benefit from implementing EBFM as described in this Road Map.

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Figure 1. The location of Regional Offices (RO), Fishery Science Centers (FSC), Fishery Management Councils (FMCs; Northeast, Mid Atlantic, South Atlantic, Caribbean, Gulf of Mexico, Pacific, North Pacific, West Pacific), Interstate Fisheries Commissions (SFCs; Atlantic, Pacific, Gulf; Great Lakes not noted), Large Marine Ecosystems (LMEs; Beaufort, Chukchi, Eastern Bering Sea, Aleutian Archipelago, Gulf of Alaska, California Current, Insular Pacific/Hawaiian, Gulf of Mexico, SEUS, NEUS, Caribbean, Antarctic – not shown), and the US Economic Exclusive Zone (EEZ) for which NOAA Fisheries and its partners have jurisdiction and are mandated to manage LMRs and marine ecosystems. The Antarctic (CCAMLR), Arctic, and regional fishery management organizations (RFMOs; i.e. CCAS, IPHC, IWC, ICCAT, NASCO, NAFO, WECAFC, ITTAC, PSC, NPAFC, WCPFC, AIDCP, IOTC, IOSEA, IAC, ACAP, CBD, CITES, UNFSA, COFI), often associated with the high seas, are not denoted. Nor are the Science Review Groups (SRGs) for marine mammals (Pacific, Atlantic, Gulf).

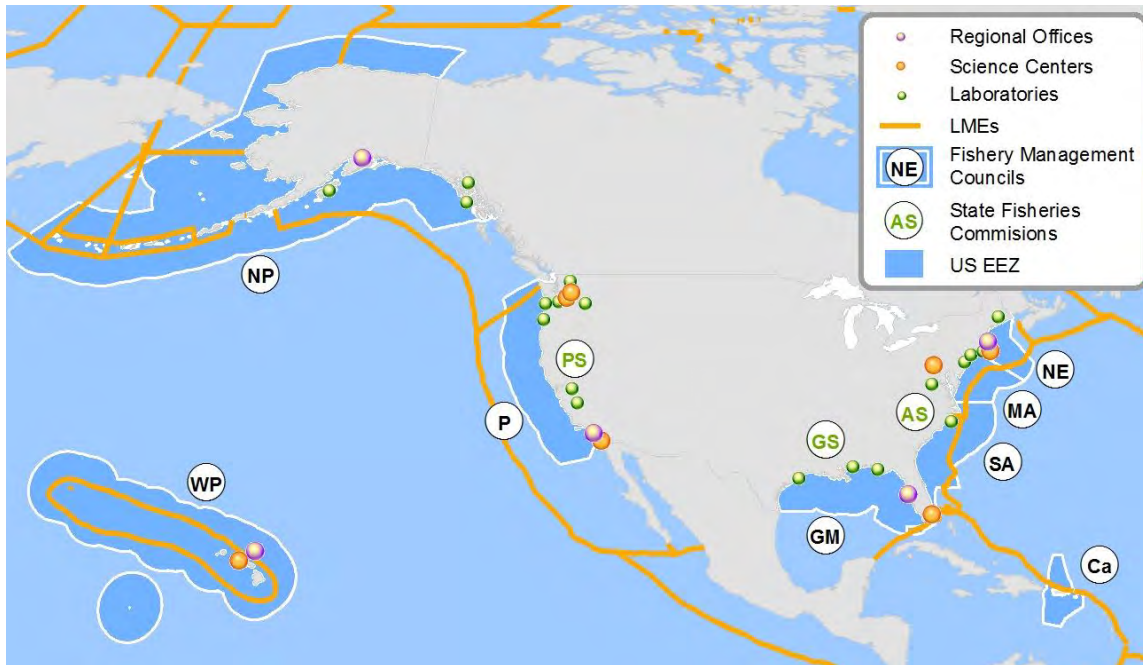
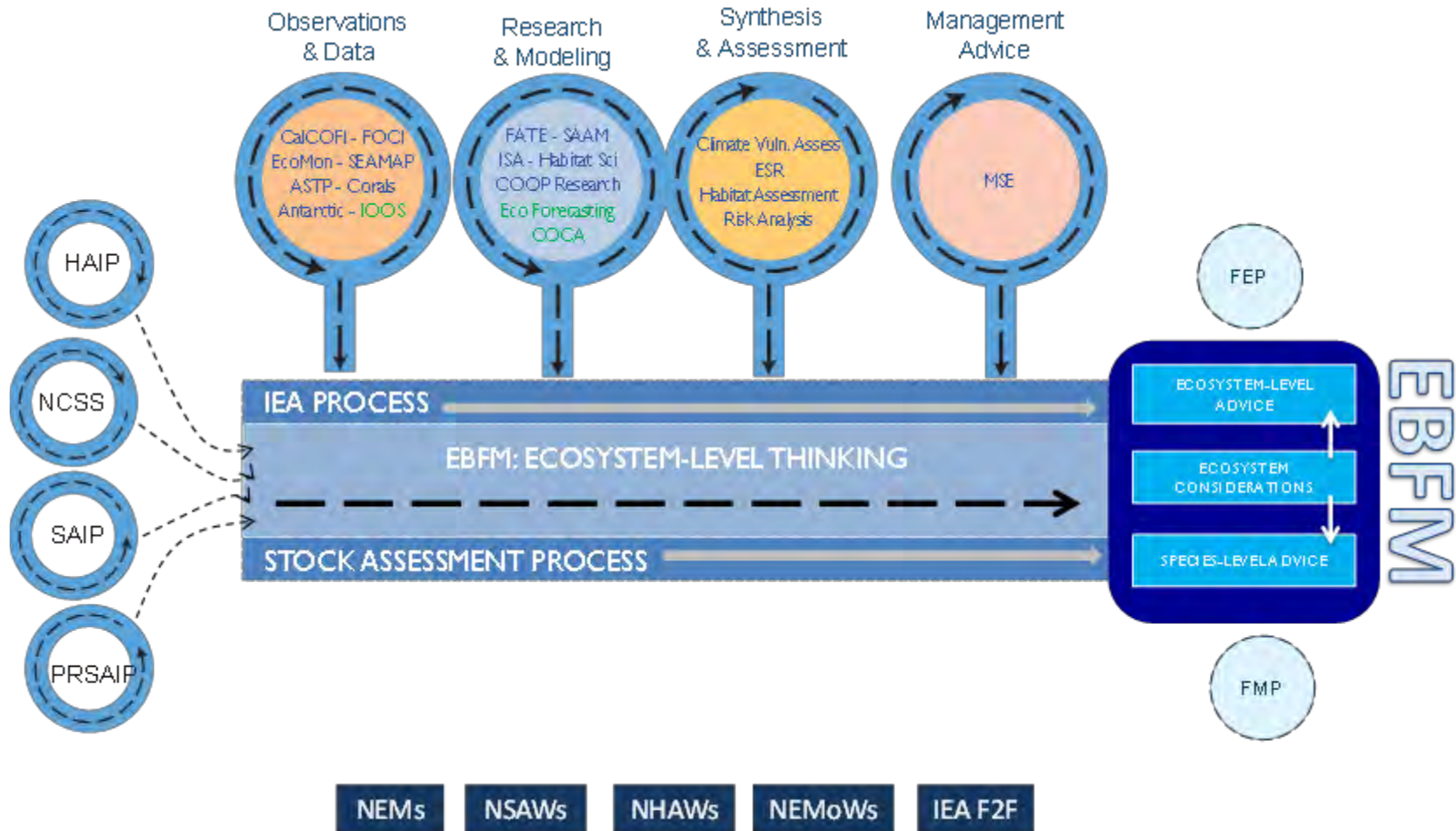
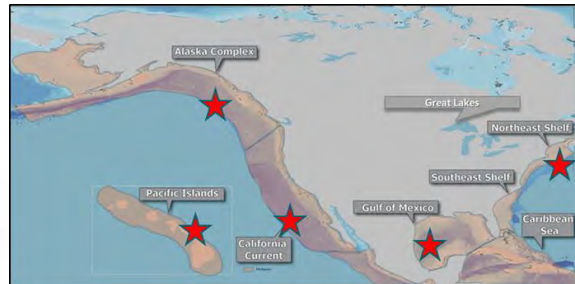


Figure 2. Inter-relationships among NOAA Fisheries programs and plans that support EBFM. See list of acronyms in the back for definitions.



**Box 1. NOAA's Integrated Ecosystem Assessment (IEA) Program: An analytical framework to deliver management advice in an ecosystem context**



NOAA's Integrated Ecosystem Assessment (IEA) program is an end-to-end framework that enables the implementation of EBM, including EBFM, to provide resource managers with ecosystem-specific information to make more informed and effective management decisions. While IEAs are designed to enable full multisector EBM, they support needs along the ecosystem management continuum by providing an ecosystem context to traditional single-sector decisions, such as fisheries management.

NOAA's IEA is a science-based stepwise process implemented with stakeholders and managers to identify priority issues and provide robust decision-support information in an ecosystem context. The approach identifies socio-economic and biophysical attributes that maintain ecosystem structure and function, assesses human activities and their interdependence with the natural ecosystem, and evaluates trade-offs of management alternatives to sustain human well-being in the coupled social-ecological system.

Though IEAs share a common national framework, the implementation varies regionally based on the ecosystem of interest and the management drivers. The overarching goal is to inform decisions that will promote ecosystems that are both sustainable and capable of providing the diverse ecosystem services upon which our society depends.

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***Box 2—Levels of EBM***

“Ecosystem management” can be adopted at multiple levels. Some levels of application are focused solely on fish stocks, some focus on fish stocks but with ecosystem considerations incorporated (ecosystem approach to fisheries management, EAFM), some focus solely on the fisheries sector but for the full system of fisheries and stocks (EBFM), and others focus on the full set of ocean-use sectors impacted by and impacting the fisheries sector (EBM). For example, consider forage stocks such as small pelagic fish. For an EAFM, one would need to consider the effects of environmental factors (e.g., temperature changes or North Atlantic Oscillation events) and ecological factors (e.g., predator removals or models of multispecies interactions) in addition to targeted fisheries removals to truly grasp what is driving the population dynamics of such stocks. Using the same type of focal species as an example, for EBFM that takes a system focus in the fisheries sector, one would have to consider not only the impacts of other factors on these forage stocks, but also the dynamics of these forage stocks on other parts of the ecosystem. For instance, some seabirds and marine mammals have some form of protected or conservation status and are highly dependent on small pelagic forage fish. Some commercially targeted groundfish are also major predators of these small pelagic forage fish. In addition, multiple fisheries operate on both the groundfish and the small pelagic species. In such a case, clearly a more integrated, “bigger picture” evaluation of the whole system and how it fits together is needed to address the potential trade-offs among the different uses of and impacts to these forage stocks. Further, if these forage stocks represent a key pathway of energy from lower trophic levels to upper trophic levels (which they typically do), then the resilience, structure, and functioning of the system would need to be evaluated. For an EBM that covers all ocean-use sectors, consideration of these small pelagics and their role in the ecosystem is warranted in a broader context for anthropogenic drivers such as power plant discharges (thermal impacts), eutrophication, toxin deposition, hydroelectric energy generation, dredging for navigation safety, and similar uses that might impact the habitats of these species.

Certainly the lines among the different levels are somewhat blurry, but defining the level of analysis and management being done helps to dispel concerns associated with linguistic uncertainty for such a comprehensive topic.

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**Box 2—Levels of EBM**

Levels	Scientific Advice	Management Framework
<p><b>EBM</b> Ecosystem Based Management</p>	 <p>Fisheries    Development    Energy    Eco Tourism    Oil &amp; Gas</p> <p>Conservation    Marine    Sanctuaries    Aquaculture    Etc</p>	 <p>Regional Ocean Plans</p>
<p><b>EBFM</b> Ecosystem Based Fisheries Management</p>	 <p>Fisheries    Climate    Habitat    Predator</p>	 <p>Fisheries Ecosystem Plan</p>
<p><b>EAFM</b> Ecosystem Approach to Fisheries Management</p>	 <p>Fisheries    Climate    Habitat    Predator</p>	 <p>Fishery Management Plan</p>
<p><b>SS</b> Single Species</p>		 <p>Fishery Management Plan</p>



**Box 3. Conceptual models guide science and provide for stakeholder engagement in support of EBFM in the California Current**

NOAA’s Integrated Ecosystem Assessment (IEA) program is developing *conceptual models* that distill marine ecosystems down to their essential elements. Conceptual models convey the intricacy of an ecosystem’s structure and function in a way that facilitates further discussion of priorities, objectives, and trade-offs without miring viewers in excessive detail. These models are developed in conjunction with NOAA Fisheries partners and stakeholders to assist in identifying the most pressing issues in any given region.

The California Current IEA team has developed a series of conceptual models to illustrate the key relationships between focal species groups and physical drivers, habitats, other species, human activities, and human well-being. These elegant models were derived through extensive, consensus-based discussions with a range of stakeholders, and are readily adaptable as new information becomes available. Models exist for target species (coastal pelagic species, salmon, and groundfish) and protected species (seabirds and marine mammals); new models are being developed for major habitat types, and for the diverse human-natural interactions that characterize the socio-ecological nature of the California Current.

These conceptual models have already proven their value as communication tools. The California Current IEA team uses them in discussions with the Pacific Fishery Management Council and other groups. Each symbol and line represents indicators that the IEA team is analyzing to track ecosystem status and management effectiveness. These models thus set the stage for more detailed discussions, and IEA scientists are using mathematical approaches to convert them from simple illustrations into dynamic simulation models.

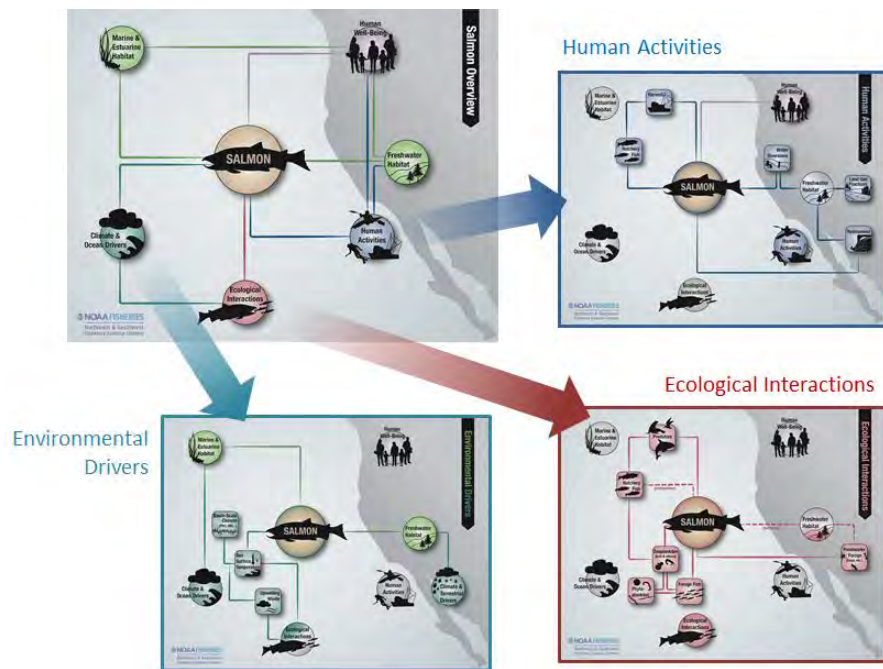


Figure. Conceptual model of the roles of Pacific salmon in the California Current Ecosystem. The general summary model (upper left) expands to detailed submodels of interactions between the focal species and environmental, ecological, and human components. (Illustrations: Su Kim, NOAA)

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**Box 4. Description of FEPs and general use**

Ten Fishery Ecosystem Plans (FEPs) are currently being used by four Fishery Management Councils (North Pacific, Pacific, Western Pacific, and South Atlantic). Each FEP covers similar ideas and principles, and varies depending on the needs of a specific Council and the fisheries and ecosystems under their jurisdiction. For example, the Pacific Council has set up their FEP to create a framework for setting policies and priorities to be implemented through Fishery Management Plan (FMP) amendments and for tracking progress through a set of indicators. In some cases, the FEPs are compilations of ecosystem information with a strong focus on habitat that support implementation of MSA essential fish habitat. Others, such as the Aleutian Islands FEP, are primarily reference documents of ecosystem information to facilitate efficient implementation through FMPs. The Western Pacific Council FEPs contain conservation and management measures and meet the requirements of FMPs, but reflect groupings of managed stocks around geographically defined island/archipelago areas and are called FEPs. Most of the Councils also supplement their FEPs with additional documents such as ecosystem chapters of Stock Assessment and Fishery Evaluation reports, stock assessments, and FMP amendments. Using supplemental documents has made it easier for some of the Councils to update crucial ecosystem-related information without having to update an entire FEP.

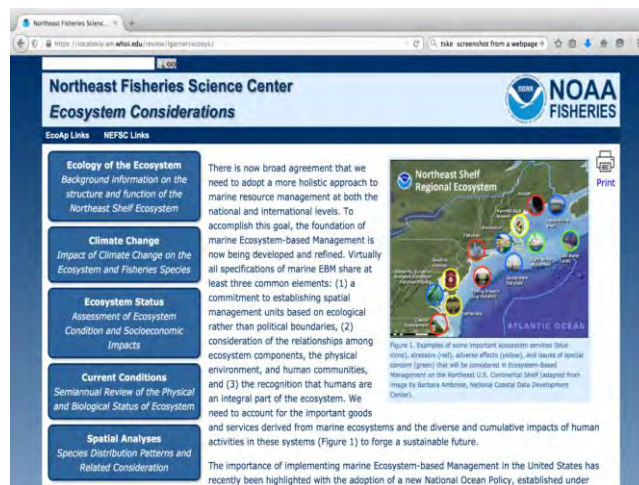


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**Box 5. Ecosystem Status Reports**

Ecosystem Status Reports (ESRs) are a key element of the NOAA Fisheries EBFM Road Map. These regularly updated reports provide a vehicle for disseminating information on the state of regional ecosystems. They describe the dynamic interplay of natural and anthropogenic drivers and resulting changes in different parts of the ecosystem. These status reports are intended to concisely convey to stakeholders, managers, and the general public how marine ecosystems are responding to different stressors and to natural environmental change. By monitoring the pulse of ecosystem change, we hope to identify early warning signals of changes within systems. NOAA’s IEA Program plays a critical role in synthesising ecosystem information and capturing it in ESRs for each region. The main findings are translated to management partners, including to Regional Fishery Management Councils and Interstate Fishery Commissions throughout the nation to help guide management actions, particularly to consider the system as a whole and not just its parts.

An example is the current Northeast Region ESR, an entirely web-based product that can be viewed on a number of devices (including smartphones and tablets) through its use of Responsive Design technology (c.f. <http://www.nefsc.noaa.gov/ecosys/>). The New England Fishery Management Council has requested annual spring updates based on a distillation of the ESR in the form of a brief State of the Ecosystem Report to help provide an ecosystem context for its deliberations. Similar applications are now underway in other parts of the country (<http://www.noaa.gov/iea/transfer-knowledge/science-supporting-ecosystem-status.html>).

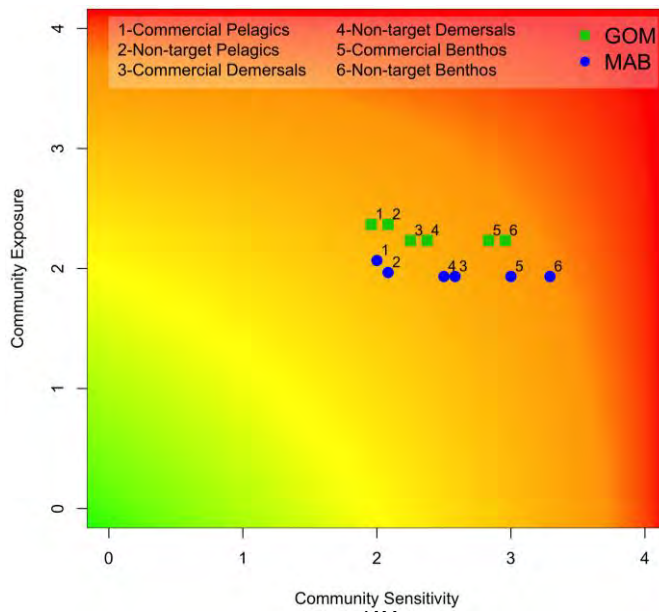


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**Box 6. Aggregate Risk Assessment**

Risk assessment methods are used worldwide to evaluate potential threats to living marine resources, and to prioritize management of these threats. For example, a semi-quantitative risk analysis for aggregate fish communities in the Northeast United States was used to identify priorities for further detailed assessment (Gaichas *et al.*, 2015). A place-based, functional group approach was taken to provide information on threats for comprehensive categories of regional fishery resources, rather than attempting to do so for individual species. In this example, climate-driven risks were the focus of the risk assessment because some of the largest observed rates of sea surface temperature increase within U.S. marine ecosystems are on the northeast U.S. continental shelf. Climate vulnerability across two ecosystems (the Gulf of Maine (GOM) and Mid-Atlantic bight (MAB)) was evaluated for six communities (both commercial and non-commercial demersal fish, pelagic fish, and benthic invertebrates, respectively). First, the probability that anticipated effects of climate change (e.g., warming water, decreased salinity, increased acidity, and altered boundary currents) would occur in these regions was evaluated, and the potential severity of change over the next 10 years was rated. Then, the sensitivity of each biological community in each region was evaluated using 12 attributes (e.g., habitat and prey specificity, temperature and acidity sensitivity, larval dispersal, adult mobility, population productivity, among others). Risks to living marine resources from increased surface water temperature, sea level rise, and earlier spring were rated moderate to high in both regions, with additional moderate to high risks in the GOM from increased bottom temperature, stratification, and river inputs. The figure shows that benthic invertebrates were rated most sensitive, with demersals intermediate and pelagics lowest. Two MAB communities were rated more sensitive than corresponding GOM communities, but greater short-term risks in the GOM indicated increased exposure for GOM communities. Overall, this simple analysis may help prioritize short-term regional climate risk management action for many fished and unfished resources, and show where more specific assessment is warranted.

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**Box 7. Stock assessment prioritization and ecosystem-linkages**

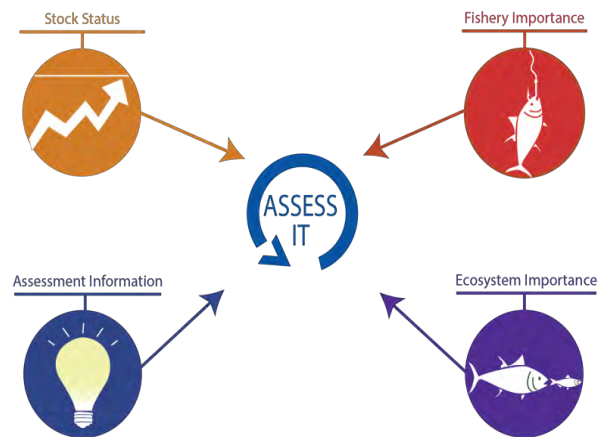
NOAA Fisheries conducts stock assessments and provides fishery managers with scientific advice to support the sustainable management of nearly 500 fished stocks. There are limitations on the number of assessments that can be done each year, and on the amount and types of data collected for those assessments. Also, each stock is unique



in its biology, its economic importance, and how it responds to fishing; hence, no single stock assessment approach is appropriate for all stocks. Recognizing the need for a process that maximizes stock assessment capacity in support of fisheries management, NOAA Fisheries recently released a national protocol for prioritizing stock assessments.<sup>6</sup> The prioritization

process is being implemented at a regional scale, and is intended to identify which stocks in a given region are candidates for stock assessments, the frequency by which assessments should be conducted for each stock, and the level (i.e., ideal data inputs and analytical complexity) at which those assessments should be conducted. This process provides regional planning bodies with an objective approach to determine which, when, and at what frequency stock assessments should be conducted, along with the data requirements associated with those assessments. Ecosystem data—including information on predator-prey dynamics, habitats, and physical and chemical properties of the ocean—are candidate inputs for stock assessments.

Thus, through the assessment prioritization process, NOAA Fisheries will evaluate relationships between stocks and their ecosystems to provide guidance on which assessments should incorporate ecosystem factors. In the first phase of implementation, the prioritization process is primarily focused on identifying stocks that are candidates for assessments and on setting target assessment frequencies for those stocks. Additionally, habitat assessment prioritization processes have been completed in three NOAA Fisheries regions to identify species that would most benefit from habitat information included in stock assessments (NMFS 2011).



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<sup>6</sup> <http://www.st.nmfs.noaa.gov/stock-assessment/stock-assessment-prioritization>

**Box 8. Two million metric ton cap for the Bering Sea and Aleutian Islands groundfish fishery**

One tool that the North Pacific Fisheries Management Council uses to prevent overfishing in the eastern Bering Sea and Aleutian Islands (BSAI) is the 2 million metric ton (M mt) optimum yield cap for the BSAI groundfish fisheries. The cap is an upper limit on the total amount of groundfish that can be harvested from the BSAI each year. The allowable catch limit (ACL) for the BSAI typically is greater than 2Mmt and in these years, the cap constrains total BSAI catch. The cap was established in 1984. As a result, many stocks, particularly flatfish, have been exploited well below sustainable levels for the individual flatfish species (Witherell 1995).

This cap is a measure of ecosystem productivity and the amount of fish protein that can be removed sustainably. A system cap that constrains individual species caps was chosen because ecological relationships in the BSAI are complex (NPFMC 1995). The cap was derived from the sum of the maximum sustainable yields of the individual species, referenced with the results of an ecosystem model of the Bering Sea, and adjusted downward for incomplete data and uncertainty in stock assessment models (NPFMC 1995).

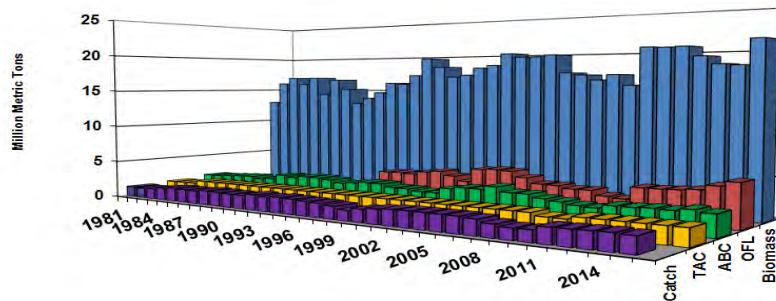
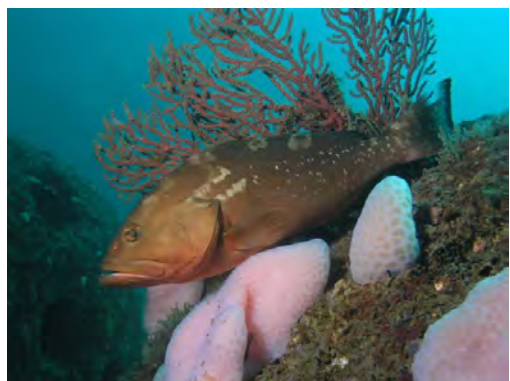


Figure. Catch, total allowable catch (TAC), allowable biological catch (ABC), overfishing limit (OFL), and total biomass of groundfish in the Bering Sea and Aleutian Islands.

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**Box 9. Fisheries Stock Assessments with ecosystem information**

NOAA Fisheries conducts stock assessments to produce scientific advice for fishery managers. The main objectives of fishery stock assessments are to evaluate stock status relative to defined limits, and to recommend harvest levels that optimize yield, prevent overfishing, and rebuild depleted stocks as necessary. In most cases, assessments are conducted from a single-species perspective, where ecosystem and environmental factors are not explicit drivers of stock dynamics, but are assumed to either be constant or to contribute to unexplained variation in stock abundance or biology. However, for a number of stocks, ecosystem information has been directly incorporated into assessment models, thereby providing fishery managers with stock-specific advice that accounts for changes in the ecosystem. West Coast salmon forecasts are informed by numerous ocean and ecosystem indicators. The North Pacific groundfish stocks, West Coast small pelagics, and the butterfish stock in the northeast Atlantic incorporate water temperature into their assessments, because this variable affects the number of fish encountered by abundance surveys. Finally, for Atlantic herring, northern shrimp, and Gulf of Mexico groupers, the numbers that die due to natural causes (i.e., natural mortality) is modeled using ecosystem indices. With herring, an important prey species in the northeast Atlantic, predator dynamics are incorporated into the stock assessment. For groupers, a red tide index is incorporated in the stock assessments, as fishermen and scientists have observed mass mortality events when there are substantial red tides (i.e., harmful algal blooms).



The number of assessments that incorporate ecosystem data has continued to increase over time. In 2005, 4% of the stock assessments conducted by NOAA Fisheries in that year included ecosystem factors, and by 2015 that number increased to 8%. As research and monitoring of stock and ecosystem dynamics continues to expand, the number of stock assessments and management measures that consider ecosystem variability and change will continue to increase.

**Box 9 cont.**

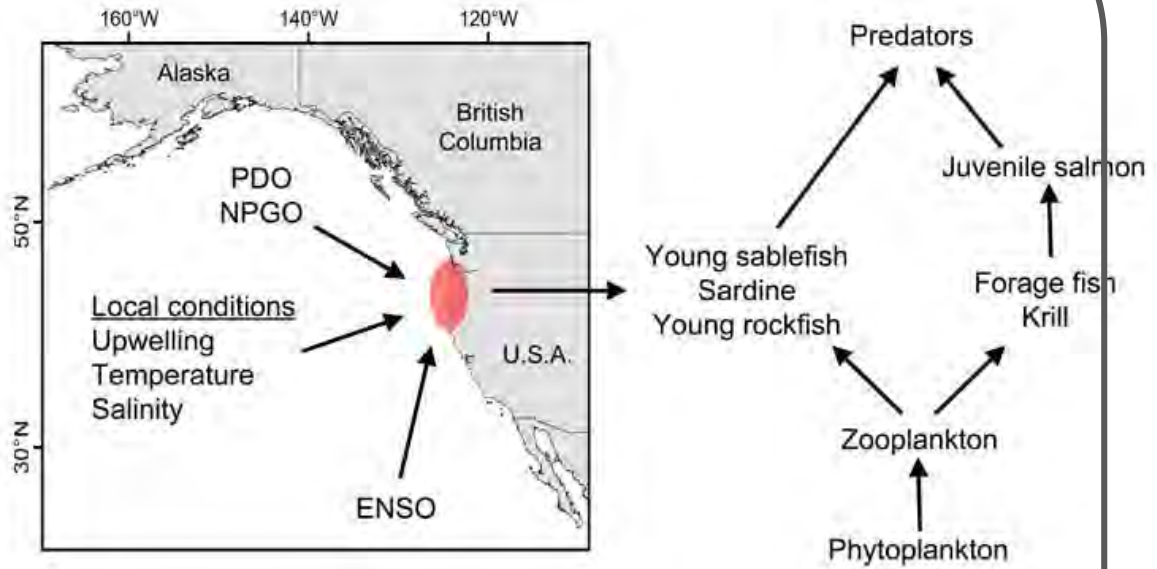


Figure. Illustration of how basin-scale and local-scale physical forces influence the northern California Current and resultant food web structure. PDO = Pacific Decadal Oscillation. NPGO = North Pacific Gyre Oscillation. ENSO = El Niño–Southern Oscillation. Figure from Peterson et al. [2014 Oceanography 27\(4\):80-89.](#)

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**Box 10. Interdisciplinary approach to estimate Multi-Species harvest control rules and reference points**

Through a partnership between NOAA Fisheries, the North Pacific Research Board, and the National Science Foundation, (the Bering Sea Project, <http://www.afsc.noaa.gov/HEPR/bseirp.htm>) scientists have advanced the mechanistic understanding of Bering Sea processes governing fish responses to climate variability, which resulted in a modeling framework to explore trophic interactions and climate change impacts on key species within the eastern Bering Sea. Analysts extended the data-rich single species stock assessment model for walleye pollock in the eastern Bering Sea (Ianelli 2005) and a simulation model of the Bering Sea foodweb, Ecosim (Aydin and Mueter 2007) to explore alternative harvest strategies under changing climate conditions. These enhancements utilized diet data derived from Alaska Fisheries Science Centers's food-habits data collections (<http://access.afsc.noaa.gov/REEM/WebDietData/DietTableIntro.php>). A climate-enhanced multispecies stock assessment was developed to incorporate species interactions between pollock and two of the main Bering Sea piscivorous groundfish (Pacific cod and arrowtooth flounder) (Holsman et al. In Press). The application of traditional harvest control rules within a multi-species model yielded regions of sustainable harvest levels rather than a single solution. Scientists utilized the Ecosim model to define this surface for Pacific cod and walleye pollock (Figure) (Moffitt et al. In Press) and they explored the effect of changing temperature on predator and prey interactions and subsequent climate-specific multispecies biological reference points (via CEATTLE; Holsman et al. In Press). Though there are many other multi-species interactions (e.g., Steller sea lions, arrowtooth flounder) and climate features to consider, these projections will help the North Pacific Fishery Management Council and its scientific review teams to develop strategies for managing fisheries under non-stationary population processes (Szuwalski and Hollowed 2016, [http://www.afsc.noaa.gov/News/BS\\_climate-change-study.htm](http://www.afsc.noaa.gov/News/BS_climate-change-study.htm)).

Box 10 cont.

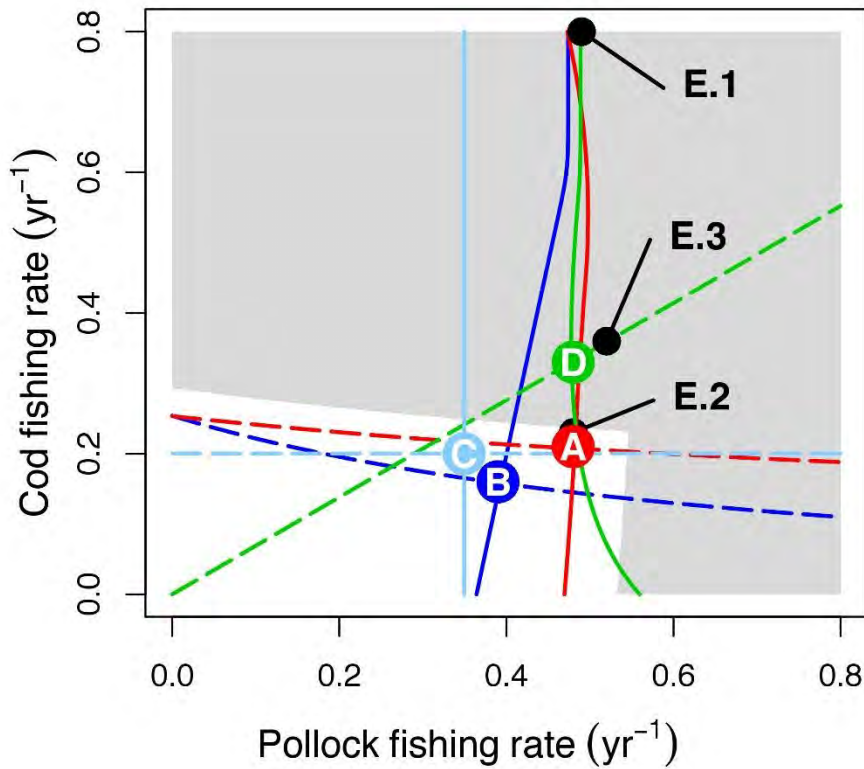


Figure. Candidate multi-species biological reference points modeled as a function of pollock and cod fishing mortality rates (Moffitt et al. In Press). Letters refer to different candidate multispecies biological reference points (A: solve for  $F_{x\%}$  by species when fishing mortality for all other species is set to current average values; B: solve for  $F_{x\%}$  by species when fishing mortality for all other species is set to zero; C: calculate  $F_{x\%}$  when  $M$ -at-age for each species is set to the values at  $B_0$ ; D:  $x \cdot B_0$  would apply over all species combined,  $F_{MSY}$  for each species would be a scalar multiplied by  $M$ ; E1: unconstrained optimization; E2 constrained so no stock falls below  $y \cdot B_0$ ; and E3: unconstrained with relative fishing mortality pre-specified. The gray area represents the “single-species” overfishing limit (fishing rate  $> F_{35\%}$  when in Option A).

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## May 20, 2016- Discussion Draft for Councils

### ***List of Acronyms***

ABC - Allowable Biological Catch	ITTAC - International Commission for the Conservation of Atlantic Tunas
ACAP - Agreement on the Conservation of Albatrosses and Petrels	IWC - International Whaling Commission
ACL - Annual Catch Limit	LME - Large Marine Ecosystem
AIDCP - Agreement on the International Dolphin Conservation Program	LMR - Living Marine Resource
CBD - Convention on Biological Diversity	MSE - Management Strategy Evaluation
CCAMLR - Conservation of Antarctic Marine Living Resources	MMPA - Marine Mammal Protection Act
CCAS - Convention for the Conservation of Antarctic Seals	MSA—Magnuson-Stevens Act
CITES - Convention on International Trade in Endangered Species	MSY - Maximum Sustainable Yield
COFI - Committee on Fisheries	NAFO - Northwest Atlantic Fisheries Organization
E2E - End to End models	NAO - North Atlantic Oscillation
EBM - Ecosystem-Based Management	NASCO - North Atlantic Salmon Conservation Organization
EBFM - Ecosystem-Based Fisheries Management	NCSS - National Climate Science Strategy
EFH - Essential Fish Habitat	NEMoW - National Ecosystem Modeling Workshop
ELRP - Ecosystem-Level Reference Point	NEPA - National Environmental Protection Act
EPAP - Ecosystem Principles Advisory Panel	NGO - Non-governmental Organization
ESA - Endangered Species Act	NGSA - Next Generation Stock Assessment
ESR - Ecosystem Status Report	NHAW - National Habitat Assessment Workshop
FATE - Fisheries and the Environment	NPAFC - North Pacific Anadromous Fish Commission
FEP - Fishery Ecosystem Plans	NSAW - National Stock Assessment Workshop
FMC - Fishery Management Council	NRC - National Research Council
FMP - Fishery Management Plan	NSF - National Science Foundation
FSC - Fisheries Science Center	OFL - Overfishing Limit
FTE—Full Time Equivalent	OSP - Optimum Sustainable Population
FY - Fiscal Year	OY - Optimum Yield
HAIP—Habitat Assessment Improvement Plan	PBR - Potential Biological Removal
HAPWG - Habitat Assessment Prioritization Working Group	PR-SAIP - Protected Species Stock Assessment Improvement Plan
HAPC - Habitat Area of Particular Concern	PSA - Productivity and Susceptibility Analysis
HCR - Harvest Control Rule	PSC - Prohibited Species Catch
IAC - Inter-American Convention	RO - Regional Office
ICCAT - International Commission for the Conservation of Atlantic Tunas	SA - Stock Assessment
ICES - International Council for the Exploration of the Sea	SAIP - Stock Assessment Improvement Plan
IEA - Integrated Ecosystem Assessment	SSC - Scientific and Statistical Committee
IGO - Inter-Governmental Organization	TAC - Total Allowable Catch
IOSEA - The Indian Ocean - South-East Asian	TOR-- Terms of Reference
IOTC - Indian Ocean Tuna Commission	UNFSA - United Nations Fish Stocks Agreement
IPHC - International Pacific Halibut Commission	VES-V - Virtual Ecosystem Scenario Viewer
	WCPFC - Western & Central Pacific Fisheries Commission
	WECAFC - Western Central Atlantic Fishery Commission