#1a

In-season Adjustment to the Atlantic Herring Fishery Specifications

for the 2019 Fishing Year
(January 1, 2019 – December 31, 2019)

Prepared by the
NMFS Greater Atlantic Regional Fisheries Office

in consultation with
New England Fishery Management Council

November 2018

1.0 EXECUTIVE SUMMARY

This supplemental environmental assessment (SEA) contains the recommendations of NOAA's National Marine Fisheries Service (NMFS) Greater Atlantic Regional Office (GARFO) for the Atlantic herring fishery specifications for the 2019 fishing year, consistent with the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Atlantic Herring Fishery Management Plan (FMP), approved by NMFS on October 27, 1999. This document also contains information and supporting analyses required under other applicable law, including the National Environmental Policy Act (NEPA) and Regulatory Flexibility Act (RFA).

The Atlantic herring fishery specifications are annual amounts specified for the 2019 fishing year (January – December). These specifications will replace those that would roll over from the 2018 fishing year, and will lessen the risk of overfishing. These specifications include:

- Overfishing Limit (OFL);
- Acceptable Biological Catch (ABC);
- Atlantic Herring Annual Catch Limit (ACL) = U.S. Optimum Yield (OY);
- Domestic Annual Harvest (DAH);
- Domestic Annual Processing (DAP);
- U.S. At-Sea Processing (USAP);
- Border Transfer (BT);
- Management Area Sub-ACLs;
- Research Set-Asides (RSA);
- Fixed Gear Set-Aside (FGSA).

In addition, annual gear-specific and area-specific catch caps for river herring and shad (RH/S) are specified for trips landing more than 6,600 pounds of Atlantic herring (3 mt) during the 2019 fishing year, consistent with Framework Adjustment 3 to the Atlantic Herring FMP.

Alternative 3 represents NMFS's preferred alternative for the 2019 Atlantic herring fishery specifications and is described in Section 5.1.3 of this document and summarized in the table on the following page. Alternative 3 would specify the ABC at 30,688 mt, (equal to the OFL), maintain the 2016-2018 management uncertainty buffer at 6,200 mt (to account for catch in the New Brunswick weir fishery), and specify the ACL/OY at 24,488 mt. The New England Fishery Management Council (Council) recommended the limit for border transfer be set at 0 mt, and to proportionally reduce the fixed gear set-aside. NMFS agreed with these recommendations and Alternative 3 would set the border transfer at 0 mt and the fixed-gear set-aside at 64 mt. Alternative 3 would maintain the status quo for all other Atlantic herring fishery specifications for 2019, consistent with the Council's recommendation, including RSA and the sub-ACL allocations. Alternative 3 includes a provision that would allow for 1,000 mt of Atlantic herring

to be returned to the Area 1A fishery from the management uncertainty buffer if certain conditions are met.

Table 1. Preferred Alternative for 2019 Atlantic Herring Fishery Specifications

Specifications	Alternative 3 (mt)
Overfishing Limit (OFL)	30,688
Acceptable Biological Catch (ABC)	30,688
Management Uncertainty	6,200 (Value in 2016-18)
U.S. Optimum Yield (OY)/Annual Catch Limit (ACL)	24,488[1]
Domestic Annual Harvesting (DAH)	24,488
Domestic Annual Processing (DAP)	24,488
U.S. At-Sea Processing (USAP)	0
Border Transfer (BT)	0
Sub-ACL Area 1A (28.9% of ACL)	7,077[1]
Sub-ACL Area 1B (4.3% of ACL)	1,053
Sub-ACL Area 2 (27.8% of ACL)	6,808
Sub-ACL Area 3 (39% of ACL)	9,550
Research Set-Aside (RSA)	3%
Fixed Gear Set-Aside (1A)	64

[1]If New Brunswick weir fishery catch through October 1 is less than 4,000 mt, then 1,000 mt will be subtracted from the management uncertainty buffer and added to the ACL and Area sub-ACL. If this occurs, the ACL would increase to 25,488 mt and the Area 1A sub-ACL would increase to 8,077 mt.

Alternative 3 Seasonal (Monthly) Sub-ACL Divisions (2019)

- Area 1A: 0% January-May; 100% June-December;
- Area 1B: 0% January-April; 100% May-December.

Alternative 3 would also maintain the status quo river herring/shad (RH/S) catch caps in the Atlantic herring fishery for 2019. These RH/S catch caps would continue to apply to midwater trawl vessels in the Gulf of Maine (76.7 mt) and Cape Cod (32.4 mt), and to both midwater trawl and small mesh bottom trawl vessels in southern New England/Mid-Atlantic (129.6 mt and 122.3 mt, respectively) on all trips landing more than 6,600 pounds of Atlantic herring.

The Affected Environment for the 2019 Atlantic herring fishery specifications is provided in Section 6.0 of this document. The Affected Environment is described based on valued ecosystem components (VECs). VECs represent the resources, areas, and human communities that may be affected by the management measures under consideration in this management action. VECs are the focus since they are the "place" where the impacts of management actions are exhibited. The VECs considered include: Atlantic Herring; Non-Target Species (with particular focus on RH/S); Physical Environment and Essential Fish Habitat (EFH); Protected Resources; and Fishery-Related Businesses and Communities.

The impacts of the alternatives on each of the VECs described in the Affected Environment are discussed in Section 7.0 of this document, and are summarized in Table 2 below. Because the Atlantic herring ACL proposed for the 2019 fishing year is substantially less than the 2018 specifications (49,900 mt in 2018 vs. 24,488 mt in 2019), there is a discernable difference between the impacts of Alternatives 1-3 on the Atlantic herring resource. Alternative 1 would have a high negative impact on the resource because it would allow fishing substantially above the OFL (this would be illegal under the MSA). Alternative 2 would have a moderate positive impact on the Atlantic herring resource because it would set the ACL substantially below the OFL (15,065 mt). Alternative 3 would have a slight positive impact because it would set the ACL at the OFL minus management uncertainty, and would likely result in catch well below the OFL. Only Alternative 1 is expected to change or jeopardize the biological status of the Atlantic herring resource. Alternatives 1 – 3 are expected to have a slight positive impact on non-target species and a slight negative impact on the physical environment. The impacts on Atlantic herring fishery-related businesses and communities for Alternative 1 are negligible, while those for Alternatives 2 (high) and 3 (moderate) are negative, as both would implement large catch reductions for the fleet, which would decrease industry revenue. The potential impacts of Alternatives 1 - 3 on protected resources are variable and are discussed in Section 7.4.

Table 2. Summary of Impacts of Alternatives Under Consideration on Each VEC

2019 Atlantic Herring Fishery Specifications					
	Atlantic Herring	**Non-Target Species**	**Physical Envt/EFH**	**Protected Resources**	**Fishery-Related Businesses and Communities**
Alt 1 (No Action)	High Negative	Slight Positive	Slight Negative	Slight Negative to Slight Positive	Negligible
Alt 2 (Most Restrictive)	Moderate Positive	Slight Positive	Slight Negative	Slight Negative to Slight Positive	High Negative
Alt 3 (Preferred)	Slight Positive	Slight Positive	Slight Negative	Slight Negative to Slight Positive	Moderate Negative

Note: The table above summarizes the overall impacts of the alternative on each VEC. The differential impacts of the alternatives, when compared to each other, are discussed in detail throughout Section 7.0.

2.0 LIST OF ACRONYMS

ABC	Acceptable Biological Catch
ABC CR	ABC Control Rule
ACL	Annual Catch Limit
AM	Accountability Measure
ASMFC	Atlantic States Marine Fisheries Commission or Commission
B	Biomass
BT	Border Transfer
CAA	Catch at Age
CC	Cape Cod
CZMA	Coastal Zone Management Act
DAH	Domestic Annual Harvest
DAP	Domestic Annual Processing
DMF	Division of Marine Fisheries
DMR	Department of Marine Resources
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
E.O.	Executive Order
ESA	Endangered Species Act
F	Fishing Mortality Rate
FEIS	Final Environmental Impact Statement
FGSA	Fixed Gear Set-Aside
FMP	Fishery Management Plan
FW	Framework
FY	Fishing Year
GB	Georges Bank
GMRI	Gulf of Maine Research Institute
GOM	Gulf of Maine
IFM	Industry-Funded Monitoring
IVR	Interactive Voice Response
IWP	Internal Waters Processing
M	Natural Mortality Rate
MA DMF	Massachusetts Division of Marine Fisheries
MAFMC	Mid-Atlantic Fishery Management Council

ME DMR	Maine Department of Marine Resources
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistical Survey
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
mt	Metric Tons
NB	New Brunswick
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fisheries Observer Program
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NSGs	National Standard Guidelines
OFL	Overfishing Limit
OY	Optimum Yield
PDT	Plan Development Team
PS/FG	Purse Seine/Fixed Gear
RFA	Regulatory Flexibility Act
RFFA	Reasonably Foreseeable Future Action
RH/S	River Herring/Shad
RIR	Regulatory Impact Review
RSA	Research Set-Aside
SARC	Stock Assessment Review Committee
SAW	Stock Assessment Workshop
SSB	Spawning Stock Biomass
SSC	Scientific and Statistical Committee
SFA	Sustainable Fisheries Act
SNE/MA	Southern New England/Mid-Atlantic
TC	Technical Committee
TRAC	Transboundary Resource Assessment Committee
TRT	Take Reduction Team
USAP	U.S. At-Sea Processing
VMS	Vessel Monitoring System
VTR	Vessel Trip Report

3.0 TABLE OF CONTENTS

4.0 INTRODUCTION

4.1 PURPOSE AND NEED FOR ACTION

The purpose of this action is to modify the Atlantic herring specifications for 2019. The 2018 herring stock assessment indicates that the existing catch limits may result in overfishing in 2019 and increase the risk of the stock becoming overfished. Therefore, an action to modify 2019 catch limits is needed to prevent overfishing and lower the risk that the stock becomes overfished. To that end, the New England Fishery Management Council (Council) recommended that NOAA's National Marine Fisheries Service (NMFS) take action to modify herring specifications for 2019 to prevent overfishing and lower the risk of the stock becoming overfished.

4.2 DEVELOPING THE 2019 SPECIFICATIONS

The Atlantic herring (*Clupea harengus*) fishery specifications are annual amounts recommended by the Council every three years through a process established in the Atlantic Herring FMP (and modified in Amendments 1 and 4). The specifications process for herring is described in detail in Section 1.1 of the 2016-2018 Herring Specifications EA. This section summarizes and supplements that description, providing context for why new alternatives are necessary. This section also summarizes the basis for this action's preferred alternative.

4.2.1 Background

This specifications document was developed in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the National Environmental Policy Act (NEPA), the former being the primary domestic legislation governing fisheries management in the U.S. Exclusive Economic Zone (EEZ). Failure to specify management measures based on the best available scientific information to prevent overfishing of Atlantic herring would be inconsistent with the National Standards under the MSA. This document was developed in accordance with the Atlantic Herring Fishery Management Plan (FMP), which details the management regime for these fisheries. The FMP and subsequent amendments are available at: http://www.nefmc.org.

This supplemental environmental assessment (SEA) updates the 2016-2018 Atlantic Herring Specifications EA that analyzed herring harvest specifications and herring fishery catch caps for river herring and shad (RH/S). This document is not a stand-alone document, but rather a supplement that should be utilized in conjunction with the EA for the 2016-2018 Atlantic Herring Specifications (81 FR 75731, November 1, 2016) and the 2018 In-season Adjustment to Atlantic Herring Sub-ACLs (83 FR 42450, August 22, 2018). Unless otherwise noted, the 2016-2018 Herring Specifications EA, attached to this SEA, remains applicable. Therefore, sections in this SEA should be considered within the context of the attached EA.

This SEA, in conjunction with the attached EA, examines the impacts of the management alternatives on the human environment. Aspects of the human environment that are likely to be directly or indirectly affected by the actions proposed in this document are described as valued

ecosystem components (VECs). The VECs make up the affected environment and are specifically defined as the managed resources (Atlantic herring) and any non-target species; habitat, including EFH for the managed resource and non-target species; protected species (i.e., ESA-listed species and species protected under the MMPA); and human communities (social and economic aspects of the environment). The impacts of the alternatives are evaluated with respect to these VECs. The expected impacts of the alternatives are described in Section 7.0 of this document.

Specifications for the herring fishery are generally set in a three-year cycle, with the last cycle spanning 2016-2018. The herring regulations at 50 CFR 600.200, state that if the specifications from the previous three years expire before new specifications are in place, the limits for the last year of the specifications are rolled over and enacted for the new year. Because new specifications will not be in place for 2019, the specifications at the beginning of 2019 will be equivalent to limits set for 2018 in the 2016-2018 specifications, as modified through the 2018 in-season adjustment reducing herring management area sub-annual catch limits (ACL).

In June of 2018, a new Northeast Regional Stock Assessment Workshop (SAW), reviewed by the Stock Assessment Review Committee (SARC), for herring was completed. The assessment concluded that although herring was not overfished and overfishing was not occurring in 2017, the stock is declining due to poor recruitment. The stock assessment estimated that recruitment has been at historic lows during the most recent 5 years (2013-2017). The final assessment summary report is available on the Northeast Fisheries Science Center (NEFSC) website (www.nefsc.noaa.gov/publications/).

The assessment projects that poor recruitment of herring will likely result in a substantial decline in biomass, but that the biomass should increase after reaching a low in 2019 if recruitment returns to historic average levels. The SAW/SARC concluded that catch reductions would be necessary during 2018-2021 in prevent overfishing and to lower the risk of the stock becoming overfished. Based on stock assessment projections, NMFS reduced the 2018 ACL to 49,900 mt to lessen the risk of overfishing (Table 3). This reduction was based on a 50% probability of preventing overfishing in 2018. NMFS set levels based on the newly projected OFL for 2018 out of precaution to prevent overfishing while allowing the fishery to achieve OY. However, if the 2018 specifications remain in effect for 2019, the limits still be too high and would result in overfishing in the 2019 fishing year.

Table 3. 2018 Atlantic Herring Specifications

Specifications	2018 Original Allocation (mt)	2018 In-Season Adjustment (mt)[1]
Overfishing Limit (OFL)	111,000	2018 – 111,000
Acceptable Biological Catch (ABC)	111,000	111,000
Management Uncertainty	6,200	6,200
U.S. Optimum Yield (OY)/Annual Catch Limit (ACL)	104,800	49,900[2]
Domestic Annual Harvesting (DAH)	104,800	104,800
Domestic Annual Processing (DAP)	100,800	100,800
U.S. At-Sea Processing (USAP)	0	0
Border Transfer (BT)	4,000	4,000
Sub-ACL Area 1A (28.9% of ACL)	30,300	27,743
Sub-ACL Area 1B (4.3% of ACL)	4,500	2,639
Sub-ACL Area 2 (27.8% of ACL)	29,100	8,200
Sub-ACL Area 3 (39% of ACL)	40,900	11,318
Research Set-Aside (RSA)	3%	3%
Fixed Gear Set-Aside (1A)	295	295

[1]This action reduced the ACL and management area sub-ACLs, but left all other specifications unchanged.

[2] If New Brunswick weir fishery catch through October 1 is less than 4,000 mt, then 1,000 mt will be subtracted from the management uncertainty buffer and added to the ACL and Area 1A Sub-ACL.

Seasonal Sub-ACL Divisions for 2018

- Area 1A: 0% January-May; 100% June-December
- Area 1B: 0% January-April; 100% May-December

In 2018, RH/S catch caps applied to midwater trawl vessels in the Gulf of Maine (76.7 mt) and Cape Cod (32.4 mt), and to both midwater trawl and small mesh bottom trawl vessels in southern New England/Mid-Atlantic (129.6 mt and 122.3 mt, respectively) on all trips landing more than 6,600 pounds of Atlantic herring.

At their September 2018 meeting, the Council approved an acceptable biological catch (ABC) control rule in Amendment 8 to the Herring FMP that, if approved by NMFS, would be used to

set specifications for the herring fishery in future years. This control rule is a more conservative management approach than the interim control rule (used in previous specification cycles) because a portion of the available catch would be set aside to explicitly account for the role of herring as forage in the ecosystem. The ABC control rule would cap overall fishing mortality at 80% of the maximum sustainable yield (known as F_{MSY}). Under previous control rules, herring harvest could occur at 100% of the F_{MSY}. This ABC control rule has not yet been reviewed by NMFS, and if approved, would not be effective at the beginning of 2019.

The regulations at 50 CFR 648.200 (e) give NMFS authority to make in-season adjustments to the herring specifications and sub-ACLs, after consultation with the Council, to achieve conservation and management objectives. Based on the SAW/SARC results, the Council recommended at its September 2018 meeting that NMFS use an in-season adjustment to reduce herring catch limits to prevent overfishing in 2019. The Council's specific recommendation is as follows:

1. Use the most recent assessment and projections to develop the 2019 specifications
2. Use the ABC control rule approved by the Council in Amendment 8
3. Maintain the sub-annual catch limits for herring management areas based on the proportions allocated in the 2016-2018 specifications package
    a. Area 1A: 28.9%
    b. Area 1B: 4.3%
    c. Area 2: 27.8%
    d. Area 3: 39%
4. Proportionally reduce the fixed gear set-aside allocation which is based on a small weir fishery west of Cutler, ME
5. Set the border transfer (which allows U.S. vessels to transfer herring to Canadian vessels to be processed as food) at 0 mt.

The Council's SSC met on October 10, 2018, to review the 2018 herring stock assessment results and develop recommendations for the herring OFL and ABC for 2019-2021. The SSC reviewed the alternatives for ABC control rules in Amendment 8, and recommended that the Council specify ABC for the 2019-2021 based on the Council-approved Amendment 8 ABC control rule alternative. This approach would produce an OFL of 30,688 mt, an ABC of 21,266 mt, and an ACL of 15,065 mt for 2019.

4.2.2 Basis and Methodology for Additional Herring Alternatives

The 2018 herring stock assessment and subsequent analysis by the Northeast Fisheries Science Center (NEFSC) project that if 2018 limits are rolled over for 2019, it would result in greater than a 50% chance of overfishing. The herring specification regulations provide that the OFL must be equal to catch resulting from applying the maximum fishing mortality threshold to a current or projected estimate of stock size. When the stock is not overfished and overfishing is not occurring, this is usually the fishing rate supporting F_{MSY}. Catch that exceeds this amount would result in overfishing. The ABC may be set equal to the OFL, or it may be set lower than

the OFL to account for scientific uncertainty. The ACL may be equal to or lower than the ABC after considering management uncertainty.

Based on the best available science, NMFS is proposing to reduce the OFL for 2019 to 30,688 mt. An OFL of 30,388 mt would ensure at least a 50% probability of preventing overfishing in 2019. This OFL is based on projections by the SAW/SARC, as updated by NEFSC staff using 2018 catch, and was recommended by both the SSC and the Council.

The Council recommended using the new Amendment 8 control rule to set the ABC for 2019, despite the fact that it has not yet been approved by NMFS. It also recommended sub-ACLs based on allocations in the previous (2016-2018) specifications, while also proportionally reducing the fixed-gear set-aside and setting border transfer at 0 mt. The Amendment 8 ABC control rule is a long-term management strategy that would cap overall fishing mortality at 80% of the maximum sustainable yield (known as F_{MSY}). Under previous control rules, herring harvest could occur at 100% of the F_{MSY}. This control rule would yield an ABC for 2019 of 21,266 mt, and an ACL of 15,065 mt. This represents a 70% decrease from the 2018 ACL total as modified in the 2018 sub-ACL reduction. The SSC agreed with the recommendation of the Council.

When setting the 2019 specifications, NMFS is required to consider economic impacts to the fishery. With any of these alternatives, the herring fleet will face catch reductions and likely severe economic impacts that have potential to put much of the industry out of business. Given the crisis that the fishery currently faces, a long-term management strategy may not appropriately consider economic impacts to the fishery. In the 2018 in-season adjustment to the management area sub-ACLs, NMFS set the ACL equal to the OFL (49,900 mt), giving the industry the greatest economic opportunity allowed by law. In 2019, the reduced OFL (30,688 mt) will result in even lower herring catch. Setting the ABC equal to the OFL would result in more herring available to the fishery, and would likely lessen the negative economic impact on the industry. The ACL under this scenario would be 24,488 mt, which would provide the industry nearly 10,000 mt more herring than the Council/SSC recommendation, while still ensuring catch stays below the OFL.

The basis for Alternative 3 (Preferred Alternative) specifications are summarized in Table 4. The ABC equals the OFL, as it did in 2018. The ACL/OY (equal to DAH and DAP) is derived by subtracting the management uncertainty (6,200 mt) from the ABC. Sub-ACLs are derived by the allocation method used in 2016-2018. USAP is again 0 mt (status quo). BT is reduced to 0 mt. RSA remains at 3% of each sub-ACL (status quo), and FGSA is reduced to 64 mt, which is a proportional reduction (based on the Area 1A sub-ACL) from 2018.

Table 4. Basis for 2019 Atlantic Herring Fishery Specification Preferred Alternative

Specifications	MT	Basis for 2019 Recommendation
OFL	30,688	Stock assessment projections
ABC	30,688	Stock assessment projections/NMFS recommendation
Management Uncertainty	6,200	Status Quo
OY/ACL	24,488	ABC minus management uncertainty
DAH	24,488	ABC minus management uncertainty
DAP	24,488	ABC minus management uncertainty
USAP	0	Status quo
BT	0	Council recommendation
Sub-ACL Area 1A	7,077	28.9% of ACL (Council recommendation/status quo)
Sub-ACL Area 1B	1,053	4.3% of ACL (Council recommendation/status quo)
Sub-ACL Area 2	6,808	27.8% of ACL (Council recommendation/status quo)
Sub-ACL Area 3	9,550	39% of ACL (Council recommendation/status quo)
RSA	3%	Status quo
FGST	64	Council recommendation (previous allocation from 2016-2018 specifications scaled to 2019 Area 1A sub-ACL)

5.0 MANAGEMENT ALTERNATIVES

This section describes the alternatives considered in this SEA for management of the herring fishery in 2019. These alternatives are treated as alternatives in addition to those considered in the 2016-2018 Herring Specifications EA. The preferred alternative for 2018 from the 2016-2018 specifications (as modified by the 2018 in-season adjustment) is the status quo/no action alternative (Alternative 1) for 2019. For the purposes of impact analysis (Section 7.0), Alternatives 2 and 3 are compared to the no action alternative.

5.1 RANGE OF ALTERNATIVES

5.1.1 Alternative 1 (No Action)

Alternative 1 is the no action alternative. This alternative would maintain the 2018 herring fishery specifications, as modified through the August 2018 in-season adjustment, for 2019. The

specifications that would remain in place under the no action alternative are listed in Table 5 below. Under the no action alternative, the herring ABC would remain at 49,900 mt, which is higher than recommendations by the Council, SSC, and NMFS. Specification of the management uncertainty buffer is based on an estimate of the New Brunswick weir fishery catch, and would remain at 6,200 mt (status quo). See Section 4.2.2.1 of the 2016-2018 Herring Specifications EA for more information on how the management uncertainty buffer was chosen. All other specifications, including sub-ACLs, set-asides, BT, and RH/S catch caps would remain the same in 2019 as in 2018.

Table 5. Alternative 1 (No Action) for the 2019 Atlantic Herring Specifications

Specifications	Alternative 1 (mt)
Overfishing Limit (OFL)	111,000
Acceptable Biological Catch (ABC)	111,000
Management Uncertainty	6,200
U.S. Optimum Yield (OY)/Annual Catch Limit (ACL)	49,900 [1]
Domestic Annual Harvesting (DAH)	104,800
Domestic Annual Processing (DAP)	100,800
U.S. At-Sea Processing (USAP)	0
Border Transfer (BT)	4,000
Sub-ACL Area 1A (28.9% of ACL)	27,743
Sub-ACL Area 1B (4.3% of ACL)	2,639
Sub-ACL Area 2 (27.8% of ACL)	8,200
Sub-ACL Area 3 (39% of ACL)	11,318
Research Set-Aside (RSA)	3%
Fixed Gear Set-Aside (1A)	295

[1] If New Brunswick weir fishery catch through October 1 is less than 4,000 mt, then 1,000 mt will be subtracted from the management uncertainty buffer and added to the ACL and Area 1A Sub-ACL.

Seasonal (Monthly) Sub-ACL Divisions for 2019

- Area 1A: 0% January-May; 100% June-December;
- Area 1B: 0% January-April; 100% May-December.

Under Alternative 1, RH/S catch caps would apply to midwater trawl vessels in the Gulf of Maine (76.7 mt) and Cape Cod (32.4 mt), and to both midwater trawl and small mesh bottom trawl vessels in southern New England/Mid-Atlantic (129.6 mt and 122.3 mt, respectively) on all trips landing more than 6,600 pounds of Atlantic herring.

5.1.2 Alternative 2 (Most Restrictive)

This alternative is based on the Council's recommendations for 2019 herring specifications at its September 2018 meeting. Alternative 2 would specify Atlantic herring ABC at the level recommended by the Council and the SSC (21,266 mt), and would maintain a status quo approach to specifying the management uncertainty buffer at 6,200 mt. This alternative would result in an ACL/OY (which would equal the DAH and DAP) of 15,065 mt. Sub-ACLs would be based on the allocation method used for 2016-2018. BT would be reduced to 0 mt ensuring all herring would be available for domestic processing or lobster bait. RSA would remain at 3% of each sub-ACL (status quo) and FGSA would be reduced to 39 mt, which is a proportional reduction (based on the Area 1A sub-ACL) from 2018. This alternative would maintain a status quo approach to all other herring specifications, including the seasonal (monthly) distribution of sub-ACLs and RH/S catch caps. The specifications that would be implemented under Alternative 2 are listed in (Table 6).

Table 6. Alternative 2 (Most Restrictive) for 2019 Atlantic Herring Specifications

Specifications	Alternative 2 (mt)
OFL	30,688
ABC	21,266
Management Uncertainty	6,200
ACL/OY	15,065
DAH	15,065
DAP	15,065
USAP	0
BT	0
Area 1A Sub-ACL (28.9%)	4,354
Area 1B Sub-ACL (4.3%)	647
Area 2 Sub-ACL (27.8%)	4,188
Area 3 Sub-ACL (39%)	5,876
RSA	3%
FGSA	39

Seasonal (Monthly) Sub-ACL Divisions for 2019

- Area 1A: 0% January-May; 100% June-December;
- Area 1B: 0% January-April; 100% May-December.

Under Alternative 2, RH/S catch caps would apply to midwater trawl vessels in the Gulf of Maine (76.7 mt) and Cape Cod (32.4 mt), and to both midwater trawl and small mesh bottom trawl vessels in southern New England/Mid-Atlantic (129.6 mt and 122.3 mt, respectively) on all trips landing more than 6,600 pounds of Atlantic herring.

5.1.3 Alternative 3 (Preferred)

Alternative 3 would specify the herring ABC at the level recommended by NMFS (ABC=OFL=30,688 mt) and would maintain a status quo management uncertainty buffer at 6,200 mt. This alternative would result in an ACL/OY (which would equal the DAH and DAP) of 24,488 mt. Sub-ACLs would be based on the allocation method used for 2016-2018. BT would be reduced to 0 mt ensuring all herring would be available for domestic processing or lobster bait. RSA would remain at 3% of each sub-ACL (status quo) and FGSA would be reduced to 64 mt, which is a proportional reduction (based on the Area 1A sub-ACL) from 2018. This alternative would maintain a status quo approach to all other Atlantic herring fishery specifications, including the seasonal (monthly) distribution of sub-ACLs and RH/S catch caps. The specifications that would be implemented under Alternative 3 are listed in Table 7.

Table 7. Alternative 3 (Preferred) for 2019 Atlantic Herring Specifications

Specifications	Alternative 3 (mt)
OFL	30,688
ABC	30,688
Management Uncertainty	6,200
ACL/OY	24,488
DAH	24,488
DAP	24,488
USAP	0
BT	0
Area 1A Sub-ACL (28.9%)	7,077
Area 1B Sub-ACL (4.3%)	1,054
Area 2 Sub-ACL (27.8%)	6,808
Area 3 Sub-ACL (39%)	9.550
RSA	3%

Specifications	Alternative 3 (mt)
FGSA	39

Seasonal (Monthly) Sub-ACL Divisions for 2019

- Area 1A: 0% January-May; 100% June-December;
- Area 1B: 0% January-April; 100% May-December.

Under Alternative 3, RH/S catch caps would apply to midwater trawl vessels in the Gulf of Maine (76.7 mt) and Cape Cod (32.4 mt), and to both midwater trawl and small mesh bottom trawl vessels in southern New England/Mid-Atlantic (129.6 mt and 122.3 mt, respectively) on all trips landing more than 6,600 pounds of Atlantic herring.

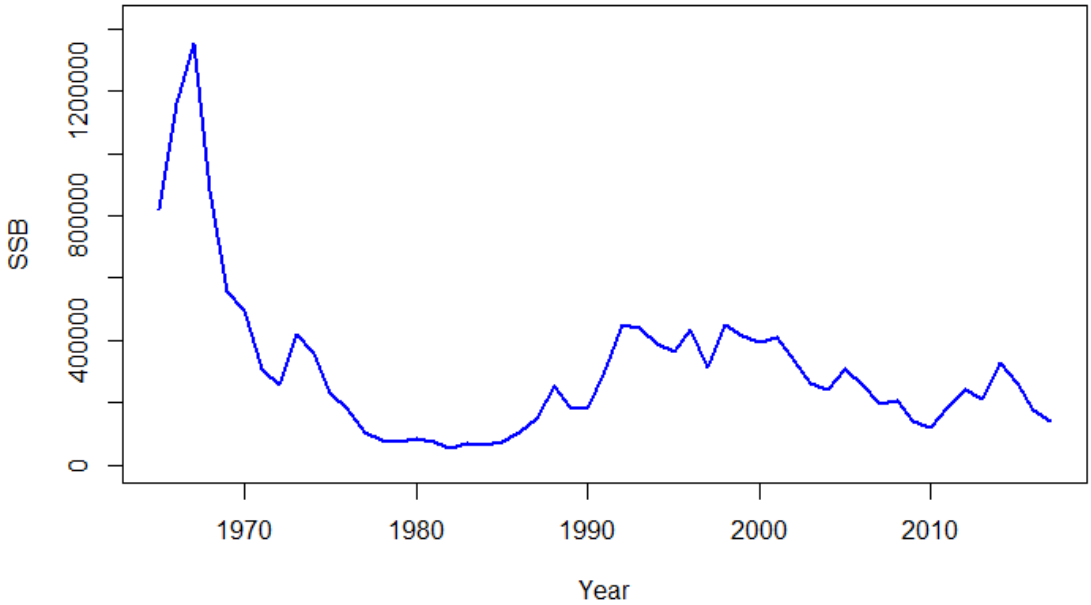
5.2 RATIONALE FOR THE PROPOSED 2019 ATLANTIC HERRING SPECIFICATIONS

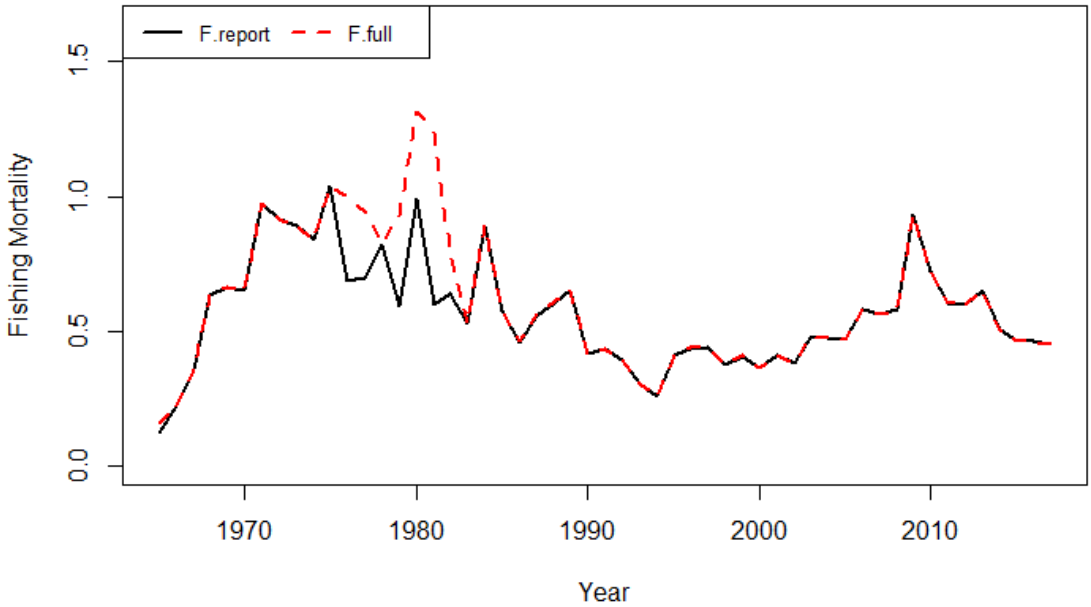
This section provides updated information and rationale to support the NMFS's preferred alternative for 2019 herring specifications. Much of the justification for proposed specifications in previous years is also applicable here, and is contained in Section 4.2 of the 2016-2018 Herring Specifications EA. This section supplements that description, providing context for why new alternatives (in addition to the no action alternative) are necessary.

5.2.1 Background

NMFS implemented 2016-2018 herring specifications as recommended by the Council. The specifications included OFLs of 138,000 mt, 117,000 mt, and 111,000 mt for 2016, 2017, and 2018, respectively. The resulting ABC based on the Council's ABC control rule was 111,000 mt in 2018, an amount equal to the OFL and that had no greater than a 50% probability that overfishing would occur. This ABC was consistent with the Council's SSC advice. The ACL for 2018 for the herring fishery was originally set at 104,800 mt.

The Atlantic herring stock was most recently assessed during the 65th Stock Assessment Workshop in June of 2018. The 2018 assessment used all the same data sources used in the previous assessment (NMFS spring, fall and summer shrimp bottom trawl survey) with the addition of an acoustic time series collected during the NMFS fall bottom trawl survey of age 3+ herring abundance. SSB generally declined from 1965 to a time series low in 1978 and then generally increased from 1978 through the mid-90s. SSB declined again from 1997 to 2010, increased for several years until 2014, and has been decreasing since. Fishing mortality was reported to be stable and low since 2009, equaling the time series low in 2014.

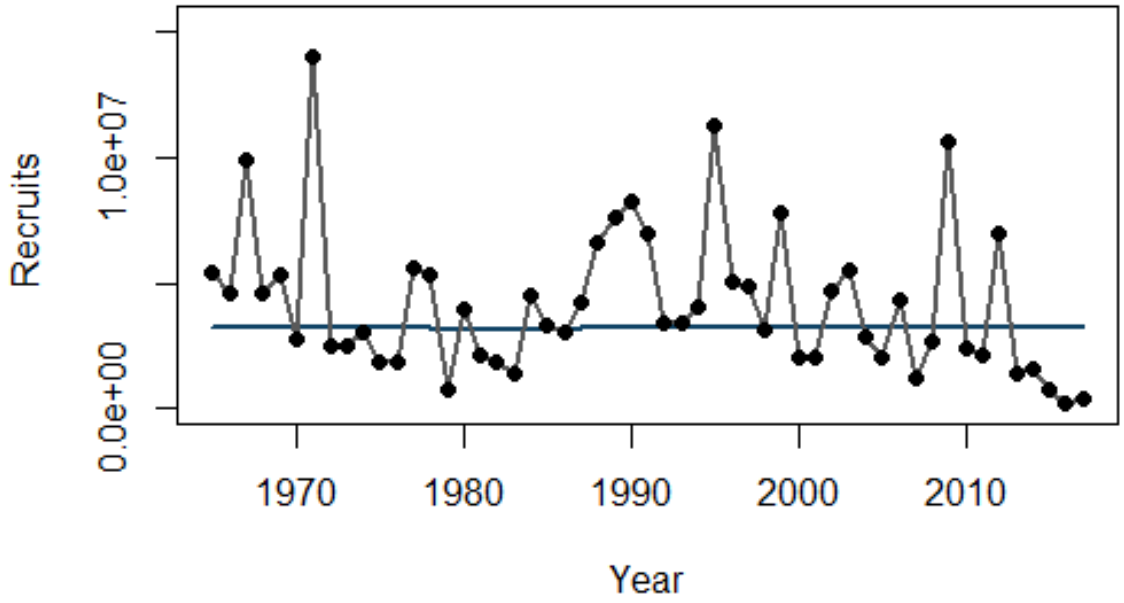




The 2018 assessment used the same model as was previously used, an Age Structured Assessment Model (ASAP) with several structural changes. One important change was a change in natural mortality (M). Natural mortality was previously thought to vary by time and age, but this assessment concluded that M should be held constant for all years and ages (set at 0.35).

When these modifications were made the 2017 SSB was estimated to be 141,473 mt (80% probability interval: 114,281-182,138), and ranged from 53,084 mt in 1982 to 1,352,700 mt in 1967. Total biomass in 2017 was 239,470 mt. The time series range for total biomass was from 169,860 mt in 1982 to 2,035,800 mt in 1967. The average F between ages 7 and 8 was used for reporting results related to fishing mortality (F7-8) because these ages are considered fully selected by the mobile gear fishery, which has accounted for most of the landings since 1986. F7-8 in 2017 equaled 0.45 (80% probability interval: 0.32-0.57), with a time series range from 0.13 in 1965 to 1.04 in 1975.

The assessment found that age-1 recruitment has been below average since 2013. The time series high of 1.4 billion age-1 fish was estimated in 1971. The estimates for 2009 and 2012 are of relatively strong cohorts, as in previous assessments. The time series low of 1.7 million fish occurred in 2016, and the second lowest of 3.9 million fish occurred in 2017, although the 2017 estimate is highly uncertain. Four of the six lowest annual recruitment estimates have occurred since 2013 (2013, 2015, 2016, and 2017).



The estimated numbers at age in 2017 indicate that the population is characterized by more age 6 fish than age 1 and age 2 fish combined. This result suggests a reliance on the ageing 2011 cohort (age 6 in 2017). If the estimated record low recruitments in recent years hold true, then the SSB is likely to remain relatively low and put the stock at relatively high risk of becoming

overfished in 2019 and beyond. Without improved recruitment, the probability of overfishing under recent catch levels is estimated to be high.

Previous assessments concluded that there is likely sub-stock structure unaccounted for in the assessment, but that there is no ability to distinguish mixed survey and fishery catches to stock of origin. This lack of information on stock of origin precludes accounting for the sub-stock structure. An attempt was made to use an assessment model (Stock Synthesis) that accounted for stock structure on a coarse level (i.e., inside and outside of Gulf of Maine), but estimating area-specific recruitment and movement rates required unrealistic assumptions and the model generally performed poorly (e.g., poor convergence). The consequences of not accounting for stock structure are unclear, which makes it unclear if the stock definition requires modification. More certain, however, is that changing the stock definition and accounting for stock structure in the assessment is currently not possible. Continued research on the topic is warranted.

The assessment concluded that although Atlantic herring was not overfished and overfishing was not occurring in 2017, the stock was declining due to poor recruitment of herring into the population. The final assessment summary report is available on the Northeast Fisheries Science Center website (www.nefsc.noaa.gov/publications/).

The assessment projected that poor recruitment of Atlantic herring would likely result in a substantial decline in biomass, but that the biomass should increase after reaching a low in 2019 if recruitment returns to historic average levels. The SAW/SARC concluded that vast reductions in allowable catch would have to be implemented for the herring fishery from 2018-2021 in order to reduce the risk of overfishing and to allow the stock to rebound.

At the request of the Council, NMFS reduced the 2018 total allowable catch to 49,900 mt in August 2018 to lessen the risk of overfishing in 2018. That action reduced the sub-ACLs for the four herring management areas but did not reduce other specifications. NMFS set levels based on the newly projected OFL for 2018 out of precaution to prevent overfishing while allowing the fishery to achieve OY.

At its September 2018, meeting, after reviewing the 2018 SAW/SARC results and recognizing that action must be taken to reduce the risk of overfishing in 2019, the Council requested NMFS use an in-season adjustment to reduce 2018 specifications for 2019 to prevent overfishing and lower the risk of the stock becoming overfished.

5.2.2 Specification of OFL, ABC, ACL, and OY

Based on the best available science, NMFS would reduce the OFL for 2019 to 30,688 mt. The Herring FMP specifies that the OFL must be equal to catch resulting from applying the maximum fishing mortality threshold to a current or projected estimate of stock size. When the stock is not overfished and overfishing is not occurring, this is usually the fishing rate supporting maximum sustainable yield. Catch that exceeds this amount would result in overfishing. An OFL of 30,388 mt would ensure at least a 50% probability of preventing overfishing in 2019.

This OFL is based on projections by the SAW/SARC, as updated by NOAA's NEFSC staff using 2018 catch, and was recommended by both the SSC and the Council.

The Herring FMP specifies that the ABC may be equal to or less than the OFL depending on scientific uncertainty concerning stock size estimates, variability around recruitment estimates, and consideration of ecosystem issues. For the 2019 ABC reduction, NMFS would continue applying the interim control rule that was used to set ABC in recent specifications (2016-2018). The ABC would have a 50% probability of preventing overfishing in 2019 and would be set equal to the OFL. In contrast, the SSC and Council recommended reducing the ABC for 2019 based on the new control rule the Council adopted in Amendment 8 that accounts for herring's role in the ecosystem. The proposed ABC is 30,688 mt and the SSC/Council recommended ABC is 21,266 mt.

The proposed ABC prevents overfishing and accounts for scientific uncertainty in the short-term until NMFS is able to consider the Council's recommendation for addressing scientific uncertainty in a long-term control rule in Amendment 8. The approach to continue using the interim control rule for 2019 is independent of and involves different considerations than NMFS's consideration of the Council's recommended control rule in Amendment 8. NMFS expects the Council to submit Amendment 8 for review and approval in late 2018. Additionally, while the 2018 assessment showed that the probability of the stock becoming overfished has increased since the last stock assessment, the proposed ABC is intended to reduce the risk of the stock becoming overfished.

NMFS is proposing to maintain the current management uncertainty buffer (6,200 mt), as recommended by the Council, so the resulting ACL would be 24,488 mt. This ACL is almost 10,000 mt higher than the ACL that would result from the Council-recommended ABC (15,065 mt). Allowing this additional harvest helps to achieve OY by accounting for social, economic, and ecological factors, specifically the need to conserve herring biomass while mitigating severe economic hardship on the herring industry. Because the majority of herring catch is bait for the lobster fishery, we expect this additional harvest to help minimize the negative economic impacts associated with bait shortages and higher bait prices on the lobster fishery. The management uncertainty buffer, in conjunction with low fishery closure thresholds (95% of the ACL and 92% of a sub-ACL), has prevented herring catch from ever exceeding the ABC, which further minimizes the probability of overfishing.

5.2.3 Specification of DAH, DAP, BT, and USAP

The Atlantic Herring FMP specifies that domestic annual harvest (DAH) will be set less than or equal to OY and will be composed of domestic annual processing (DAP) and the amount of Atlantic herring that can be taken in U.S. waters and transferred to Canadian herring carriers for transshipment to Canada (BT). Domestic annual harvest (DAH) is established based on the expected catch from U.S. fishing vessels during the upcoming fishing year and equals OY for the U.S. fishery.

Stockwide ACL = OY = DAH

The Herring FMP, as modified in Amendment 4, also specifies that domestic annual harvest (DAH) will be composed of domestic annual processing (DAP) and the amount of Atlantic herring that can be taken in U.S. waters and transferred to Canadian herring carriers for transshipment to Canada (BT).

DAH = DAP + BT

Much of the description of how DAH/OY was set in previous years is also applicable here, and is contained in section 4.2 of the 2016-2018 Herring Specifications EA. In prior years when considering the DAH specification, the Council has evaluated the harvesting capacity of the herring fleet and determined that the herring fleet is capable of fully utilizing the available yield from the fishery. Therefore, NMFS will maintain the status quo and DAH specification for the 2019 fishing years is proposed to be equal to the ACL.

Domestic Annual Processing (DAP) is defined in the Herring FMP as the amount of U.S. harvest that domestic processors will use, combined with the amount of the resource that will be sold as fresh fish (including bait). DAP was set equal DAH minus 4,000 mt for BT during the 2016-2018 fishing years and in prior specifications.

Processing, with respect to the Atlantic herring fishery, is defined in the regulations as *the preparation of Atlantic herring to render it suitable for human consumption, bait, commercial uses, industrial uses, or long-term storage, including but not limited to cooking, canning, roe extraction, smoking, salting, drying, freezing, or rendering into meat or oil.* The definition of processing does not include trucking and/or transporting fish.

While it is difficult to predict whether or not the U.S. processing sector will utilize all of the available DAP in 2019, it is certainly possible given the capacity of the domestic processing sector. Therefore, the DAP specification for the 2019 fishing year is proposed to be equal to the DAH specification minus the BT specification.

The Border Transfer specification represents U.S. herring transshipped to Canada via Canadian carrier vessels and used for human consumption. This specification is not a set-aside; rather, it represents a maximum amount of Atlantic herring caught from Area 1A that can be transshipped to Canadian vessels for human consumption. NMFS tracks BT utilization through a dealer code. Specification of BT has remained at 4,000 mt since the implementation of the Herring FMP, and there was no change for the 2016-2018 fishing years. However, given the catch reductions necessary for 2019 and beyond, the Council recommended setting the BT at 0 mt as a way to ensure all herring caught in U.S. waters are available to U.S. Federal dealers for lobster bait or human consumption. Therefore, the BT specification is proposed to be reduced to 0 mt for the 2019 fishing year.

The Atlantic Herring FMP states that “part of DAP may be allocated for at-sea processing by domestic vessels that exceed the vessel size limits.” This allocation is the U.S. at-sea processing

(USAP) allocation. The term 'at-sea processing' refers to processing activities that occur in the Exclusive Economic Zone outside State waters. When determining this specification, the Council considers the availability of other processing capacity, development of the fishery, status of the resource, and opportunities for vessels to enter the herring fishery." The USAP specification serves as a cap for USAP activities and is not a specific allocation to this processing sector.

During the 2007-2009 fishing years, the Council maintained a USAP specification of 20,000 mt (Areas 2/3 only) based on information received about a new at-sea processing vessel that intended to utilize a substantial amount of the USAP specification. At that time, landings from Areas 2 and 3 – where USAP is authorized – were considerably lower than allocated sub-ACLs for each of the past several years. Moreover, the specification of 20,000 mt for USAP did not restrict either the operation or the expansion of the shoreside processing facilities during the 2007-2009 fishing years. However, this operation never materialized, and none of the USAP specification was used during the 2007-2009 fishing years. Consequently, the Council set USAP at zero since the 2010-2012 specifications. The Council has not received any information that would suggest changing this specification for the 2019 fishing year. Therefore, the specification of USAP for the 2019 fishing years is proposed to remain at 0 mt.

5.2.4 Specification of Management Area Sub-ACLs

Although the ACL proposed for 2019 is substantially less than in previous specifications, NMFS is proposing to maintain the status quo method to allocate the ACL to the management area sub-ACLs in 2019. These sub-ACL allocations were recommended by the Council for past specifications, as well as for 2019, because they do not substantially impact one stock component (inshore versus offshore) more than the other while maximizing opportunities for the fishery to achieve OY. Additionally, the 2018 stock assessment does not suggest that there is a biological basis to modify the distribution of the ACL. To this end, the status quo approach for specifying herring sub-ACLs for 2019 is proposed by NMFS (Table 8). NMFS is also proposing to maintain the same seasonal (monthly) seasons/divisions of the Area 1A and Area 1B sub-ACLs as previous specifications.

Table 8: Maintain Proportional Distribution of Atlantic Herring Sub-ACLs in 2019

	2016-2018	2019
OFL (mt)	138,000/117,000/111,000	30,688
ABC (mt)	111,000	30,688
ACL (mt)	104,800	24,488
Sub-ACL Area 1A	**30,300 (28.9%)**	**7,077 (28.9%)**
Sub-ACL Area 1B	**4,500 (4.3%)**	**1,053 (4.3%)**
Sub-ACL Area 2	**29,100 (27.8%)**	**6,808 (27.8%)**
Sub-ACL Area 3	**40,900 (39%)**	**9,550 (39%)**
RSA	**3%**	**3%**
FGSA	**295**	**64**

Proposed Seasonal (Monthly) Sub-ACL Divisions (2016-2018)

- Area 1A: 0% January-May; 100% June-December;
- Area 1B: 0% January-April; 100% May-December

Normally, sub-ACL catches are adjusted based on overages/underages from the last complete year of data available (e.g. 2019 sub-ACLs would be adjusted based on 2017 overages/underages). The ACL would not be adjusted, consistent with Framework 2 to the Atlantic Herring FMP. Total catch in 2017 did not reach or exceed any of the management area sub-ACLs, so typically NMFS would carryover those underages, or a portion of the underages, to increase sub-ACLs in 2019. However, to help ensure catch does not exceed the ABC/OFL in 2019 and to help prevent overfishing, NMFS is proposing to not increase any sub-ACLs in 2019 based on carryover from underages in 2017.

5.2.5 Specification of RSA

The RSA process is a competitive grants process administered by the NEFSC, whereby incoming RSA proposals from the public are reviewed and ranked. NMFS is proposing to maintain RSA at 3% of each sub-ACL for 2019 consistent with the 2016-2018 specifications. Establishing RSA for 2019 to support RSA priorities identified by the Council is consistent with goals, objectives, and long-term management strategies in the Herring FMP.

5.2.6 Specification of FGSA

Amendment 1 to the Herring FMP allows the Council to set-aside up to 500 metric tons of the Area 1A sub-ACL until November 1 for fixed gear fishermen fishing West of Cutler, ME. The FGSA was set at 295 mt in the 2016-2018 specifications. Table 15 in the 2016-2018 Herring Specifications EA provides herring catch estimates from the fixed gear fishery through 2013. According to Table 15, none of the FGSA has been utilized since 2012 and it has all been returned to the Area 1A fishery after November 1. Additionally, fixed gear landings tracked

against the set-aside have averaged less than 12 mt in the past 5 years. At its September 2018 meeting, the Council recommended that NMFS proportionally reduce the FGSA. Therefore, NMFS proportionally reduced the FGSA relative to the Area 1A sub-ACL. This results in a 2019 FGSA of 64 mt.

5.3 ALTERNATIVES CONSIDERED BUT REJECTED

NMFS considered two additional alternatives that are not analyzed in this document. Both alternatives revised the method to allocate the ACL to the management areas to affect the sub-ACLs. In particular, those alternatives would have allocated a higher percentage of the ACL to the Area 1A sub-ACL compared to previous specifications (2013-2018). However, NMFS rejected these alternatives because adjusting the sub-ACL allocations for the herring management areas may have biological or economic impacts beyond those considered in this action. Allocating more fish to Area 1A has to the potential to economically benefit purse seine vessels, but economic benefit to bottom trawl or midwater trawl vessels may be minimal. The current range of alternatives, in particular Alternative 3, are intended to provide economic benefit to the entire fishery with similar impacts across gear types.

6.0 AFFECTED ENVIRONMENT

The affected environment was described in Section 6.0 of the 2016-2018 Herring Specifications EA and is incorporated here by reference and remains unchanged. This section supplements the description of the managed resources in Section 6.1 of the 2016-2018 Herring Specifications EA with more recent information about the stock status for Atlantic herring.

As described in Section 5.2.1, the Atlantic herring stock was most recently assessed during the 65th Stock Assessment Workshop in June of 2018. The 2018 assessment used all the same data sources used in the previous assessment (NMFS spring, fall and summer shrimp bottom trawl survey) with the addition of an acoustic time series collected during the NMFS fall bottom trawl survey of age 3+ herring abundance. SSB generally declined from 1965 to a time series low in 1978 and then generally increased from 1978 through the mid-90s. SSB declined again from 1997 to 2010, increased for several years until 2014, and has been decreasing since. Fishing mortality was reported to be stable and low since 2009, equaling the time series low in 2014.

The 2018 assessment used the same model as was previously used, an Age Structured Assessment Model (ASAP) with several structural changes. One important change was a change in natural mortality (M). Natural mortality was previously thought to vary by time and age, but this assessment concluded that M should be held constant for all years and ages (set at 0.35).

When these modifications were made the 2017 SSB was estimated to be 141,473 mt (80% probability interval: 114,281-182,138), and ranged from 53,084 mt in 1982 to 1,352,700 mt in 1967. Total biomass in 2017 was 239,470 mt. The time series range for total biomass was from 169,860 mt in 1982 to 2,035,800 mt in 1967. The average F between ages 7 and 8 was used for reporting results related to fishing mortality (F7-8) because these ages are considered fully

selected by the mobile gear fishery, which has accounted for most of the landings since 1986. F7-8 in 2017 equaled 0.45 (80% probability interval: 0.32-0.57), with a time series range from 0.13 in 1965 to 1.04 in 1975.

The estimated numbers at age in 2017 indicate that the population is characterized by more age 6 fish than age 1 and age 2 fish combined. This result suggests a reliance on the ageing 2011 cohort (age 6 in 2017). If the estimated record low recruitments in recent years hold true, then the SSB is likely to remain relatively low and put the stock at relatively high risk of becoming overfished in 2019 and beyond. Without improved recruitment, the probability of overfishing under recent catch levels is estimated to be high.

Previous assessments concluded that there is likely sub-stock structure unaccounted for in the assessment, but that there is no ability to distinguish mixed survey and fishery catches to stock of origin. This lack of information on stock of origin precludes accounting for the sub-stock structure. An attempt was made to use an assessment model (Stock Synthesis) that accounted for stock structure on a coarse level (i.e., inside and outside of Gulf of Maine), but estimating area-specific recruitment and movement rates required unrealistic assumptions and the model generally performed poorly (e.g., poor convergence). The consequences of not accounting for stock structure are unclear, which makes it unclear if the stock definition requires modification. More certain, however, is that changing the stock definition and accounting for stock structure in the assessment is currently not possible. Continued research on the topic is warranted.

The assessment concluded that herring was not overfished and overfishing was not occurring in 2017. It projected that poor recruitment of herring would likely result in a substantial decline in biomass, but that the biomass should increase after reaching a low in 2019 if recruitment returns to historic average levels. The SAW/SARC concluded that vast reductions in allowable catch would have to be implemented for the herring fishery from 2018-2021 in order to reduce the risk of overfishing and to allow the stock to rebound. The final assessment summary report is available on the Northeast Fisheries Science Center website (www.nefsc.noaa.gov/publications/).

7.0 IMPACTS OF PROPOSED MANAGEMENT ACTION AND OTHER ALTERNATIVES

In this section, the impacts of the proposed 2019 Atlantic herring fishery specifications are evaluated and discussed relative to each of the valued ecosystem components (VECs) described in the Affected Environment (Section 6.0). The impacts of the no action alternative and non-preferred alternative considered by NMFS are also described in this section.

In general, the descriptive and analytic components of this document are constructed in a consistent manner. The Affected Environment section for this action updates the biological and management history related to each VEC since the implementation of Amendment 1 to the Atlantic Herring FMP (in 2006) through Amendment 5 (finalized by the Council in 2013). The Affected Environment section is designed to enhance the readers' understanding of the baseline

conditions and recent trends in order to fully understand the anticipated environmental impacts of the management measures under consideration in this management action. The impacts of the proposed 2019 herring specifications are assessed in the following sub-sections of this document using a similar structure to that found in the Affected Environment.

To enhance clarity and maintain consistency, the terms described in Table 9 are used to summarize the impacts of each alternative/option on the VECs in this document. In some instances (although less common), impacts on a VEC may be characterized as mixed, particularly if there may be both positive and negative impacts resulting from a management measure. If it is determined there is no impact, the reasons for making such a determination are provided in the discussion.

7.1 BACKGROUND INFORMATION

The general impacts to VECs for the 2016-2018 specifications are described in the 2016-2018 Herring Specifications EA and are not repeated here. This SEA analyzes the impacts of the alternatives described in Section 5.0. These alternatives specify catch limits and set-asides for the 2019 Atlantic herring fishery. NMFS developed these measures in order to prevent overfishing of herring in 2019, which is likely to occur if the 2018 specifications (which roll over and become effective in January 2019) remain in place.

As described in Section 7.0, aspects of the human environment likely to be directly or indirectly affected by the actions proposed in this document are referred to as VECs. The aspects of the VECs that could be affected by the proposed action are described in Section 6.0 of the 2016-2018 Herring Specifications EA. Specifically, the VECs include the managed resource (Atlantic herring) and any non-target species; habitat, including EFH for the managed resource and non-target species; ESA and MMPA protected species; and human communities. The analysis in this section focuses on impacts of Alternatives 1-3 relative to each VEC.

In the following sections, as in the 2016-2018 Herring Specifications EA, the direction of the impacts on each of the VECs are described as negative, no impact, or positive. If the magnitude of the impact is expected to be moderate, the impact is described as such, with a directional indicator. If the magnitude of the impact is expected to be minor, the impact is described as “slight”, as in slight negative or slight positive. If the magnitude of the impact is expected to be substantial, the impact is described as “high”, as in high positive or high negative. If there is some degree of uncertainty associated with the impact, it is described as “likely”. More information on how impacts to the VECs are described in shown in Table 9.

Table 9. General definitions for impacts and qualifiers relative to resource condition (i.e., baselines).

General Definitions				
VEC	**Resource Condition**	**Impact of Action**		
		Positive (+)	Negative (-)	No Impact (0)
Target and non-target Species	Overfished status defined by the MSA	Alternatives that would maintain or are projected to result in a stock status above an overfished condition*	Alternatives that would maintain or are projected to result in a stock status below an overfished condition*	Alternatives that do not impact stock / populations
ESA-listed protected species (endangered or threatened)	Populations at risk of extinction (endangered) or endangerment (threatened)	Alternatives that contain specific measures to ensure no interactions with protected species (i.e., no take)	Alternatives that result in interactions/take of listed species, including actions that reduce interactions	Alternatives that do not impact ESA listed species
MMPA protected species (not also ESA listed)	Stock health may vary but populations remain impacted	Alternatives that maintain takes below PBR and approaching the Zero Mortality Rate Goal	Alternatives that result in interactions with/take of marine mammals that could result in takes above PBR	Alternatives that do not impact MMPA protected species
Physical environment / habitat / EFH	Many habitats degraded from historical effort and slow recovery time (see condition of the resources table for details)	Alternatives that improve the quality or quantity of habitat or allow for recovery	Alternatives that degrade the quality/quantity or increase disturbance of habitat	Alternatives that do not impact habitat quality
Human communities (socioeconomic)	Highly variable but generally stable in recent years (see condition of the resources table for details)	Alternatives that increase revenue and social well-being of fishermen and/or communities	Alternatives that decrease revenue and social well-being of fishermen and/or communities	Alternatives that do not impact revenue and social well-being of fishermen and/or communities

	Impact Qualifiers	
A range of impact qualifiers is used to indicate any existing uncertainty	Negligible	To such a small degree to be indistinguishable from no impact
	Slight (sl), as in slight positive or slight negative	To a lesser degree / minor
	Moderate (M) positive or negative	To an average degree (i.e., more than “slight”, but not “high”)
	High (H), as in high positive or high negative	To a substantial degree (not significant unless stated)
	Significant (in the case of an EIS)	Affecting the resource condition to a great degree, see 40 CFR 1508.27.
	Likely	Some degree of uncertainty associated with the impact

*Actions that will substantially increase or decrease stock size, but do not change a stock status may have different impacts depending on the particular action and stock. Meaningful differences between alternatives may be illustrated by using another resource attribute aside from the MSA status, but this must be justified within the impact analysis.

Throughout Section 7.0, the preferred alternative (Alternative 3) is compared Alternatives 1 and 2, and the current environmental baseline conditions. As described in Section 5.1.1, Alternative 1 represents the specifications that will roll over from 2018 and become effective for 2019. The baseline conditions are the current conditions of the VECs (i.e., resource and socio/economic conditions). More information on the baseline conditions for the VECs (i.e., affected environment) can be found in Section 6.0 of the 2016-2018 Herring Specifications EA.

To facilitate the comparison of the expected impacts of the alternatives, Table 10 below compares the proposed 2019 limits (Alternative 3) to the 2018 original specifications, the 2019 Alternative 1 (equal to 2018 adjusted specifications), and 2019 Alternative 2.

Table 10: Specifications (in mt) under the three alternatives for 2019, with percent difference from the 2018 original and 2018 adjusted limits.

Measure	2018 Original	2018 Adjusted/ 2019 Alternative 1	2019 Alternative 2	2019 Alternative 3 (Preferred
OFL	111,000	111,000	30,688	30,688
ACL	104,800	49,900	15,065	24,488
% from 2018 Original	0.0%	-52.4%	-85.6%	-76.6%
% from 2018 Adjusted/ 2019 Alternative 1		0.0%	-69.8%	-50.9%
Difference (mt) between Alternatives 2 and 3			9,423 mt less	9,423 mt more
% Difference between Alternatives 2 and 3			-38.5%	+62.5%

Changes in catch limits can result in changes in fishing effort. The direction and magnitude of the change is dependent on factors such as fish abundance and availability and how the fishery responds to changes in regulations. The extent of interactions between fishing gear and habitat and other non-target species, including protected species, is related to fishing effort. The magnitude of the change in effort that results from changes in catch limits and availability is difficult to quantify; however, as described in the following sections, it is not expected to be highly significant for the alternatives presented here. The following section describes the general direction of impacts in response to these two factors in order to better describe the expected impacts from the alternatives.

A decrease in effort may result in positive impacts as a result of fewer encounters with non-target, ESA and MMPA-protected species, and fewer gear impacts on habitat. Conversely, an

increase in effort may result in negative impacts on these VECs. A finding of "no impact" could result from negligible changes in effort. Implementing status quo measures in a future year may result in a negligible or no impact; however, the impacts could be different (positive or negative) if the future environmental conditions have changed. Some negative effects on non-target species resulting from increases in fishing effort in the recreational fishery could be offset by the use of ethical angler practices such as using proper catch and release techniques and use of gear which minimizes mortality on non-target species. Some negative impacts could be minimized if commercial fishermen avoid non-target species.

A general evaluation of changes in fishing effort in response to quota levels and fish availability is shown in Table 11. It is important to note that fishing effort is influenced by many factors besides catch limits and fish availability, thus future fishing effort may not respond as predicted. Many factors influence demand for fishing trips and the behavior of fishermen, such as changes in fishing site and trip characteristics, travel costs, catch rates, available species, fishery management policies, and other characteristics. Limited data are available to address many of these factors. This makes evaluation of changes in fishing behavior difficult and complex, and makes it difficult to predict how fishing effort will change each year.

Table 11. Changes in fishing effort as a result of adjustments to quota and/or fish availability

Change in quota	Change in fish abundance/availability		
	Decrease in availability	**No change in availability**	**Increase in availability**
Decrease in quota	**A)** Fishing effort (number of trips) may decrease as a result of a decrease in quota; however, because of the decrease in availability (trips catching fewer fish), fishermen may need to take additional trips to offset the lower catch per unit effort (CPUE); managers may reduce trip limits or adjust regulations that extend the fishing season and affect effort; therefore fishing effort may be the same or increase.	**B)** Fishing effort may decrease as a result of a decrease in quota under similar availability (trips catching similar amounts of fish); however, managers may reduce trip limits or adjust regulations that extend the fishing season and affect effort; therefore fishing effort may be the same or decrease.	**C)** Fishing effort may decrease as a result of a decrease in quota; likewise under increased availability (trips catching more fish), effort may decrease; however, managers may reduce trip limits or adjust regulations that extend the fishing season and affect effort; therefore fishing effort may be the same or decrease.
No change in quota	**D)** Fishing effort may remain the same as the quota has not changed; however, because of the decrease in availability (trips catching fewer fish), fishermen may need to take more trips to catch the same amount of fish; therefore fishing effort may be the same or increase.	**E)** Fishing effort may remain the same given the quota has not changed and availability is expected to be similar.	**F)** Fishing effort may remain the same as the quota has not changed; however, because of the increase in availability (trips catching more fish), fishermen may be able to catch the same amount of fish with fewer trips thus decreasing effort; therefore fishing effort may be the same or decrease.
Increase in quota	**G)** Fishing effort may increase in response to the increase in quota; because of the decrease in availability (trips catching fewer fish), fishermen may need to take more trips to catch the same amount of fish; however, managers may increase trip limits or adjust regulations in response to the higher quota allowing fewer trips to catch more fish; therefore, fishing effort may be the same or increase.	**H)** Fishing effort may increase in response to the increase in quota under similar fish availability due to fishermen taking more trips to catch the quota; however, managers may increase trip limits or adjust regulations in response to the higher quota allowing fewer trips to catch more fish; therefore, fishing effort may be the same or increase.	**I)** Fishing effort may increase in response to the increase in quota; because of the increase in availability (trips catching more fish), fishermen may be able to catch the same amount of fish with fewer trips thus decreasing effort; managers may increase trip limits or adjust regulations, but this may be offset by higher CPUE; therefore, fishing effort may be the same or decrease, depending on the combination of factors.

7.2 IMPACTS OF THE ALTERNATIVES ON THE HERRING RESOURCE AND NON-TARGET SPECIES

The specification alternatives analyzed in the 2016-2018 Herring Specifications EA have potential insignificant biological impacts ranging from negative to positive. The 2019 alternatives analyzed below fall within this range, with potential biological impacts ranging from negative to positive. For 2019, the preferred alternative (Alternative 3) includes higher catch limits than Alternative 2, but lower catch limits than Alternative 1 (no action). Therefore, Alternative 3 would be expected to have the second highest potential for overall positive biological impacts, as it has the second greatest potential to prevent overfishing.

The three alternatives for 2019 have potential impacts on herring and non-target species that range from high negative to moderate positive relative to the current condition of the VEC. For herring, Alternative 1 is expected to have a high negative impact, while Alternatives 2 and 3 will have positive impacts, though to varying degrees. Alternative 1 is expected to result in overfishing, while Alternatives 2 and 3 are expected to maintain or improve the stock status and result in a biomass estimate well over the target biomass.

The alternatives are unlikely to have a meaningful impact on non-target species caught in the herring fishery. Most of the species that are caught on herring trips have a positive stock status, and those that do not are caught either caught in very small quantities and/or are constrained by catch caps. Given the likelihood that effort is expected to substantially decrease under both Alternative 2 and 3, these alternatives are likely to have slight positive impacts on non-target species. Alternative 1 is likely to result in effort similar to 2018 for 2019, and is expected to have a slight positive impact on non-target species.

Under each of these alternatives, the catch limits are likely to be achieved, and are therefore likely to constrain catch in 2019. Thus, the overall biological impacts on herring and non-target species are expected to be positive for Alternatives 2 and 3; impacts under Alternative 1 are expected to be positive (slight) for non-target species and negative for herring because of the likelihood of overfishing. Alternative 2 (most restrictive) would be expected to have moderately more positive impacts compared to Alternative 3 given the current need for conservation of the herring stock.

The primary non-target species in the directed herring fishery are groundfish (particularly haddock, but also occasionally cod, pollock, etc.) and the river herring/shad (RH/S) species. Spiny dogfish, squid, butterfish, Atlantic mackerel are also common non-target species in the directed Atlantic herring fishery (mackerel and some other non-target species catch is often landed and sold). Comprehensive information about the catch of these species in the Atlantic herring fishery can be found in Section 5.2 of the FEIS for Amendment 5 and Sections 3.2 (River Herring/Shad) and 3.3 (Other Non-Target Species) of Framework 3 to the Atlantic Herring FMP. River herring and shad are non-target species of particular concern, and catch of RH/S in the directed Atlantic herring fishery is managed through gear and area-specific catch caps were set

for 2016-2018 specifications and will be unchanged for 2019. In cases where RH/S stocks are depleted, none of these alternatives are expected to change that stock status.

7.2.1 Alternative 1 (No Action)

7.2.1.1 Atlantic Herring

The 2018 stock assessment and subsequent projections from the NEFSC indicate that including 2018 catch projections, herring SSB will drop from 79,673 mt in 2018 to 46,095 mt in 2019. If Alternative 1 goes into effect, it will allow herring catch of 49,900 mt, which is substantially higher than the OFL of 30,688 mt. The catch limits are approximately double those of the Preferred Alternative (Alternative 3), and are more than three times higher than those allowed in Alternative 2. This alternative would have high negative impacts for herring, because it would likely result in exceeding F_{MSY} and may result in putting the stock in an overfished state.

Because the stock is already at risk of overfishing due to poor recruitment over the past five years, allowing fishing in excess of the OFL has potential to devastate the remaining herring stock. Alternative 1 is expected to have a high negative impact on the herring resource when compared to the current resource condition given that it would likely lead to a change in the current stock status for herring.

Relative to the other alternatives, Alternative 1 is likely to be more negative than either Alternative 2 or 3. This is the only alternative that would be likely to exceed the OFL, and has the potential to do so by a wide margin. Alternative 1 would be more negative than the other alternatives because those alternatives would likely result in lower fishing effort and catch, and leave more of herring resource unfished.

7.2.1.2 Non-Target Species

Under Alternative 1, the 2019 herring OFL and ABC would remain at 111,000 mt, and the ACL would remain at 49,900. These specifications are within the range of analysis that was used in development of the 2016-2018 specifications, and the catch allowance is approximately equivalent to the amount of catch in 2017 and the projected catch in 2018. Because the seasonal/spatial distribution of herring catch and fishing effort would not change from 2016-2018 levels, and due to the continuing management of non-target species catch in the herring fishery and ongoing efforts to avoid/minimize bycatch, this alternative is not expected to alter the biological status of any non-target species.

Overall, Alternative 1 is expected to have a slight positive on non-target species (with the exception of depleted stocks of RH/S) relative to the current condition of the non-target species. Relative to the other alternatives, Alternative 1 is expected to have more negative impacts on non-target species than those from Alternatives 2 and 3. This is due to the projection that catch and effort would be much higher under Alternative 1, and that would likely result in more catch of non-target species.

7.2.2 Alternative 2 (Most Restrictive)

7.2.2.1 Atlantic Herring

For Alternative 2, the ABC would be reduced to 21,266 mt, which is calculated based on the Amendment 8 control rule. The resulting ACL would be 15,065 mt, which is approximately half the OFL of 30,688 mt. The ACL is also nearly 10,000 mt lower than Alternative 3 and 35,000 mt less than Alternative 1. This alternative would have moderate positive impacts for herring, because it would likely result in a catch level that is only half of the OFL, and would thus leave more of the herring SSB in the water to maintain and potentially expand the herring stock in future years.

Because the stock is at risk of overfishing due to poor recruitment over the past five years, providing a buffer from the OFL to restrict fishing effort and catch may be important to ensure that an adequate level of the herring resource is available to maintain or improve stock biomass. This alternative is the most restrictive to the fishery, but is the most conservative in managing the resource to promote future availability. Alternative 2 is expected to have a moderate positive impact on the herring resource when compared to the current resource condition given that it would result in a greater amount of unfished herring, which may result in higher herring biomass and improved stock status in future years.

Relative to the other alternatives, Alternative 2 is likely to be more positive than Alternatives 1 or 3. This alternative leaves a large buffer between the OFL and the ACL, which will leave a greater amount of herring resource unfished. Alternative 3 provides a smaller buffer between the ACL and OFL, while Alternative 1 exceeds the OFL. Alternative 2 would be more positive than the other alternatives that would allow greater fishery effort and catch, and result in lower herring biomass.

7.2.2.2 Non-Target Species

Under Alternative 2, the annual specification of the herring OFL and ABC would be reduced to at 30,688 mt and 21,266 mt respectively, and the ACL would be reduced to 15,065 mt. These limits are substantially reduced from the 2016-2018 specifications, and the catch allowance is approximately one-third of both the 2017 catch and the projected catch in 2018. Because the reduced effort and catch that would be projected to take place if Alternative 2 was implemented, it is not expected to negatively affect the biological status of any non-target species. Overall, Alternative 2 is expected to have slight positive impacts on non-target species (with the exception of depleted stocks of RH/S) as it will maintain the current condition of the non-target resources.

Relative to the other alternatives, Alternative 2 is expected to have more positive impacts than those from Alternatives 1 and 3. This is due to the projection that catch and effort would be much lower under Alternative 2 than the other alternatives, and that would likely result in less catch of non-target species.

7.2.3 Alternative 3 (Preferred)

7.2.3.1 Atlantic Herring

For preferred Alternative 3, the ABC would be set equal to the OFL (30,688 mt) and the resulting ACL would be 24,488 mt. This is equal to the OFL/ABC minus the management uncertainty buffer (6,200 mt). The ACL is nearly 10,000 mt higher than Alternative 2, but is about half of the ACL for Alternative 1. This alternative would have slight positive impacts for herring, because it would likely result in a catch level that is substantially below the OFL, therefore maintaining the current positive stock status and would thus leave a high amount herring SSB in the water to maintain and potentially expand the herring stock in future years.

Because the stock is at risk of overfishing due to poor recruitment over the past five years, providing a buffer from the OFL to restrict fishing effort and catch may be important to ensure that an adequate level of the herring resource is available to maintain or improve stock biomass. This alternative does provide a buffer for management uncertainty, but setting the ABC equal to the OFL does result in some risk of overfishing. However, because there is a 92% fishery closure buffer for each of the herring management areas and a 95% closures buffer for the ACL, it is very unlikely that the fishery would exceed the ACL, and even more unlikely that it would exceed OFL. Alternative 3 is expected to have a positive impact on the herring resource when compared to the current resource condition because it likely would result in herring catch below the OFL, which may result in higher herring biomass and improved stock status in future years.

Relative to the other alternatives, Alternative 3 is likely to be more positive than Alternative 1 but less positive than Alternative 2. This alternative is positive because it is not likely to exceed the OFL, which would maintain the positive stock status. Alternative 2 provides a greater buffer between the ACL and OFL, resulting in a more positive affect on the stock. Alternative 1 would likely result in catch that exceeds the OFL, so it is more negative.

7.2.3.2 Non-Target Species

Under preferred Alternative 3, the OFL and ABC would be reduced to 30,688 mt, and the ACL would be reduced to 24,488 mt. These limits are substantially reduced from the 2016-2018 specifications, and the catch allowance is approximately one-half of both the 2017 catch and the projected catch in 2018. Because the reduced effort and catch that would be projected to take place if Alternative 3 was implemented, it is not expected to negatively affect the biological status of any non-target species.

Overall, Alternative 3 is expected to have slight positive impacts on non-target species (with the exception of depleted stocks of RH/S) as it will maintain the current condition of the non-target resources.

Relative to the other alternatives, Alternative 3 is expected to have more positive impacts than those from Alternative 1, but less positive impacts than Alternative 2. This is due to the projection that catch and effort would be much lower under Alternative 2 than Alternative 1, but noticeably

higher than in Alternative 2. This would likely result in less catch of non-target species than Alternative 1, but more catch of non-target species than Alternative 2.

7.3 IMPACTS OF THE ALTERNATIVES ON THE PHYSICAL ENVIRONMENT

The three alternatives for 2019 are likely to have potential slight negative impacts on habitat and EFH. The herring fisheries operate in areas that have been fished for many years. Changes in quotas, and resulting possible changes in fishing effort under the alternatives in this action are unlikely to further degrade habitat beyond its current state. However, none of the alternatives are expected to result in any improvements to current habitat conditions, and continued or increased fishing effort does limit the recovery potential of currently degraded areas. Thus, all alternatives are expected to have slight negative impacts on habitat.

Because Alternatives 2 and 3 are expected to result in reduced fishing effort compared to the status quo, they are expected to have less negative impacts on habitat. Alternatives 1, which maintains the status quo for fishing effort, would be expected to have impacts on habitat that are slightly greater than those under Alternatives 2 and 3. Although each of the alternatives would likely have different impacts due to different levels of fishing effort, the effort would not meaningfully impact habitat recovery potential.

The vast majority of effort and catch in the herring fishery is by midwater trawl gear and purse seine gear. Both of these gears are considered pelagic, as they are not intended to contact the ocean floor. Therefore, their impact to habitat is limited. Over the past three years, about 5% of the yearly herring quota was harvested by vessels that fish with a bottom trawl. When fishing for herring, these vessels are likely to have greater impact on habitat than the other gear types. Given that herring fishing is largely carried out by vessels that fish off of the bottom and that all alternatives either hold current catch limits or reduce them, habitat impacts from the herring fishery under all three alternatives are expected to have a negligible impact relative to current habitat conditions.

7.3.1 Alternative 1 (No Action)

Because the ACL under this alternative would be the same as 2018 and mirror the catch totals from 2017, fishing effort is expected to remain at similar levels to those years. The areas fished for herring have been impacted by fishing operations in many fisheries over many years. This alternative is not expected to result in additional negative impacts to areas which are not already impacted by the herring and other fisheries. However, continued commercial fishing under this alternative does limit the recovery potential of impacted habitat areas, therefore slight negative impacts relative to current habitat conditions are expected under Alternative 1.

Thus, overall, Alternative 1 is expected to have slight negative impacts on habitat due to limited recovery potential. Alternative 1 is expected to result in levels of catch and effort that are similar to current levels. Changes in fishing effort are not expected under Alternative 1, but are expected under Alternatives 2 and 3, yet all three would have similar slight negative impacts on

habitat. Alternative 1 would be expected to have slightly more negative impacts compared to Alternatives 2 and 3, given that there would likely be greater fishing effort under this alternative.

7.3.2 Alternative 2 (Most Restrictive)

Alternative 2 includes a 70% decrease to the herring ACL compared to the status quo/no action alternative (Alternative 1) and a 38% decrease in ACL compared to the preferred alternative (Alternative 3). This alternative would likely result in slightly less negative habitat impacts when compared to the other alternatives because the reduced catch limits would likely result in reduced fishing effort, which would be expected to lead to reduced fishing time and thus fewer interactions between fishing gear and habitat. However, similar slight negative impacts to Alternatives 1 and 3 may occur under Alternative 2 given that the fishery is still expected to operate in the same areas, resulting in similar limited recovery potential. Overall, the expected impacts on habitat under this alternative are expected to be slightly negative relative to current habitat conditions.

The reduction in fishing effort associated with Alternative 2 is expected to be greater than under Alternatives 1 and 3, yet all three would have similar slight negative impacts on habitat. Alternative 2 would be expected to have slightly less negative impacts compared to Alternatives 1 and 3 given that this alternative is expected to allow the least fishing effort and catch.

7.3.3 Alternative 3 (Preferred)

Alternative 3 would result in a 49% decrease to the herring ACL compared to the status quo/no action alternative (Alternative 1), but would be a 63% increase in ACL compared to Alternative 2. This alternative would likely result in slightly less negative habitat impacts when compared to Alternative 1 because the reduced catch limits would likely result in reduced fishing effort, which would be expected to lead to reduced fishing time and thus fewer interactions between fishing gear and habitat. It would result in slightly more negative habit impacts than Alternative 2, because it is expected to be associated with greater fishing effort. However, similar slight negative impacts under Alternatives 1 and 2 may occur under Alternative 3 given that the fishery is still expected to operate in the same areas, resulting in similar limited recovery potential. Overall, the expected impacts on habitat under this alternative are expected to be slightly negative relative to current habitat conditions.

The reduction in fishing effort associated with Alternative 3 is expected to be fall between Alternatives 1 and 2, yet all three would have similar slight negative impacts on habitat. Alternative 3 would be expected to have slightly less negative impacts compared to alternative 1 and slightly more negative impacts compared to Alternative 2. This is because Alternative 3 is associated with an intermediate level of fishing effort and catch.

7.4 IMPACTS OF THE ALTERNATIVES ON PROTECTED RESOURCES

The Atlantic herring fishery primarily is composed of purse seine and midwater trawl vessels, with a smaller contribution from bottom trawl vessels. Protected species (ESA listed and MMPA protected) are known to interact with all of these gear types.

As described above in the introduction to section 7, the impacts on protected resources may vary between ESA-listed and MMPA-protected species. For ESA-listed species, any action that could result in take of ESA-listed species is expected to have negative impacts, including actions that reduce interactions. Under the MMPA, the impacts of alternatives would vary based on the stock condition of each protected species and the potential for each alternative to impact fishing effort. For marine mammal stocks/species that have their PBR level reached or exceeded, negative impacts would be expected from any alternative that has the potential to interact with these species or stocks. For species that are at more sustainable levels (i.e., PBR levels have not been exceeded), any action not expected to change fishing behavior or effort such that interaction risks increase relative to what has been seen in the fishery previously, may have positive impacts by maintaining takes below the PBR level and approaching the Zero Mortality Rate Goal. Taking the latter into consideration, the overall impacts on the protected resources VEC for each alternative takes into account impacts on ESA-listed species, impacts on marine mammal stocks in good condition (i.e., PBR level has not been exceeded), and marine mammal stocks that have reached or exceeded their PBR level.

Overall, all three alternatives will have potential impacts on protected resources ranging from slight positive to slightly negative, with no impact to slight positive impacts likely on non-ESA listed marine mammals, and a slight negative impact on ESA-listed species. Because effort is not expected to increase under Alternative 1 (no action), and is expected to decrease under Alternatives 2 and 3, all three of these alternatives would have similar magnitudes of slightly positive to slightly negative impacts on protected resources. Compared to the other alternatives, Alternative 2 may result in slightly less negative impacts due to the likely highest decrease in fishing effort under this alternative, which would result in the least potential for interactions with protected species.

MMPA (Non-ESA Listed) Species

The herring fishery is prosecuted in areas that overlap with the distribution of non-ESA listed species of marine mammals (cetaceans and pinnipeds). As a result, marine mammal interactions with fishing gear used to in the herring fishery are possible. Non-ESA listed species, which consist of species of cetaceans and pinnipeds (marine mammals), are known to interact with the Atlantic herring fishery (see Section 3.4.3 of the 2016-2018 Herring Specifications EA). Impacts of the no action alternative on non-ESA listed species are somewhat uncertain as quantitative analysis has not been performed. However, to the extent possible, available information on marine mammal interactions with commercial fisheries has been considered, including the Atlantic herring fishery (Waring *et al*. 2014, 2015; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html).

Aside from harbor porpoise and several stocks of bottlenose dolphin, there has been no indication that takes of non-ESA listed species of marine mammals in commercial fisheries has gone above and beyond levels which would result in the inability of each species population to sustain itself over the last 5 or more years (Waring *et al*. 2014, 2015). Specifically, aside from

harbor porpoise and several stocks of bottlenose dolphin, PBR has not been exceeded for any of the non-ESA listed marine mammal species identified in Section 6.4 of the 2016-2018 Herring Specifications EA (Waring *et al*. 2014, 2015)[1].

Although the available information on marine mammal interactions with fishing gear is a collective representation of commercial fisheries interactions with non-ESA listed species of marine mammals, and does not address the effects of the Herring FMP specifically, the information does demonstrate that to date, operation of the Herring FMP, or any other fishery, has not resulted in a collective level of take that threatens the continued existence of non-ESA listed marine mammal populations.

ESA Listed Species

The herring fishery primarily is prosecuted with purse seine and midwater trawl vessels, with a smaller contribution from bottom trawl vessels. As documented in Section 6.4 of the 2016-2018 Herring Specifications EA, ESA listed species interactions with the Atlantic herring fishery are rare to non-existent. A 2010 informal consultation that fully analyzed and considered the effects of the herring fishery on all ESA-listed species and designated critical habitat concluded that the herring fishery is not likely to interact with ESA-listed species, and is not likely to adversely affect ESA-listed species.

7.4.1 Impacts of Alternative 1 (No Action)

Based on this information, and the fact that voluntary measures exist that reduce serious injury and mortality to marine mammal species incidentally caught in trawl fisheries (see the Atlantic Trawl Gear Take Reduction Team), it is not expected that Alternative 1, which will maintain status quo conditions, will result in levels of take that will affect the continued existence of non-ESA listed species of marine mammals. Thus, given that Alternative 1 is not expected to significantly change fishing effort, the impacts of Alternative 1 on these non-ESA listed species of marine mammals are expected to be slight positive (i.e., continuation of current operating conditions is not expected to result in exceedance of any of these stocks/species PBR level). Based on this information overall, Alternative 1 is expected to have no impact to slight positive impacts on non-ESA listed species of marine mammals.

As Alternative 1 will maintain current operating conditions, this alternative would not modify fishing practices or increase fishing effort in a way that is expected to increase interactions with ESA-listed species. As interactions with ESA listed species over this time frame have remain rare to non-existent, Alternative 1 is not expected to introduce any new risks (e.g., changes in gear or effort) to ESA listed species that have not already been considered by NMFS since the

[1] Take reduction plans have been implemented for harbor porpoise (Harbor Porpoise Take Reduction Plan, effective January 1, 1999 (63 FR 71041)) and bottlenose dolphins (Bottlenose Dolphin Take Reduction Plan, effective April 26, 2006 (71 FR 24776)) to reduce bycatch in the fisheries affecting these species. These plans are still in place and are continuing to assist in decreasing bycatch levels for these species

2010 informal consultation for these species (NMFS 2012a,b, 2013, 2014a,b). As a result, the effects of the Alternative 1 on ESA listed species are expected to be slight negative to negligible.

7.4.2 Impacts of Alternative 2 (Most Restrictive)

Under Alternative 2, the herring ABC for 2019 would be 21,266 mt, based on the Herring Amendment 8 control rule, as recommended by the Council and the SSC. This is a 70% decrease in catch from the final 2018 allocation. When the ACL is distributed across the four management areas under this alternative, there are substantial differences in the management area sub-ACLs compared to sub-ACLs under Alternatives 1 or 3. Because fishing effort is expected to decrease and changes in the seasonal/spatial distribution of herring catch are not expected, the effects of Alternative 2 on ESA (slight negative to negligible) and non-ESA (no impact to moderate positive) listed species are expected to be less negative than those described for the no action alternative.

Compared to Alternatives 1 and 3, Alternative 2 is expected to have less negative impacts on protected species, since the effort and catch will likely be lower, resulting in a reduced chance of interacting with ESA and non-ESA listed species.

7.4.3 Impacts of Alternative 3 (Preferred)

Under Alternative 3, the herring ABC for 2019 would be 24,488 mt. This is a 49% decrease in catch from the final 2018 allocation. When the Atlantic herring ACL is distributed across the four management areas under this alternative, there are substantial differences in management area sub-ACLs when compared to sub-ACLs under Alternatives 1 or 2. Because fishing effort is expected to be lower than in 2018 and changes in the seasonal/spatial distribution of Atlantic herring catch are not expected, the effects of Alternative 3 on ESA (slight negative to negligible) and non-ESA (no impact to moderate positive) listed species are expected to be less negative than those described for the no action alternative.

As stated above, Alternative 3 is expected to have less negative impacts on protected species than Alternative 1. Effort and catch will likely be higher under Alternative 3 than under Alternative 2, resulting in a slightly greater chance of interacting with ESA and non-ESA listed species. Alternative 3 is expected to have more negative impacts than Alternative 2. Thus, the effects of Alternative 3 on ESA (slight negative to negligible) and non-ESA (no impact to moderate positive) listed species fall between Alternatives 1 and 2.

7.5 IMPACTS OF THE ALTERNATIVES ON HUMAN COMMUNITIES

The herring fishery had nearly the same catch in 2017 as what would be allowed under Alternative 1 (no action) and 2018 is on pace to harvest about the same amount (less than 50,000 mt). Therefore, NMFS expects that catch limits will be reached under any of these alternatives. Both Alternative 2 and 3 would likely result in substantially less catch than the fishery has recently harvested. It is difficult to estimate what the market price for herring will be, but declining herring catch in recent years has been associated with increased herring market prices. However, it is unknown if this trend will continue, and even if it does, it is very unlikely that the price increase would be enough to make up for the reduction in catch. Therefore, it is expected

that Alternative 1 would result in similar and negligible socioeconomic impacts compared to 2018, while Alternatives 2 and 3 would result in catch below recent landings and would result in negative socioeconomic impacts.

When comparing across the three alternatives for 2019, Alternatives 1 would have negligible short-term socioeconomic impacts while Alternatives 2 and 3 would result in negative short-term socioeconomic impacts. Short-term impacts are those that will be encountered in 2019, and may be felt for several more years. The short-term impacts under Alternative 2 would be high negative, and may reduce revenue enough that some industry members would not be able to afford to continue fishing. Alternative 3 is also expected to limit catch and revenue, but would be more likely allow more industry members to earn enough revenue to continue fishing. Therefore, Alternative 3 is likely to result in moderate negative short-term socioeconomic impacts to the fishery.

The long-term economic impacts of Alternative 1 are expected to be high negative. While the fishery in 2019 would likely have the highest catch than under any other alternatives, it would also substantially exceed the OFL for the fishery, which would result in excessive pressure on the already depleted herring resource. This alternative would overexploit the stock, and it could take years to recover from the damage done by allowing this level of catch. Both Alternatives 2 and 3 are likely to have mixed socioeconomic impacts in the long-term. Alternative 2 would allow the most protection for the herring resource, and would have a moderate positive impact on the resource because it would give it the best chance for an expedient recovery. However, the minimal level of catch in 2019 would have a high negative socioeconomic impact on some of the fishery, as it has potential to not allow for a viable herring fishery and the potential that some business may fail. If that is the case, those failed businesses would receive no long-term benefit from these catch restrictions. Similarly, Alternative 3 would have mixed socioeconomic impacts to the industry. It will provide moderate positive impacts to the resource because it would allow a level of fishing effort that is under the OFL, and would allow for the recovery of herring stock. However, it still may have the potential to prevent a viable herring fishery such that businesses fail if they are not able to generate adequate revenue. Therefore, long-term socioeconomic impacts for Alternative 3 are mixed.

When considering potential changes in herring revenue from 2017 to 2019, Alternative 2 would have the greatest reduction (87%), followed by Alternative 2 (80%), followed by Alternative 1 (no change). When considering potential changes in total revenue for herring industry participants from 2017 to 2019, Alternative 2 would have the greatest reduction (22%), followed by Alternative 2 (20%), followed by Alternative 1 (no change).

Because the majority of herring catch is used for bait for the lobster fishery, herring availability has the potential to affect the price of bait for the lobster fishery. Alternatives 1 and 3 are expected to help minimize the negative economic impacts associated with bait shortages and higher bait prices on the lobster fishery more than Alternative 2.

7.5.1 Alternative 1 (No Action)

Under Alternative 1, 2019 catch limits would be equal to the limit set for 2018, and would result in negligible socioeconomic impacts in the short-term. Because Alternative 1 will likely result in similar catch and revenue as 2017 and 2018, it would provide greater opportunity for the fishery to continue into 2019 with similar effort levels. The long-term impacts of Alternative 1 are expected to be high negative, due to depletion of the stock from overfishing. Alternative 1 would allow a level of fishing that would be 63% higher than the overfishing limit. While this catch level might benefit the fishery in 2019, it could reduce the herring stock to a point from which it would take years to recover, which may reduce opportunities to participate in the herring fishing in future years.

Overall, Alternative 1 is expected to have mixed socioeconomic impacts on herring-related businesses and communities. Negligible socioeconomic impacts are expected in the short-term, while high negative impacts would be expected for the long-term. Alternative 1 is expected to have the least negative short term impacts compared to Alternatives 2 or 3, but will have more negative long-term impacts than either of the other alternatives.

7.5.2 Alternative 2 (Most Restrictive)

Under Alternative 2, the 2019 ACL would be 70% less than in 2018 (and under Alternative 1). Alternative 2 is likely to substantially reduce catch and revenue in 2019, and would likely have high negative short-term impacts on the herring industry. The long-term impacts of Alternative 2 are expected to be mixed. Because the ACL is approximately half of the overfishing limit, it would be expected to result in greater herring biomass available for future years, and is expected to contribute to rebounding of the stock. However, the low catch limits in 2019 are expected to have a high negative impact on some of the fishery, as it has the potential to prevent a viable herring fishery such that some businesses fail. In that case, those failed businesses would receive no long-term benefit from these restrictions. For this reason, Alternative 2 is expected to have mixed long-term impacts.

Overall, Alternative 2 is expected to have high negative socioeconomic impacts on herring-related businesses and communities. High negative socioeconomic impacts are expected in the short-term, while mixed impacts would be expected for the long-term. Alternative 2 is expected to have higher short-term negative impacts than either Alternative 1 or 3, because it has the lowest 2019 ACL, and is expected to result in the lowest catch and revenue. Alternative 2 is likely to have more long-term negative impacts than Alternative 3 because it has the potential to prevent a viable herring fishery such that some businesses may fail. It is expected to have less long-term negative impacts than Alternative 1, because Alternative 1 is likely to cause negative impacts to future herring stocks such that future herring fishing opportunities may be limited.

7.5.3 Alternative 3 (Preferred)

Under Alternative 3, the 2019 ACL would be 49% less than in 2018 (and under Alternative 1). Alternative 3 is likely to substantially reduce catch and revenue in 2019, and has potential to prevent a viable herring fishery such that businesses may fail. This alternative is expected to have moderate negative short-term socioeconomic impacts. The long-term impacts of Alternative 3 are expected to be mixed. Because the ACL is substantially below the overfishing

limit, it is expected to result in greater herring biomass available for future years, and is expected to contribute to rebounding of the stock. However, the level of allowable catch in 2019 is expected to have a negative impact on some of the fishery, as decreased revenue associated with this alternative has potential to lead some businesses to fail. In that case, those failed businesses would receive no long-term benefit from these restrictions. For this reason, Alternative 3 is expected to have mixed long-term impacts.

Overall, Alternative 3 is expected to have negative socioeconomic impacts on herring-related businesses and communities. Negative socioeconomic impacts are expected in the short-term, while mixed impacts would be expected for the long-term. Alternative 3 is expected to have higher short-term negative impacts than Alternative 1, but lower short-term negative impacts than Alternative 2. This is because Alternative 3 has a 2019 ACL that is between the ACLs associated with the other alternatives, and is therefore expected to result in an intermediate level of catch and revenue. Alternative 3 is likely to have less long-term negative impacts than either Alternative 2 or Alternative 1, because it has less potential to prevent a viable herring fishery such that businesses fail than Alternative 2 and it will not have the negative impact on the future herring stock like Alternative 1.

8.0 CUMULATIVE EFFECTS ANALYSIS

A cumulative effects analysis (CEA) is required by the Council on Environmental Quality (CEQ; 40 CFR part 1508.7). The purpose of the CEA is to consider the combined effects of many actions on the human environment over time that would be missed if each action were evaluated separately. CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective. Rather, the intent is to focus on those effects that are truly meaningful. A formal cumulative impact assessment is not necessarily required under NEPA as part of an EA if the significance of cumulative impacts have been considered (U.S. EPA 1999). The following remarks address the significance of the expected cumulative impacts as they relate to the federally managed Atlantic herring fishery.

8.1 CONSIDERATION OF THE VECS

The following sections discuss the significance of the cumulative effects on the following VECs:

- Managed resources (i.e., herring) and non-target species
- Physical environment
- Protected resources
- Human communities

8.1.1 Geographic Boundaries

A general description of fishery-related businesses and communities that may be affected by the preferred alternative can be found in Section 6.5 of the 2016-2018 Herring Specifications EA and in Amendment 5 to the Herring FMP.

The analysis of impacts focuses on actions related to the commercial harvest of Atlantic herring. The Western Atlantic Ocean is the core geographic scope for each of the VECs. The core

geographic scopes for the managed species are the four Atlantic herring management areas (1A, 1B, 2, and 3), which encompass waters from North Carolina through Maine. For non-target species, those ranges may be expanded, and would depend on the range of each species in the Western Atlantic Ocean. For habitat, the core geographic scope is focused on EFH within the EEZ but includes all habitat utilized by Atlantic herring, and non-target species in the Western Atlantic Ocean. The core geographic scope for protected species is their range in the Western Atlantic Ocean. For human communities, the core geographic boundaries are defined as those U.S. fishing communities in coastal states from North Carolina through Maine directly involved in the harvest or processing of the managed species.

8.1.2 Temporal Boundaries

Overall, while the effects of the historical Atlantic herring fishery are important and considered in the analysis, the temporal scope of past and present actions for Atlantic herring, non-target species and other fisheries, the physical environment and EFH, and human communities is primarily focused on actions that occurred after FMP implementation (2000). For protected species, the scope of past and present actions is focused on the 1980s and 1990s (when NMFS began generating stock assessments for marine mammals and sea turtles that inhabit waters of the U.S. EEZ) through the present.

The temporal scope of future actions for all VECs extends about five years (2023) into the future beyond the analyzed time frame of the alternatives described in this document. The dynamic nature of resource management for these species and lack of information on projects that may occur in the future make it difficult to predict impacts beyond this timeframe with any certainty. The impacts discussed in Section 8.0 are focused on the cumulative effects of the preferred alternative in combination with the relevant past, present, and reasonably foreseeable future actions over these time scales.

8.1.3 Actions Other Than Those Proposed in this Document

The impacts of the alternatives considered in this document are described in Section 7.0 above. The sections below present meaningful past, present, and reasonably foreseeable future actions other than those considered in this document. The impacts of these actions are described qualitatively as the actual impacts are too complex to be quantified in a meaningful way. Some past actions are still relevant to the present and/or future actions.

8.1.3.1 Fishery Management Actions

Atlantic Herring FMP Actions

Past, present, and reasonably foreseeable future actions for Atlantic herring management include the establishment of the original FMP, all subsequent amendments and frameworks, and the setting of annual specifications (annual catch limits and measures to constrain catch and harvest). Key actions are described below.

Past and Present Actions

In 2010, the Atlantic States Marine Fisheries Commission (ASMFC) adopted an Addendum which modified Amendment 1 and Amendment 2 to the Interstate Fisheries Management Plan for Atlantic Sea Herring by changing the specification setting process and associated definitions. Based on the difficulty of having two sets of acronyms, one for the NEFMC plan and one for the

ASMFC plan, for one cooperatively managed species the addendum was developed to establish an identical set of definitions and acronyms as those that the NEFMC is required to use under MSA. The addendum also established a new specification setting process that is more in line with the ASMFC Sea Herring Section's usual process for setting specifications while taking into account the new process that was enacted by the NEFMC in Amendment 4 to the Atlantic Herring FMP.

Amendment 4 to the Atlantic Herring FMP primarily responded to the requirements of the MSA and NEPA. The amendment established provisions for ACLs by including setting an interim ABC control rule, modifying the specifications process, and adding accountability measures to promote compliance with catch limits.

In 2006, Framework 43 to the Northeast Multispecies FMP was enacted and modified the restrictions related groundfish for herring vessels. In 2011, Framework 46 changed these catch cap provisions so that they would apply only to midwater trawl vessels with a herring permit.

Framework 2 to the Atlantic Herring FMP was implemented by NMFS concurrently with the 2013-2015 Atlantic herring fishery specifications on September 30, 2013. Framework 2 authorizes the Council to split sub-ACLs in all herring management areas seasonally (by month) during the specifications process, and modified accountability measures related to catch limits. It also establishes a general policy for authorizing annual carryover of unutilized sub-ACL (up to 10%) under specific conditions.

Amendment 5 to the Atlantic Herring FMP became effective on March 17, 2014. Amendment 5 established a comprehensive catch monitoring program for the Atlantic herring fishery, addressed river herring bycatch, established criteria for midwater trawl vessel access to groundfish closed areas, and adjusted other aspects of the fishery management program to keep the Herring FMP in compliance with the MSA.

Amendment 14 to the Mackerel Squid Butterfish (MSB) FMP was developed concurrently to Amendment 5 by the Mid-Atlantic Fishery Management Council. Many of the actions contained with both amendments have been developed to compliment and/or replicate each other to avoid conflicting overlaps of restrictions on vessels that participate in both fisheries. The ways in which these actions overlap can be seen in Table 196 of the Amendment 5 FEIS.

Following the completion of Amendment 5 in 2013, the NEFMC developed Framework 3 to the Atlantic Herring FMP, which expanded on the management measures in Amendment 5 and established catch caps for RH/S as well as related provisions to manage and minimize interactions with these species in the directed Atlantic herring fishery.

Framework 4 to the Atlantic Herring FMP (effective March 17, 2014) built upon measures implemented in Amendment 5 to the Atlantic Herring FMP and proposed management measures to further enhance catch monitoring and address net slippage on vessels participating in the Atlantic herring fishery.

Combined effects of past and present actions have controlled effort and reduced bycatch to maintain a sustainable stock of Atlantic Herring and non-target species. Constraining fishing effort through regulatory actions can have negative short-term socioeconomic impacts. These impacts are sometimes necessary to bring about long-term sustainability of a resource, and as such should promote positive effects on human communities in the long-term. Generally, these actions have had slight negative impacts on habitat, due to continued fishing operations preventing impacted habitats from recovering; however, some actions have had direct or indirect long-term positive impacts on habitat through designating or protecting important habitats. FMP actions have also had a range of impacts on protected species, including generally moderate negative impacts on ESA-listed species, and a range of impacts on non-listed marine mammals from moderate negative to slight positive, depending on the stock condition of each protected species.

Reasonably Foreseeable Future Actions

Amendment 8 to the Atlantic Herring FMP was approved by the Council in September 2018. The goals of Amendment 8 were to develop an ABC control rule for the herring fishery and to address localized depletion of the herring resource and user group conflict. The Council adopted a control rule that caps overall fishing mortality at 80% of sustainable levels. Previously, fishermen were allowed to harvest up to 100% of sustainable catch levels. Under the proposed control rule, a portion of the available catch would be set aside to explicitly account for the role of herring as forage within the ecosystem. The new control rule is intended to address uncertainty in year-to-year variation in biomass estimates. The control rule is expected to reduce catch in the near term, but it has a lower probability of resulting in overfishing than previous methods used to set catch limits. With regard to localized depletion/user group conflict, the Council adopted a blend of two modified alternatives including a ban on midwater trawling within 12 nautical miles of the territorial sea baseline from Maine to the 71° 51’ W longitude line off Connecticut. The outer boundary of this “buffer zone” is the same as the territorial sea limit. Midwater trawling would also be prohibited year-round within two 30-minute squares east of Cape Cod (114 and 99). The impacts of Amendment 8 are still being analyzed by the Council and the amendment will be submitted to NMFS for review and approval in the near future.

The Council has taken many actions to manage the associated commercial fisheries. The MSA is the statutory basis for federal fisheries management. To the degree with which this regulatory regime is complied, the cumulative impacts of past, present, and reasonably foreseeable future federal fishery management actions on the VECs should generally be associated with positive long-term outcomes. Constraining fishing effort through regulatory actions can have negative short-term socioeconomic impacts. These impacts are sometimes necessary to bring about long-term sustainability of a resource, and as such should promote positive effects on human communities in the long-term.

Other FMP Actions

There are many other FMPs and associated fishery management actions for other species that impacted these VECs over the temporal scale described in Section 8.1.3, in addition to Atlantic herring FMP. These include FMPs managed by the Mid-Atlantic Fishery Management Council, New England Fishery Management Council, Atlantic States Marine Fisheries Commission, and to a lesser extent the South Atlantic Fishery Management Council. Omnibus amendments are also frequently developed to amend multiple FMPs at once. Actions associated with other FMPs and omnibus amendments have included measures to regulate fishing effort for other species, measures to protect habitat and forage species, and fishery monitoring and reporting requirements.

NMFS led the development of an omnibus amendment to address the Standardized Bycatch Reporting Methodology (Amendment 6 to the Atlantic Herring FMP). This amendment established a process and provisions for allocating observer coverage across all Federally-managed fisheries. The proposed measures include bycatch reporting and monitoring mechanisms; analytical techniques and allocation of at-sea fisheries observers; a standardized bycatch reporting methodology performance standard; a review and reporting process; framework adjustment and annual specifications provisions; a prioritization process; and provisions for industry-funded observers and observer set-aside programs. The SBRM amendment measures were effective in mid-2015. This action has a slight positive impact on herring, non-target species, protected species, and human communities because it is designed to increase the accuracy of catch and bycatch data by the herring fleet, which may lead to better management and lower bycatch in the future. The impacts on the physical environment and EFH are negligible, as this action will not result in a change in effort or fishing grounds.

Implementation of the Omnibus EFH Amendment has resulted in change in habitat protections, which may affect fishery-related businesses and communities. This amendment also modified the boundaries and access provisions (including those for midwater trawl gear) related to the year-round groundfish closed areas. The reduction in groundfish closed areas that include midwater trawl gear are expected to have a slight positive effect on herring fishery-related businesses and communities.

The NEFMC has approved an omnibus amendment to implement provisions for industry-funded monitoring (IFM) across all fisheries. This amendment includes provisions for 50% monitor coverage in the Atlantic herring fishery. The target implementation date for the omnibus amendment is the 2019 fishing year. This amendment may have moderate negative socioeconomic impacts on the herring fishery, as they will incur costs for each trip on which they are selected for IFM coverage. This action may have a slight positive impact on herring, non-target species, protected species, and human communities because it is designed to increase the accuracy of catch and bycatch data by the herring fleet, which may lead to better management and lower bycatch in the future.

In general, the other FMP actions discussed in this section have slight positive impacts on the herring resource, non-target species, and protected species, because they may increase data collection and provide more information to better manage the herring fishery. These actions may

have negligible to moderate negative impacts on fishery-related businesses and communities because they may reduce catch and revenue for some of the fishing community while requiring most of the fishery to pay for additional monitoring coverage.

As with the Atlantic herring actions described above, other FMP actions developed by Fishery Management Councils or GARFO have been developed in compliance with the MSA and have had positive long-term cumulative impacts on managed and non-target species, habitat, and protected resources because they constrain fishing effort, improve monitoring, and manage stocks at sustainable levels. However, constraining fishing effort through regulatory actions can have negative short-term socioeconomic impacts. These impacts are sometimes necessary to bring about long-term sustainability of a resource, and as such should promote positive effects on human communities in the long-term.

8.1.3.2 Non-Fishing Activities

Other Human Activities

Non-fishing activities that introduce chemical pollutants, sewage, or suspended sediment into the marine environment or result in changes in water temperature, salinity, or dissolved oxygen, pose a risk to all VECs. Human-induced non-fishing activities tend to be localized in nearshore areas and marine project areas where they occur. Examples of these activities include agriculture, port maintenance, beach nourishment, coastal development, marine transportation, marine mining, dredging, and the disposal of dredged material. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality and as such may indirectly constrain the sustainability of managed species, non-target species, and protected species. Decreased habitat suitability tends to reduce the tolerance of these VECs to the impacts of fishing effort. Mitigation of this outcome through regulations that reduce fishing effort could negatively impact human communities. The overall impact on the affected species and their habitats on a population level is unknown, but likely to range from no impact to low negative, depending on the population, since a large portion of these populations have a limited or minor exposure to these local non-fishing perturbations.

Non-fishing activities permitted under other Federal agencies (e.g. beach nourishment, offshore wind facilities, etc.) require examinations of potential impacts on the VECs. The MSA imposes an obligation on other Federal agencies to consult with the Secretary of Commerce on actions that may adversely affect EFH (50 CFR 600.930). The eight regional fishery management councils engage in this review process by making comments and recommendations on federal or state actions that may affect habitat for their managed species and by commenting on actions likely to substantially affect habitat. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on resources under NMFS' jurisdiction.

Non Fishing Impacts - Global Climate Change

Global climate change will affect all components of marine ecosystems, including human communities. Physical changes that are occurring and may continue to occur to these systems include sea-level rise, changes in sediment deposition, changes in ocean circulation, increased frequency, intensity and duration of extreme climate events, changing ocean chemistry, and

warming ocean temperatures. Emerging evidence demonstrates that these physical changes are resulting in direct and indirect ecological responses within marine ecosystems which may alter the fundamental production characteristics of marine systems. Climate change may potentially exacerbate the stresses imposed by fishing and other non-fishing human activities and stressors (described in this section).

Results from the Northeast Fisheries Climate Vulnerability Assessment indicate that climate change could have overall directional impacts on Council-managed species that range from negative to positive, depending on the adaptability of these species to the changing environment. Based on this assessment, Atlantic herring was determined to have a low vulnerability to climate change. Atlantic herring occur over a wide range in the western Atlantic, and they are not constrained in migration by any physical boundaries. There migratory ability may result in reducing the impacts of climate change on this stock.

In addition to the activities above, in recent years, offshore wind energy and oil and gas exploration have become more relevant activities in the Greater Atlantic region that are expected to impact all VECs, as described below. For potential biological impacts of wind, the turbines and cables may influence water currents and electromagnetic fields, respectively, which can affect patterns of movement for various species (target, non-target, protected). Habitats directly at the turbine and cable sites would be affected, and there could be scouring concerns around turbines. Impacts on human communities in a general sense will be mixed – there will be economic benefits in the form of jobs associated with construction and maintenance, and replacement of some electricity generated using fossil fuels with renewable sources. But there may be negative effects on fishing activities in terms of effort displacement, or making fishing more difficult or expensive near the turbines or cables.

While there are currently no operational wind farms in Mid-Atlantic waters, potential offshore wind energy sites have been identified off of Virginia, Maryland, New Jersey, Delaware, and New York, and there are several proposals to develop wind farms in both nearshore and offshore waters. In New England, offshore wind project construction south of Massachusetts/Rhode Island may begin as early as 2019 (three projects including Vineyard Wind, Bay State Wind, and South Fork Wind Farm). Additional areas have been leased and will have site assessment activities in the next few years. These projects could have low negative impacts on EFH, as well as Atlantic herring, non-target, and fishing communities if there are any negative impacts on those resources. Furthermore, there could be negative impacts on protected species of birds and marine mammals if they interact with the wind farms.

For oil and gas, this timeframe would include leasing and possible surveys. Seismic surveys impact the acoustic environment within which marine species live, and have uncertain effects on fish behaviors that could cumulatively lead to negative population level impacts. The science on this is somewhat uncertain. If marine resources are affected by seismic surveys, then so in turn the fishermen targeting these resources would be affected. However, there would be an economic component in the form of increased jobs where there may be some positive effects on human communities.

The overall impact of offshore wind energy and oil and gas exploration on the affected species and their habitats on a population level is unknown, but likely to range from no impact to moderate negative, depending on the number and locations of projects that occur, as well as the effects of mitigation efforts.

Global Climate Change

Global climate change will affect all components of marine ecosystems, including human communities. Physical changes that are occurring and may continue to occur to these systems include sea-level rise, changes in sediment deposition, changes in ocean circulation, increased frequency, intensity and duration of extreme climate events, changing ocean chemistry, and warming ocean temperatures. Emerging evidence demonstrates that these physical changes are resulting in direct and indirect ecological responses within marine ecosystems which may alter the fundamental production characteristics of marine systems (Stenseth et al. 2002). Climate change may potentially exacerbate the stresses imposed by fishing and other non-fishing human activities and stressors (described in this section).

Results from the Northeast Fisheries Climate Vulnerability Assessment indicate that climate change could have overall directional impacts on Council-managed species that range from negative to positive, depending on the adaptability of these species to the changing environment (Hare et al. 2016). Based on this assessment, Atlantic herring was determined to have a low vulnerability to climate change. Atlantic herring occur over a wide range in the western Atlantic, and they are not constrained in migration by any physical boundaries. There migratory ability may result in reducing the impacts of climate change on this stock.

Overall, climate change is expected to have impacts that range from positive to negative depending on the species. However, future mitigation and adaptation strategies to climate change may mitigate some of these impacts. The science of predicting, evaluating, monitoring and categorizing these changes continues to evolve.

8.1.4 Magnitude and Significance of Cumulative Effects

In determining the magnitude and significance of the cumulative effects, the additive and synergistic effects of the preferred alternative, as well as past, present, and future actions, must be taken into account. The following section describes the expected effects of these actions on each VEC. Those past, present, and reasonably foreseeable future actions which may impact the VECs, and the direction of those potential impacts, are summarized in Section 8.1.3.1. The indirectly negative actions described in Section 8.1.3.1 are localized in nearshore and marine areas where the projects occur; therefore, the magnitude of those impacts on the managed resources is expected to be limited due to limited exposure to the populations at large.

8.1.4.1 Magnitude and Significance of Cumulative Effects on Managed Species and Non-Target Species

Past fishery management actions taken through the FMP and the annual specifications process have had a positive cumulative effect on the managed resources. It is anticipated that the future management actions described in Section 8.1.3.1 will have additional indirect positive effects on

the managed resources through actions which reduce and monitor bycatch, protect habitat, and protect the ecosystem services on which the productivity of managed species depends. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to the managed resources have had positive cumulative effects.

Catch limits and commercial quotas have been specified to ensure that stocks are managed sustainably and that measures are consistent with the objectives of the FMP under the guidance of the MSA. Commercial management measures such as those described in this document are designed to ensure that catch and landings limits are not exceeded. The impacts of annual specification of management measures are largely dependent on how effective those measures are in meeting the objectives of preventing overfishing and achieving optimum yield, and on the extent to which mitigating measures are effective. The preferred alternative described in this document would positively reinforce the past and anticipated positive cumulative effects on the managed resources by achieving the objectives specified in the FMP. Therefore, the preferred alternative would have a positive, but not significant effect on the managed resources individually or in conjunction with other past, present, and reasonably foreseeable future actions (Section 8.1.3.1).

8.1.4.2 Magnitude and Significance of Cumulative Effects on Physical Environment

Past fishery management actions taken through the FMP and annual specifications process have had positive cumulative effects on habitat. The herring fishery is generally prosecuted with pelagic gear (i.e., midwater trawl, purse seine), but a small percentage of catch does come from bottom trawl gear. The actions have constrained fishing effort both at a large scale and locally and have implemented gear requirements which may reduce impacts on habitat. As required under these FMP actions, EFH and Habitat Areas of Particular Concern were designated for the managed resources. It is anticipated that the future management actions described in Section 8.1.3.1 will result in additional direct or indirect positive effects on habitat through actions which protect EFH and protect ecosystem services on which these species' productivity depends. These impacts could be broad in scope. All the VECs are interrelated; therefore, the linkages among habitat quality, managed resources and non-target species productivity, and associated fishery yields should be considered. For habitat, there are direct and indirect negative effects from actions which may be localized or broad in scope; however, positive actions that have broad implications have been, and will likely continue to be, taken to improve the condition of habitat. Some actions, such as coastal population growth and climate change may indirectly impact habitat and ecosystem productivity; however, these actions are beyond the scope of NMFS and Council management. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to habitat have had slight positive cumulative effects. Therefore, the preferred alternative would have a positive, but not significant effect on habitat individually or in conjunction with other past, present, and reasonably foreseeable actions (Section 8.l.4.2).

8.1.4.3 Magnitude and Significance of Cumulative Effects on Protected Species

Given their life history dynamics, large changes in protected species abundance over long time periods, and the multiple and wide-ranging fisheries management actions that have occurred, the cumulative impacts on protected species were evaluated over a long-time frame (i.e., from the

early 1970s when the Marine Mammal Protection Act and Endangered Species Act were implemented through the present). While some protected species are doing better than others, overall the trend of stock condition for protected resources has improved over the long-term due to reductions in the number of interactions. Past fishery management actions taken through the FMP and annual specifications process have contributed to this long-term trend toward positive cumulative effect on protected species through the reduction of fishing effort (and thus reduction in potential interactions) and implementation of gear requirements. It is anticipated that future management actions, described in Section 8.1.3.1 will result in additional indirect positive effects on protected species. These impacts could be broad in scope. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to protected species have had a positive cumulative effect. Therefore, the proposed action would have a positive, but not significant effect on the managed resources individually or in conjunction with other past, present, and reasonably foreseeable future actions (Section 8.1.3.1).

8.1.4.4 Magnitude and Significance of Cumulative Effects on Human Communities

Past fishery management actions taken through the FMP and annual specifications process have had both positive and negative cumulative effects by benefiting domestic fisheries through sustainable fishery management practices while also sometimes reducing the ability of some individuals to participate in fisheries. Sustainable management practices are, however, expected to yield broad positive impacts to fishermen, their communities, businesses, and the nation as a whole. It is anticipated that the future management actions described in Section 8.1.3.1 will result in positive effects for human communities due to sustainable management practices, although additional indirect negative effects on some human communities could occur if management actions result in reduced revenues. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to human communities have had overall positive cumulative effects.

Catch limits and commercial quotas for herring have been specified to ensure that the stock is managed in a sustainable manner and that management measures are consistent with the objectives of the FMPs under the guidance of the MSA. The impacts from annual specification of management measures on the managed species are largely dependent on how effective those measures are in meeting their intended objectives and the extent to which mitigating measures are effective. Quota overages may alter the timing of commercial fishery revenues such that revenues can be realized a year earlier. Impacts to some fishermen may be caused by unexpected reductions in their opportunities to earn revenues from commercial fisheries in the year during which the overages are deducted.

Despite the potential for negative short-term effects on human communities, positive long-term effects are expected due to the long-term sustainability of the managed stocks. Therefore, the proposed action would have a positive, but not significant effect on the managed resources individually or in conjunction with other past, present, and reasonably foreseeable future actions (Section 8.1.3.1).

8.1.5 Impacts of the Proposed Action on all the VECs

The preferred alternative (i.e., the proposed action) is described in Section 5.1.3. The direct and indirect impacts of the preferred alternative on the VECs are described in Section 7.0 and are

summarized in the Executive Summary. The magnitude and significance of the cumulative effects, including additive and synergistic effects of the proposed actions, as well as past, present, and future actions, have been taken into account (Section 8.1.4).

When considered in conjunction with all other pressures placed on the fisheries by past, present, and reasonably foreseeable future actions, the preferred alternatives are not expected to result in any significant impacts, positive or negative. The preferred alternative would implement specifications for the 2019 fishery, and is expected to have overall positive impacts on the fishery. The preferred alternative is consistent with other management measures that have been implemented in the past for these fisheries. These measures are part of a broader management scheme for the Atlantic herring fishery. This management scheme has helped to ensure long-term sustainability, while minimizing environmental impacts.

The regulatory atmosphere within which federal fishery management operates requires that management actions be taken in a manner that will optimize the conditions of managed species, habitat, and human communities. Consistent with NEPA, the MSA requires that management actions be taken only after consideration of impacts to the biological, physical, economic, and social dimensions of the human environment. Given this regulatory environment, and because fishery management actions must strive to create and maintain sustainable resources, impacts on all VECs from past, present and reasonably foreseeable future actions have generally been positive and are expected to continue in that manner for the foreseeable future. This is not to say that some aspects of the VECs are not experiencing negative impacts, but rather that when considered as a whole and as a result of the management measure implemented in these fisheries, the overall long-term trend is positive.

There are no significant cumulative effects associated with the preferred alternatives based on the information and analyses presented in this document and in past FMP documents (Table 12). Cumulatively, through 2023, it is anticipated that the preferred alternatives will result in generally positive, but not significant, impacts on the all VECs.

Table 12. Magnitude and significance of the cumulative, additive, and synergistic effects of the preferred alternatives, as well as past (P), present (PR), and reasonably foreseeable future (RFF) actions.

VEC	Current Status	Net Impact of P, PR, and RFF Actions	Impact of the Preferred Alternative for 2019	Significant Cumulative Effects
Managed Species	Positive	Positive	Slight Positive	**None**
Non-target Species	Positive	Positive	Slight Positive	**None**
Habitat	Slight Negative	Positive	Slight Negative	**None**
Protected Resources	Slight Negative to Slight Positive	Slight Negative to Slight Positive	Slight Negative to Slight Positive	**None**
Human Communities	Positive	Positive	Mixed	**None**

9.0 APPLICABLE LAWS

9.1 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT (MSA)

9.1.1 National Standards

Section 301 of the MSA requires that FMPs contain conservation and management measures that are consistent with the ten National Standards. The 2016-2018 Atlantic herring specifications and recent FMP amendments describe how recent management actions implemented comply with the National Standards. This proposed action sets catch limits for 2019 only and is consistent with previous Atlantic herring management actions. The proposed action continues to meet the obligations of National Standard 1 by adopting and implementing conservation and management measures that will continue to prevent overfishing, while achieving, on a continuing basis, the optimum yield (OY) for herring and the U.S. fishing industry. It uses the best scientific information available (National Standard 2) and manages herring throughout its range (National Standard 3). The proposed action does not discriminate among residents of different states (National Standard 4) and does not have economic allocation as its sole purpose (National Standard 5). The proposed action accounts for variations in the fishery (National Standard 6), it avoids unnecessary duplication (National Standard 7), takes into account the fishing communities (National Standard 8), and promotes safety at sea (National Standard 10). The proposed action is also consistent with National Standard 9, which addresses bycatch in fisheries.

9.2 NEPA FINDING OF NO SIGNIFICANT IMPACT (FONSI)

The Council on Environmental Quality (CEQ) Regulations state that the determination of significance using an analysis of effects requires examination of both context and intensity, and lists ten criteria for intensity (40 CFR 1508.27). In addition, the Companion Manual for NOAA Administrative Order 216-6A provides sixteen criteria (the same ten as the CEQ Regulations and six additional) for determining whether the impacts of a proposed action are significant. Each criterion is discussed below with respect to the proposed action and considered individually as well as in combination with the others.

1. Can the proposed action reasonably be expected to cause both beneficial and adverse impacts that overall may result in a significant effect, even if the effect will be beneficial?

The preferred alternative is not expected to result in significant impacts on any of the VECs, nor will it result in overall significant effects, either beneficial or adverse. The preferred alternative establishes 2019 catch limits for Atlantic herring that are consistent with FMP objectives. This alternative would have slight positive impacts for Atlantic herring, because it would likely result in a catch level that is substantially below the OFL, and would thus leave a high amount herring SSB in the water to maintain and potentially expand the herring stock in future years (Section 7.2.3). It is also expected to have slight positive impacts on non-target species relative to the current condition of the non-target resources, since it is expected to reduce effort in the fishery and catch of non-target species (Section 7.2.3). The reduction in fishing effort associated with the preferred alternative is expected to have a slight negative impacts on habitat, because some types of fishing would not allow for recovery of areas impacted by fishing (Section 7.3.3). Because fishing effort is expected to be lower than in 2018 and changes in the seasonal/spatial distribution of Atlantic herring catch are not expected, the impacts on ESA listed species are

expected to be slight negative to negligible, and non-ESA impacts are expected to be no impact to moderate positive (Section 7.4.3). The long-term impacts of preferred alternative on human communities are expected to be mixed (Section 7.5.3). Because the ACL is substantially below the overfishing limit, it is expected to be slight positive because it may result in greater herring biomass available for future years, and is expected to contribute to rebounding of the stock. However, the level of allowable catch in 2019 is expected to have a negative impact on some of the fishery, as decreased revenue associated with this alternative has potential to put them out of business. Thus, they would receive no long-term benefit from these restrictions.

2. Can the proposed action reasonably be expected to significantly affect public health or safety?

The preferred alternative is not expected to alter the manner in which the industry conducts fishing activities for Atlantic herring, but it may reduce fishing effort in comparison to the no action alternative. Therefore, no changes in fishing behavior that would affect safety are anticipated. The overall effect of the preferred alternative on the herring fishery, including the communities in which they operate, will not adversely impact public health or safety.

3. Can the proposed action reasonably be expected to result in significant impacts to unique characteristics of the geographic area, such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?

The preferred alternative is not expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas. While the Atlantic herring industry does have potential to impact historic shipwreck sites, the fishery tends to avoid these areas due to the potential for extensive gear damage. The preferred alternative affects fishing for Atlantic herring in the U.S. Exclusive Economic Zone and is not expected to have any impacts on shoreside historical and/or cultural resources. In addition, the preferred alternative is not expected to substantially affect fishing and other vessel operations around the unique historical and cultural resources encompassed by the Stellwagen Bank National Marine Sanctuary.

4. Are the proposed action's effects on the quality of the human environment likely to be highly controversial?

The preferred alternative is consistent with Atlantic Herring FMP objectives and based on measures contained in the FMP, which have been in place for many years. The scientific information upon which the catch limits are based has been peer reviewed and is the most recent information available (Section 6.0). Thus, the measures contained in this action are not expected to be highly controversial.

5. Are the proposed action's effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

The impacts of the preferred alternative on the human environment are described in Section 7.0. The preferred alternative is not expected to alter fishing methods or activities or to substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort. The effects of fishing are well studied and the impacts to managed species, non-target species, and protected resources will continue to be monitored. The preferred alternative is not expected to have highly uncertain effects or to involve unique or unknown risks on the human environment.

6. Can the proposed action reasonably be expected to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

The preferred alternative is for 2019 only is not expected to substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort. Future specifications will be adjusted consistent with the FMP and MSA and will consider new stock assessments or other updated biological information. The preferred alternative does not result in significant effects, nor does it represent a decision in principle about a future consideration. The significance of the impacts of any future changes will be analyzed as part of their development and implementation.

7. Is the proposed action related to other actions that when considered together will have individually insignificant but cumulatively significant impacts?

As discussed in Section 8.0, the preferred alternative is not expected to have individually insignificant, but cumulatively significant impacts. The synergistic interaction of improvements in the efficiency of the fishery is expected to generate insignificant positive impacts overall. The preferred alternative, together with past, present, and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts on the biological, physical, and human components of the environment.

8. Can the proposed action reasonably be expected to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources?

The preferred alternative is not expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas. While the Atlantic herring industry does have potential to impact historic shipwreck sites, the fishery tends to avoid these areas due to the potential for extensive gear damage. The preferred alternative affects fishing for Atlantic herring in the U.S. Exclusive Economic Zone and is not expected to have any impacts on shoreside historical and/or cultural resources. In addition, the preferred alternative is not expected to substantially affect fishing and other vessel operations around the unique historical and cultural resources encompassed by the Stellwagen Bank National Marine Sanctuary.

9. Can the proposed action reasonably be expected to have a significant impact on endangered or threatened species, or their critical habitat as defined under the Endangered Species Act of 1973?

The impacts of the preferred alternative on protected resources are discussed in Section 7.4. The preferred alternative is not reasonably expected to have an adverse impact on endangered or threatened species, or critical habitat for these species. The activities to be conducted under the preferred alternative are within the scope of the Atlantic Herring FMP and do not change the basis for the determinations made in previous consultations. Additionally, the preferred alternative may reduce interactions with protected species as compared to the no action alternative. Any interaction that may occur is not expected to change or jeopardize the status of any protected resources.

10. Can the proposed action reasonably be expected to threaten a violation of Federal, state, or local law or requirements imposed for environmental protection?

The preferred alternative is not expected to alter fishing methods or activities such that they threaten a violation of federal, State, or local law or requirements imposed for the protection of the environment. The preferred alternative has been found to be consistent with other applicable laws (Section 9.0).

11. Can the proposed action reasonably be expected to adversely affect stocks of marine mammals as defined in the Marine Mammal Protection Act?

The impacts of the preferred alternative on marine mammals are discussed in Section 7.4. The preferred alternative is not reasonably expected to have an adverse impact on marine mammals, or critical habitat for these species. The activities to be conducted under the preferred alternative are within the scope of the Atlantic herring FMP and do not change the basis for the determinations made in previous consultations. Additionally, the preferred alternative may reduce interactions with marine mammals as compared to the no action alternative, any interaction that may occur is not expected to change or jeopardize the status of any marine mammal.

12. Can the proposed action reasonably be expected to adversely affect managed fish species?

The impacts of the preferred alternative on managed fish species, including target and non-target species, are described in Section 7.2. The preferred alternative is designed to prevent overfishing and overfished status of the Atlantic herring stock, resulting in expected slight positive, but insignificant, impacts on this managed resource. River herring and shad are non-target species of particular concern, and catch of river herring/shad in the directed Atlantic herring fishery is managed through gear and area-specific catch caps, which would remain unchanged from 2018. Due to the depleted status of many of the river herring/shad stocks and concerns about the impact of river herring/shad catch/bycatch and associated mortality in the Atlantic herring fishery, there is likely to be a biological benefit to continuing to specify river herring/shad catch caps for the directed Atlantic herring fishery. The impacts of all of the river herring/shad catch cap alternatives on non-target species, particularly river herring/shad, are therefore expected to be slight positive and not significant.

13. Can the proposed action reasonably be expected to adversely affect essential fish habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act?

The preferred alternative cannot be reasonably expected to adversely affect essential fish habitat as defined under the Magnuson-Stevens Act and identified in the FMP. The impacts of the preferred alternative on the physical environment and essential fish habitat are discussed throughout Section 7.3. In general, essential fish habitat that occurs in areas where the fishery occurs is designated as the bottom habitats consisting of varying substrates (depending upon species) within the Gulf of Maine, Georges Bank, and the continental shelf off southern New England and the Mid-Atlantic south to Cape Hatteras. The primary gears utilized to harvest Atlantic herring are purse seines and midwater trawls which typically do not impact bottom

habitats. Therefore, the preferred alternative is expected to have only a slight negative impact on essential fish habitat.

14. Can the proposed action reasonably be expected to adversely affect vulnerable marine or coastal ecosystems, including but not limited to, deep coral ecosystems?

The preferred alternative is not expected to have significant impacts on the natural or physical environment, including vulnerable marine or coastal ecosystems. The current specifications do not adversely affect these areas, and the preferred alternative is not expected to alter fishing methods or activities or to substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort. The areas fished for Atlantic herring have been fished for many years, and this action is not expected to change the core locations of any fishing activity. The preferred alternative in this document is not expected to alter Atlantic herring fishing patterns relative to this protected area or in any other manner that would lead to adverse impacts on deep sea coral or other vulnerable marine or coastal ecosystems.

15. Can the proposed action reasonably be expected to adversely affect biodiversity or ecosystem functioning (e.g., benthic productivity, predator-prey relationships, etc.)?

The preferred alternative is not expected to have a substantial impact on biodiversity and ecosystem function within the affected area. While Atlantic herring is recognized as one of many important forage fish for marine mammals, other fish, and birds throughout the region, the resource appears to be large enough at this time to accommodate all predators including Atlantic bluefish, Atlantic striped bass, and several other pelagic species such as shark and tuna. To the extent possible, the proposed 2019 catch limits account for these important issues. In addition to accounting for forage/predation through the stock assessment, the proposed catch limits should ensure that an adequate forage base continues to be available for important fish, marine mammal, and bird species in the Gulf of Maine region during 2019.

16. Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

The preferred alternative is not expected to result in the introduction or spread of a non-indigenous species. The preferred alternative relates specifically to removals of Atlantic herring using traditional fishing practices. Vessels affected by the preferred alternative are those currently engaged in the Atlantic herring fishery. The fishing-related activity of these vessels is anticipated to occur solely within the Greater Atlantic Region and should not result in the introduction or spread of a non-indigenous species.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Supplemental Environmental Assessment prepared for the In-season Adjustment to Atlantic Herring Specifications and Sub-ACLs for 2019, it is hereby determined that the preferred alternative will not significantly impact the quality of the human environment as described above and in the supporting Environmental Assessment. In addition, all beneficial and adverse impacts of the preferred alternative have been addressed to reach the conclusion of no

significant impacts. Accordingly, preparation of an environmental impact statement for this action is not necessary.

_____ _____

Regional Administrator for GARFO *Date*

9.3 ENDANGERED SPECIES ACT

The batched fisheries Biological Opinion completed on December 16, 2013, concluded that the actions considered would not jeopardize the continued existence of any listed species. On October 17, 2017, NMFS reinitiated consultation on the batched Biological Opinion due to updated information on the decline of Atlantic right whale abundance.

Section 7(d) of the ESA prohibits Federal agencies from making any irreversible or irretrievable commitment of resources with respect to the agency action that would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternatives during the consultation period. This prohibition is in force until the requirements of section 7(a)(2) have been satisfied. Section 7(d) does not prohibit all aspects of an agency action from proceeding during consultation; non-jeopardizing activities may proceed as long as their implementation would not violate section 7(d). Per the October 17, 2017, memo, it was concluded that allowing those fisheries specified in the batched Biological Opinion to continue during the re-initiation period will not increase the likelihood of interactions with ESA listed species above the amount that would otherwise occur if consultation had not been reinitiated. Based on this, the memo concluded that the continuation of these fisheries during the re-initiation period would not be likely to jeopardize the continued existence of any ESA listed species. Taking this, as well as our analysis of the preferred alternative into consideration, we do not expect the preferred alternative, in conjunction with other activities, to result in jeopardy to any ESA listed species.

This action does not represent any irreversible or irretrievable commitment of resources with respect to the FMP that would affect the development or implementation of reasonable and prudent measures during the consultation period. NMFS has discretion to amend its Magnuson-Stevens Act and ESA regulations and may do so at any time subject to the Administrative Procedure Act and other applicable laws. As a result, the Council has preliminarily determined that fishing activities conducted pursuant to this action will not affect endangered and threatened species or critical habitat in any manner beyond what has been considered in prior consultations on this fishery.

9.4 MARINE MAMMAL PROTECTION ACT

Section 7.4.3 contain an assessment of the impacts of the preferred alternative on marine mammals. A final determination of consistency with the MMPA will be made by the agency during rulemaking for this action.

9.5 COASTAL ZONE MANAGEMENT ACT

NMFS has determined that this action is consistent to the maximum extent practicable with the enforceable policies of the approved coastal management programs of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina. The coastal zone management implications were analyzed in the 2016-2018 herring specifications and are unchanged by this action. Herring regulations state that

specifications remain in effect until replaced and allow NMFS to adjust the specifications in-season, after consultation with the Council, to achieve conservation and management objectives. Thus, the states have already agreed to consistency with this action as part of the 2016-2018 herring specifications.

9.6 ADMINISTRATIVE PROCEDURE ACT

This action was developed in compliance with the requirements of the Administrative Procedures Act, and these requirements will continue to be followed when the proposed regulation is published. Section 553 of the Administrative Procedure Act establishes procedural requirements applicable to informal rulemaking by Federal agencies. The purpose of these requirements is to ensure public access to the Federal rulemaking process, and to give the public adequate notice and opportunity for comment. At this time, NMFS is not requesting any abridgement of the rulemaking process for this action.

9.7 SECTION 515 (DATA QUALITY ACT)

Utility of Information Product

This action proposes 2019 catch limits for Atlantic herring. This document includes a description of the alternatives considered, the preferred alternative and rationale for selection, and any changes to the implementing regulations of the FMP. As such, this document enables the implementing agency (NMFS) to make a decision on implementation of annual specifications (i.e., management measures) and this document serves as a supporting document for the proposed rule.

The action contained within this specifications document was developed to be consistent with the FMP, MSA, and other applicable laws, through a multi-stage process that was open to review by affected members of the public. The public will have opportunity to review and comment on management measures during the December 2018 Council meeting. The public will have further opportunity to comment on this specifications document once NMFS publishes a request for comments notice in the *Federal Register*.

Integrity of Information Product

This information product meets the standards for integrity under the following types of documents: Other/Discussion (e.g. Confidentiality of Statistics of the MSA; NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics; 50 CFR 229.11, Confidentiality of information collected under the Marine Mammal Protection Act).

Objectivity of Information Product

The category of information product that applies here is “Natural Resource Plans.” Section 9.0 describes how this document was developed to be consistent with any applicable laws, including MSA. The analyses used to develop the alternatives (i.e., policy choices) are based upon the best scientific information available. The most up to date information was used to develop the EA which evaluates the impacts of those alternatives (Section 7.0). The specialists who worked with these core data sets and population assessment models are familiar with the most recent analytical techniques and are familiar with the available data and information relevant to the summer flounder, scup, and black sea bass fisheries.

The review process for the basis of the proposed action involves Council, NEFSC, GARFO, and NMFS headquarters, as well as NEFSC senior level scientists with specialties in fisheries ecology, population dynamics, biology, economics, and social anthropology. The Council review process involves public meetings at which affected stakeholders can comment on proposed management measures. Review by GARFO is conducted by those with expertise in fisheries management and policy, habitat conservation, protected resources, and compliance with the applicable law. Final approval of the specifications document and clearance of the rule is conducted by staff at NOAA Fisheries Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget.

9.8 PAPERWORK REDUCTION ACT (PRA)

The Paperwork Reduction Act (PRA) concerns the collection of information. The intent of the PRA is to minimize the federal paperwork burden for individuals, small businesses, state and local governments, and other persons, as well as to maximize the usefulness of information collected by the Federal government. There are no changes to the existing reporting requirements previously approved under this FMP for vessel permits, dealer reporting, or vessel logbooks. This action does not contain a collection-of-information requirement for purposes of the PRA.

9.9 RELATIVE TO FEDERALISM/EXECUTIVE ORDER 13132

This document does not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under Executive Order 13132.

9.10 REGULATORY FLEXIBILITY ACT – INITIAL FLEXIBILITY ANALYSIS

The purpose of the Regulatory Flexibility Act (RFA) is to reduce the impact of burdensome regulations and recordkeeping requirements on small businesses. To achieve this goal, the RFA requires Federal agencies to describe and analyze the effects of proposed regulations, and possible alternatives, on small business entities. To this end, this section contains an Initial Regulatory Flexibility Analysis (IRFA), which includes an assessment of the effects that the proposed action and other alternatives are expected to have on small entities.

9.10.1 Reasons for Considering the Action

The purpose and need for the action are provided in Section 4.1 of this document.

9.10.2 Objectives and Legal Basis for the Action

The objectives and legal basis for this action are provided in Section 4.0 of this document.

9.10.3 Description and Estimate of Small Entities to Which the Rule Applies

The RFA recognizes three kinds of small entities: Small businesses, small organizations, and small governmental jurisdictions. For purposes of the RFA only, the small business criteria in the finfish fishing industry is a firm that is independently owned and operated and not dominant in its field of operation, with gross annual receipts of $11 million or less. Small organizations and small governmental jurisdictions are not directly regulated by this action.

There are five permit categories in the herring fishery: (1) limited access permit for all management areas (Category A); (2) limited access permit for access to Areas 2 and 3 only (Category B); (3) limited access incidental catch permit for 25 mt per trip (Category C); (4) an open access incidental catch permit for 3 mt per trip (Category D); and (5) an open access permit for limited access mackerel permit holders authorizing up to 9 mt per trip (Category E) in Areas 2 and 3.

In 2017, there were a total of 1,566 permitted herring vessels. Of those, 1,434 were exclusively Category D vessels. Of the remaining 132 permitted herring vessels, 22 belonged to large businesses. Every Category B permit was also authorized for Category C, and all but one Category E permitted vessel also carried a Category D authorization. NMFS included Category E vessels that also have Category D authorization in the analysis. Table 2 presents the counts of permitted vessels by category along with their affiliated entity's small or large business status (the status of the company that holds the herring permit).

Table 13. Number of Herring Permits by Category, 2015-2017

Herring Permit Categories	Number of Herring Permits					
	2015		2016		2017	
	Large	Small	Large	Small	Large	Small
A	5	32	5	30	6	30
B/C	4	4	4	4	4	4
C (exclusive)	3	37	3	37	3	37
D (exclusive)	112	1222	115	1306	114	1320
E	9	39	9	40	9	39
Total	133	1334	136	1417	136	1430

Source: NMFS

Table 14 refines the counts from Table 13 to include only those vessels that had revenue from herring at least once in the 3-year period of analysis. In 2017, there were 4 large businesses and 69 small that had revenue from herring.

Table 14. Number of Herring Permits with Herring Revenue, 2015-2017

Herring Permit Categories	Number of Herring Permits					
	2015		2016		2017	
	Large	Small	Large	Small	Large	Small
A	4	20	4	19	4	19
B/C	0	2	0	2	0	3
C (exclusive)	0	11	0	9	0	12
D (exclusive)	0	27	0	29	0	31
E	0	4	0	1	0	4
Total	4	64	4	60	4	69

Source: NMFS

Table 15 defines the small entities affected by this proposed action - small businesses with a Herring Category A, B ,C, or E permit and revenue from herring during the 2015-2017 period of analysis. There were 37, 31, and 38 such vessels in 2015, 2016, and 2017 respectively.

Table 15. Affected Small Entities, Permitted Herring Vessels with Herring Revenue, 2015-2017

Herring Permit Categories	Number of Herring Permits					
	2015		2016		2017	
	Large	Small	Large	Small	Large	Small
A	4	20	4	19	4	19
B/C	0	2	0	2	0	3
C (exclusive)	0	11	0	9	0	12
E	0	4	0	1	0	4
Total	4	37	4	31	4	38

Source: NMFS

To better understand the impact of this action on the affected small businesses, NMFS compared the revenue from herring fishing to total revenue brought in by the entity (business) that holds the herring permit. The 17 to 18 small entities with Category A permits show the most dependence on the herring fishery, with 49.75% to 62.03% of their revenue coming from herring landings. The 4 small Category E permitted entities have the least dependence on the herring fishery with less than one percent of total entity revenue coming from the herring fishery.

9.10.4 Recordkeeping and Reporting Requirements

This action does not introduce any new reporting, recordkeeping, or other compliance requirements.

9.10.5 Duplication, Overlap, or Conflict with other Federal Rules

No relevant Federal rules have been identified that would duplicate or overlap with the preferred alternative.

9.10.6 Economic Impacts on Small Entities Resulting for the Action

Section 7.5 of this document describes the economic impacts of the preferred alternative on fishing vessels. Of the 42 vessels active in 2017, 7 were purse seine vessels and 35 were trawl vessels. Catch limits are set by area, with purse seine vessels fishing in Area 1A and trawl vessels in Areas 1B, 2 and 3. Thus, for each alternative, we can estimate the revenue outcomes for vessels by gear by comparing the new alternative's sub-ACLs with the sub-ACLs for each area in 2017.

Table 16 below summarizes the estimated impacts to herring fishery revenues of each alternative. Table 17 below summarizes the estimated impacts as a percentage of total entity revenue, based on the 2017 revenues of the 39 impacted entities. Impacts to total revenues depends upon gear used and entity dependence on the herring fishery (what percent of total

entity revenue came from herring in 2017). An analysis follows detailing these expected changes.

Table 16. Expected Impacts to Herring Fishery from 2017 to 2019, Revenue Change

Alternative	Impacts to Herring Fishery, Revenue Change		
	Purse Seine	Trawl	Overall
Alternative 1 (No Action)	No Change		
Alternative 2 (Most Restrictive)	-86%	-87%	-87%
Alternative 3 (Preferred)	-78%	-80%	-80%

Source: NMFS

Table 17. Expected Impacts to Herring Fishery Entities from 2017 to 2019, Revenue Change

Alternative	Impacts to Herring Fishery Entities, Revenue Change		
	Purse Seine	Trawl	Overall
Alternative 1 (No Action)	No Change		
Alternative 2 (Most Restrictive)	-63%	-17%	-22%
Alternative 3 (Preferred)	-57%	-16%	-20%

Source: NMFS

9.10.6.1 Alternative 1 (No Action)

Alternative 1 would take no action and maintain the catch limits from 2018. No change to the fishery is expected as a result of Alternative 1.

9.10.6.2 Alternative 2 (Most Restrictive)

Alternative 2 would reduce the sub-ACLs in areas 1A, 1B, 2 and 3 by 87% from 2017 to 2019.

Table 18. Change in Herring Sub-ACLs by Area, 2017 to 2019 for Alternative 2 (Most Restrictive)

Area	2017	2019	Percent Change
1A	32,115	4,354	-86%
1B	4,825	647	-87%
2	31,227	4,188	-87%
3	43,873	5,876	-87%

Source: NMFS

The total revenue brought in by the 7 purse seine herring vessels in 2017 was $8,157,000 (rounded). With the sub-ACL in Area 1A decreasing by 86% in 2019, the impact to the expected herring revenue in 2019 is to reduce it to $1,109,000. The six entities owning the 7 purse seine vessels had a sum of $11,165,000 in 2017 revenue (that is the sum of revenue from all fisheries

for the entities owning the 7 purse seine vessels). The purse seine herring fishery derived approximately 73% of its value from herring. The decrease in herring quota under Alternative 2 would reduce total entity revenue by 63% (from $11,165,000 to $4,117,000).

The 35 trawl vessels brought in $18,592,000 in herring revenue in 2017. With the sub-ACLs in Areas 1B, 2 and 3 decreasing by 87% from 2017 to 2019, the expected herring revenue in 2019 is projected at $2,497,000. The 33 entities owning the 35 trawl vessels had a sum of $96,055,000 in 2017 revenue (that is the sum of revenue from all fisheries for the entities owning the 35 trawl vessels). With $18,592,000 from herring, the trawl herring fishery derived approximately 19% of its value from herring. The decrease in herring quota under Alternative 2 would project a 17% decrease in total revenues brought in by these entities (from $96,055,000 to $79,960,000).

Combined impacts to both the purse seine and trawl fishery from Alternative 2 is an estimated decrease in revenue from the herring fishery by 87% and decrease the total revenue of affected entities by 22%.

9.10.6.3 Alternative 3

Alternative 3 would reduce the sub-ACLs in areas 1A, 1B, 2 and 3 by 78% from 2017 to 2019.

Table 19. Change in Herring Quota by Area, 2017 to 2019, Alternative 3

Area	2017	2019	Percent Change
1A	32,115	7,077	-78%
1B	4,825	1,053	-78%
2	31,227	6,808	-78%
3	43,873	9,550	-78%

Source: NMFS

The total revenue brought in by the 7 purse seine herring vessels in 2017 was $8,157,000. With the sub-ACL in Area 1A decreasing by 78% in 2019 under Alternative 3, the expected herring revenue from this area in 2019 is $1,795,000. The 6 entities owning the 7 purse seine vessels had a sum of $11,165,000 in 2017 revenue (that is the sum of revenue from all fisheries for the entities owning the 7 purse seine vessels). With $8,157,000 from herring, the purse seine herring fishery derived approximately 73% of its value from herring. The decrease in herring catch under Alternative 3 projects a 57% decrease in total revenues brought in by these entities (from $11,165,000 to $4,802,660).

The 35 trawl vessels brought in $18,592,000 in herring revenue in 2017. With the sub-ACLs in Areas 1B, 2 and 3 decreasing by 78% from 2017 to 2019, the expected herring revenue in 2019 is $3,686,602. The 33 entities owning the 35 trawl vessels had a sum of $96,055,000 in 2017 revenue (that is the sum of revenue from all fisheries for the entities owning the 35 trawl vessels). With $18,592,000 from herring, the trawl herring fishery derived approximately 19% of its value from herring. From 2017 to 2019 the decrease in herring sub-ACL under Alternative 3 will decrease total entity revenue by 16% (from $96,055,000 to $81,150,000).

Combined impacts to both the purse seine and trawl fishery from Alternative 3 is an estimated decrease in revenue from the herring fishery by 80% and decrease the total revenue of affected entities by 20%.

10.0 LITERATURE CITED

Waring G, Josephson E, Maze-Foley K & Rosel P. (2014). *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2013*. Woods Hole, MA: U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-228. 475 p.

Waring G, Josephson E, Maze-Foley K & Rosel P. (2015). *Trends in Selected U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2014*. Woods Hole, MA: U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-231. 370 p.

11.0 LIST OF PREPARERS

This document was prepared by the NMFS, in consultation with the New England Council.

12.0 APPENDIX

Atlantic Herring Fishery Specifications

for the 2016-2018 Fishing Years
(January 1, 2016 – December 31, 2018)

Including an
Environmental Assessment

Prepared by the
New England Fishery Management Council

in consultation with
Atlantic States Marine Fisheries Commission
National Marine Fisheries Service
Mid-Atlantic Fishery Management Council

Preliminary Submission: November 4, 2015
Formal Submission: March 1, 2016

Intentionally Blank

1.0 EXECUTIVE SUMMARY

This document contains the New England Fishery Management Council's (Council's) recommendations for the Atlantic herring fishery specifications for the 2016-2018 fishing years, consistent with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and the Atlantic Herring Fishery Management Plan (FMP), approved by the National Marine Fisheries Service (NMFS) on October 27, 1999. This document also contains information and supporting analyses required under other applicable law, including the National Environmental Policy Act (NEPA) and Regulatory Flexibility Act (RFA).

The Atlantic herring fishery specifications are annual amounts specified for the 2016-2018 fishing years (January – December), including:

- Overfishing Limit (OFL);
- Acceptable Biological Catch (ABC);
- Stockwide Atlantic Herring Annual Catch Limit (ACL) = U.S. Optimum Yield (OY);
- Domestic Annual Harvest (DAH);
- Domestic Annual Processing (DAP);
- U.S. At-Sea Processing (USAP);
- Border Transfer (BT, U.S.-caught herring transferred to Canadian vessels for export);
- Management Area sub-ACLs;
- Research Set-Asides (RSA);
- Fixed Gear Set-Aside (FGSA); and
- Seasonal (Monthly) Sub-ACL Divisions

In addition, annual gear-specific and area-specific catch caps for river herring and shad (RH/S) are specified for trips landing more than 6,600 pounds of Atlantic herring (3 mt) during the 2016-2018 fishing years, consistent with Framework Adjustment 3 to the Atlantic Herring FMP.

Proposed Action

Alternative 3 is the Council's ***Preferred Alternative*** for the 2016-2018 Atlantic herring fishery specifications and is described in Section 4.1.4 (p. 14) and summarized in Table 1. Alternative 3 would specify Atlantic herring ABC at the level recommended by the SSC (111,000 mt) and would maintain the 2013-2015 specification of management uncertainty for 2016-2018. Under Alternative 3, the management uncertainty buffer would be specified at 6,200 mt to account for catch in the NB weir fishery (average catch 2009-2011). Alternative 3 would maintain a status quo approach to all other Atlantic herring fishery specifications for 2016-2018, including set-asides and the seasonal (monthly) distribution of sub-ACLs (Table 2). Alternative 3 includes a provision that would allow for 1,000 mt of Atlantic herring to be returned to the Area 1A fishery from the management uncertainty buffer if certain conditions are met.

Table 1 - Preferred alternative for 2016-2018 Atlantic herring fishery specifications

Specifications	Alternative 3 *Preferred Alternative*
OFL	2016 – 138,000 2017 – 117,000 2018 – 111,000
ABC	111,000
Management Uncertainty	6,200 (Value in 2015)
ACL/OY	104,800[1]
DAH	104,800
DAP	100,800
USAP	0
BT	4,000
Area 1A Sub-ACL (28.9%)	30,300
Area 1B Sub-ACL (4.3%)	4,500
Area 2 Sub-ACL (27.8%)	29,100
Area 3 Sub-ACL (39%)	40,900
RSA	3%
FGSA	295

[1]***NB Weir Payback Provision –*** If, by considering landings through ***October 1,*** NMFS determines that less than 4,000 mt has been caught in the NB weir fishery, NMFS will allocate an additional 1,000 mt to the Area 1A sub-ACL to be made available to the directed herring fishery as soon as possible, through the remainder of the fishing year (until the AM is triggered). If this occurs, the stockwide Atlantic herring ACL would increase to **105,800 mt**.

Table 2 - Preferred alternative for seasonal (monthly) sub-ACL divisions (2016-2018)

Area	Seasonal sub-ACL division
1A	0% January-May; 100% June-December
1B	0% January-April; 100% May-December

These specifications include the Council's recommendations for river herring/shad catch caps in the directed Atlantic herring fishery for the 2016-2018 fishing years. RH/S Catch Cap Alternative 3, Option 2 (Weighted Mean) is the Council's ***Preferred Alternative*** for specifying the 2016-2018 river herring/shad catch caps and is described in Section 4.3.3 (p. 36) and summarized in Table 3. This alternative would incorporate RH/S catch estimates from the most recent two fishing years, extending the time series on which the caps are based to seven years,

with the weighted mean values selected as the 2016-2018 RH/S catch caps. The proposed RH/S catch caps would continue to apply to midwater trawl vessels in the Gulf of Maine and Cape Cod Catch Cap Areas, and to both midwater trawl and small mesh bottom trawl vessels in the southern New England/Mid-Atlantic Catch Cap Area (see RH/S Catch Cap Areas shaded on Figure 1, p. 3) on all trips landing more than 6,600 pounds of Atlantic herring. No RH/S catch cap would be adopted for the GB Catch Cap Area.

Table 3 - Preferred alternative for 2016-2018 river herring/shad catch caps

RH/S Catch Cap Area	2016-2018 RH/S Catch Cap (mt) Option 2 (Weighted Mean)
GOM	Midwater Trawl – 76.7
CC	Midwater Trawl – 32.4
SNE/MA	Midwater Trawl – 129.6 Bottom Trawl – 122.3
GB	0

Affected Environment

The Affected Environment for the 2016-2018 Atlantic herring fishery specifications is in Section 6.0 (p. 40). The Affected Environment is described based on valued ecosystem components (VECs). VECs represent the resources, areas, and human communities that may be affected by the measures under consideration in this management action. VECs are the focus, since they are the "place" where the impacts of management actions are exhibited. The VECs for consideration in the 2016-2018 Atlantic herring fishery specifications include: **Atlantic Herring**; **Non-Target Species** (with particular focus on river herring/shad); **Physical Environment and Essential Fish Habitat (EFH)**; **Protected Resources**; and **Fishery-Related Businesses and Communities**. In addition to the information in Section 6.0, Appendix I (*Development of Options for River Herring and Shad Catch Caps in the Atlantic Herring Fishery, 2016-2018*, Herring PDT) provides a complete discussion of the Herring Plan Development Team (PDT) has estimations of recent RH/S catch in the Atlantic herring fishery.

Impacts of the Alternatives

The impacts of the alternatives considered by the Council on each VEC described in the Affected Environment are in Section 7.0 (p. 102) and summarized in Table 4. Because the range of alternatives for Atlantic herring ABC specification for the 2016-2018 fishing years only differs by 3,000 mt (2.6%), there is no discernable difference between the impacts of Alternatives 1-3 on the Atlantic herring resource. The projections (Section 7.1.1) show that under the OFL/ABC specifications considered by the Council (all alternatives), Atlantic herring spawning stock biomass (SSB) and fishing mortality (F) resulting from fully utilizing ABC fall within the same range (based on the 80% confidence intervals). Because the overall status of Atlantic herring (rebuilt, B > SSB) is not expected to be jeopardized, and there would be mortality controls in the fishery, all three alternatives under consideration for the 2016-2018 fishery specifications are expected to have a ***low positive impact*** on the Atlantic herring resource. The proposed specifications are expected to have a ***negligible*** impact on non-target species, because

interactions with the primary non-target species in the Atlantic herring fishery (haddock and RH/S) will continue to be managed through catch caps, the impacts of all three alternatives on non-target species are expected to be ***negligible***. Given the minimal and temporary nature of adverse effects on Essential Fish Habitat (EFH) in the Atlantic herring fishery, all alternatives are expected to have a ***negligible*** impact on the physical environment and EFH. The impacts on protected resources are expected to be ***low negative to neutral***. The impacts on fishing businesses and communities are expected to be ***low positive***, as stability in specifications provides a sense of certainty about regulations and the future of the Atlantic herring fishery, and harvesting within OFL, ABC, and ACL constraints should provide for a sustainable fishery.

In general, the proposed 2016-2018 RH/S catch caps are expected to have ***negligible*** impacts on most VECs and ***low positive*** impacts on non-target species. The RH/S catch caps are not expected to affect the amount of Atlantic herring available for harvest in any given fishing year, which is specified through the Atlantic herring OFL, ABC, and the stockwide ACL/OY. The proposed RH/S catch caps (by gear and area) are intended to provide an opportunity for the vessels participating in the directed Atlantic herring fishery to fully utilize the total stockwide ACL for Atlantic herring (U.S. OY) if they can continue to avoid RH/S. Assuming this, the impacts of all of the RH/S catch cap alternatives under consideration for 2016-2018 on the Atlantic herring resource and fishery-related businesses and communities are expected to be ***negligible***.

River herring and shad are non-target species of particular concern in this management action and are discussed in Section 6.2.3 (p. 51). All of the alternatives for 2016-2018 RH/S catch caps are expected to have a ***low positive*** impact on non-target species, particularly river herring and shad. While stock and fishery data are not robust enough at this time to determine a biologically-based RH/S catch cap and/or the potential impacts of such a catch cap on the RH/S stocks, setting a cap on the catch of these species in the directed Atlantic herring fishery is a proactive action intended to manage and minimize catch to the extent practicable while allowing the Atlantic herring fishery to continue to operate and fully use OY during 2016-2018, if RH/S can be avoided. The catch of RH/S in the directed Atlantic herring fishery would likely be less under any of the alternatives when compared to not specifying catch caps in the fishery because catch would be capped, and there would be a regulatory incentive for the fleet to avoid RH/S. Generally, lower catches should result in positive impacts on RH/S.

Table 4 - Summary of impacts of alternatives under consideration on each VEC

	Atlantic Herring	Non-Target Species	Physical Envt/EFH	Protected Resources	Fishery-Related Businesses and Communities
2016-2018 Atlantic Herring Fishery Specifications					
Alt 1 (No Action)	Low positive	Negligible	Negligible	Low Negative to Negligible	Low positive
Alt 2	Low positive	Negligible	Negligible	Low Negative to Negligible	Low positive
Alt 3 (Preferred)	Low positive	Negligible	Negligible	Low Negative to Negligible	Low positive
2016-2018 RH/S Catch Caps					
RH/S Alt 1 (No Action)	Negligible	Low positive	Negligible	Low Negative to Negligible	Negligible
RH/S Alt 2	Negligible	Low positive	Negligible	Low Positive to Low Negative	Negligible (Possibly Negative for SNE/MA SMBT)
RH/S Alt 3 (Preferred)	Negligible	Low positive	Negligible	Option 1 – Low Positive to Low Negative Option 2 (Preferred) – Low Negative to Negligible	Negligible (Possibly Negative for SNE/MA SMBT)
Note: The overall impacts of the alternative on each VEC are provided. The differential impacts of the alternatives are discussed in detail throughout Section 7.0. Preferred alternatives are shaded					

2.0 CONTENTS

2.1 TABLE OF CONTENTS

2.2 TABLES

2.3 FIGURES

2.1 APPENDICES

2.2 ACRONYMNS

ABC	Acceptable Biological Catch
ABC CR	ABC Control Rule
ACL	Annual Catch Limit
AM	Accountability Measure
ASMFC	Atlantic States Marine Fisheries Commission or Commission
B	Biomass
BT	Border Transfer
CAA	Catch at Age
CC	Cape Cod
CZMA	Coastal Zone Management Act
DAH	Domestic Annual Harvest
DAP	Domestic Annual Processing
DMF	Division of Marine Fisheries
DMR	Department of Marine Resources
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
E.O.	Executive Order
ESA	Endangered Species Act
F	Fishing Mortality Rate
FEIS	Final Environmental Impact Statement
FGSA	Fixed Gear Set-Aside
FMP	Fishery Management Plan
FW	Framework
FY	Fishing Year
GB	Georges Bank
GMRI	Gulf of Maine Research Institute
GOM	Gulf of Maine
IFM	Industry-Funded Monitoring
IVR	Interactive Voice Response
IWP	Internal Waters Processing
JVP	Joint Venture Processing
M	Natural Mortality Rate
MADMF	Massachusetts Division of Marine Fisheries

MAFMC	Mid-Atlantic Fishery Management Council
MEDMR	Maine Department of Marine Resources
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistical Survey
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
mt	Metric Tons
NB	New Brunswick
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fisheries Observer Program
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NSGs	National Standard Guidelines
OFL	Overfishing Limit
OY	Optimum Yield
PDT	Plan Development Team
PS/FG	Purse Seine/Fixed Gear
RFA	Regulatory Flexibility Act
RFFA	Reasonably Foreseeable Future Action
RH/S	River Herring/Shad
RIR	Regulatory Impact Review
RSA	Research Set-Aside
SARC	Stock Assessment Review Committee
SAW	Stock Assessment Workshop
SSB	Spawning Stock Biomass
SSC	Scientific and Statistical Committee
SFA	Sustainable Fisheries Act
SNE/MA	Southern New England/Mid-Atlantic
TALFF	Total Allowable Level of Foreign Fishing
TC	Technical Committee
TRAC	Transboundary Resource Assessment Committee
TRT	Take Reduction Team
USAP	U.S. At-Sea Processing
VMS	Vessel Monitoring System
VTR	Vessel Trip Report

3.0 INTRODUCTION

This document contains the New England Fishery Management Council's (Council's) recommendations for the Atlantic herring fishery specifications for the 2016-2018 fishing years, consistent with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and the Atlantic Herring Fishery Management Plan (FMP), initially approved by the National Marine Fisheries Service (NMFS) on October 27, 1999. This document also contains information and supporting analyses required under other applicable law, including the National Environmental Policy Act (NEPA) and Regulatory Flexibility Act (RFA).

The Atlantic herring fishery specifications are annual amounts specified for the 2016-2018 fishing years (January – December), including:

- Overfishing Limit (OFL);
- Acceptable Biological Catch (ABC);
- Stockwide Atlantic Herring Annual Catch Limit (ACL) = U.S. Optimum Yield (OY);
- Domestic Annual Harvest (DAH);
- Domestic Annual Processing (DAP);
- U.S. At-Sea Processing (USAP);
- Border Transfer (BT, U.S.-caught herring transferred to Canadian vessels for export);
- Management Area sub-ACLs;
- Research Set-Asides (RSA);
- Fixed Gear Set-Aside (FGSA);
- Seasonal (Monthly) Sub-ACL Divisions; and

In addition, annual gear-specific and area-specific catch caps for river herring and shad (RH/S) are specified for trips landing more than 6,600 pounds (3 mt) of Atlantic herring during the 2016-2018 fishing years, consistent with Framework Adjustment 3 to the Atlantic Herring FMP.

The 2016-2018 Atlantic herring fishery specifications are developed by the Council based on the best available science. The 2015 Atlantic herring operational stock assessment and the recommendations of the NEFMC Scientific and Statistical Committee (SSC) form the basis of the OFL and ABC specifications for 2016-2018.

3.1 BACKGROUND

The Atlantic herring (*Clupea harengus*) fishery specifications are annual amounts recommended by the New England Fishery Management Council every three years through a process established in the Atlantic Herring FMP (and modified in Amendments 1 and 4). In recognition of the spatial structure of the Atlantic herring stock complex (multiple stock components that separate to spawn and mix during other times of the year), the total annual catch limit for Atlantic herring (stockwide ACL/OY) is divided and assigned as sub-ACLs to four management areas (Figure 1, p. 3). Management Area 1 represents the Gulf of Maine (GOM), which is divided into an inshore (Area 1A) and offshore section (Area 1B). Area 2 is located in the coastal waters between MA and NC (southern New England/Mid-Atlantic), and Area 3 represents the offshore Georges Bank (GB) area. The Council uses the best available information to consider the proportion of each spawning component of the Atlantic herring stock complex in each area/season and distribute the sub-ACLs such that the risk of overfishing an individual spawning component is minimized to the extent practicable.

Amendment 1 to the Herring FMP (NEFMC 2006) established a process that allows the Council to set multiyear (up to three fishing years) specifications. In Amendment 4 (NEFMC 2010), the Council updated the Atlantic herring specifications process to ensure consistency with the newly-implemented provisions of the MSA and implemented provisions for annual catch limits (ACLs) and accountability measures (AMs) in the Atlantic herring fishery. The Council opted to retain the general provisions for establishing specifications for the Atlantic herring fishery but eliminated the need to annually specify Joint Venture Processing (JVP), Internal Waters Processing (IWP), Total Allowable Level of Foreign Fishing (TALFF), and a sub-ACL reserve. While TALFF will not have to be considered by the Council during the specifications process, countries interested in foreign fishing for herring may still request TALFF allocations from NMFS, and these requests will be addressed as they arise. Framework 2 paralleled the 2013-2015 Atlantic herring fishery specifications and authorized the Council to split Atlantic herring sub-ACLs seasonally (by month) during the specifications process. It also established a general policy for authorizing annual carryover of unused sub-ACL (up to 10%) under specific conditions (NEFMC 2014a).

Framework 3 to the Atlantic Herring FMP became effective in late 2014 and established provisions for gear-specific and/or area-specific RH/S catch caps, which apply to vessels participating in the directed Atlantic herring fishery. Framework 3 also specified RH/S catch caps for the 2014 and 2015 fishing years and included provisions to allow future RH/S catch caps to be specified through the Atlantic herring fishery specifications process. The RH/S catch cap areas established in Framework 3 are shown in Figure 1.

Table 5 and Table 6 summarize the 2013-2015 Atlantic herring fishery specifications, as well as the 2014/2015 RH/S catch caps that were implemented in Framework 3.

Figure 1 - Atlantic Herring Management Areas and RH/S Catch Cap Areas

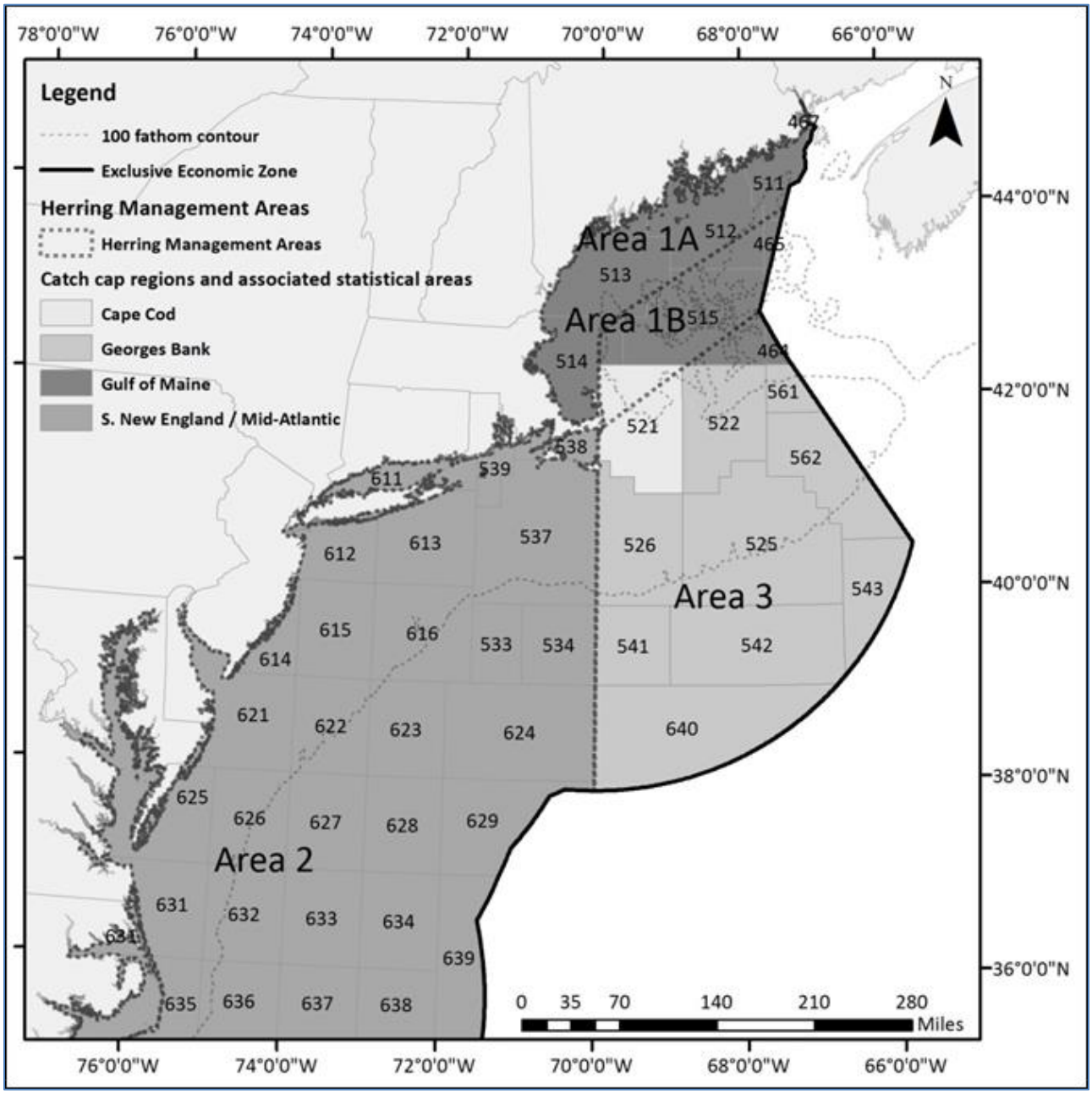


Table 5 - 2013-2015 Atlantic herring specifications (initial allocations)

SPECIFICATION	2013-2015 INITIAL ALLOCATION (MT)
Overfishing Limit (OFL)	169,000 – 2013 136,000 – 2014 114,000 – 2015
Acceptable Biological Catch (ABC)	114,000
U.S. Optimum Yield (OY)/Annual Catch Limit (ACL)	107,800
Domestic Annual Harvesting (DAH)	107,800
Domestic Annual Processing (DAP)	103,800
U.S. At-Sea Processing (USAP)	N/A
Border Transfer (BT)	4,000
Sub-ACL Area 1A (28.9% of ACL)	31,200
Sub-ACL Area 1B (4.3% of ACL)	4,600
Sub-ACL Area 2 (27.8% of ACL)	30,000
Sub-ACL Area 3 (39% of ACL)	42,000
Research Set-Aside (RSA)	3% of each sub-ACL
Fixed Gear Set-Aside (1A)	295

Seasonal Sub-ACL Divisions for 2014 and 2015

Area 1A: 0% January-May; 100% June-December
Area 1B: 0% January-April; 100% May-December

Table 6 - 2014-2015 RH/S catch caps

Area	2014-2015 RH/S Catch Cap (mt)
GOM	Midwater Trawl – 85.5
CC	Midwater Trawl – 13.3
SNE/MA	Midwater Trawl – 123.7 Bottom Trawl – 88.9
GB	0
Note: RH/S Catch Cap Areas shown in Figure 1 (p. 3).	

3.2 PURPOSE AND NEED

The purpose of this action is to specify the overfishing limit (OFL) and acceptable biological catch (ABC) for the Atlantic herring fishery, and to set specifications for the 2016-2018 fishing years consistent with the best available science and the requirements of the Atlantic Herring FMP, while providing additional flexibility and promoting the full utilization of optimum yield (OY). The requirement to set multiyear specifications is also needed to prevent overfishing. Pursuant to the requirements of the MSA, the specifications and RH/S catch caps are intended to continue to address and minimize the catch and bycatch of river herring and shad to the extent practicable.

3.3 GOALS AND OBJECTIVES

The 2016-2018 Atlantic herring fishery specifications are intended to meet the goal and several of the objectives of the Atlantic Herring FMP, as modified in Amendment 1:

Goal

- Manage the Atlantic herring fishery at long-term sustainable levels consistent with the National Standards of the Magnuson-Stevens Fishery Conservation and Management Act.

Objectives

- Harvest the Atlantic herring resource consistent with the definition of overfishing contained in the Herring FMP and prevent overfishing.
- Prevent the overfishing of discrete spawning components of Atlantic herring.
- Avoid patterns of fishing mortality by age which adversely affect the age structure of the stock.
- Provide for long-term, efficient, and full utilization of the optimum yield from the herring fishery while minimizing waste from discards in the fishery. Optimum yield is the amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, taking into account the protection of marine ecosystems, including maintenance of a biomass that supports the ocean ecosystem, predator consumption of herring, and biologically sustainable human harvest. This includes recognition of the importance of Atlantic herring as one of many forage species of fish, marine mammals, and birds in the Northeast Region.
- Minimize, to the extent practicable, the race to fish for Atlantic herring in all management areas.
- Provide, to the extent practicable, controlled opportunities for fishermen and vessels in other mid-Atlantic and New England fisheries.
- Promote and support research, including cooperative research, to improve the collection of information in order to better understand herring population dynamics, biology and ecology, and to improve assessment procedures.

- Promote compatible U.S. and Canadian management of the shared stocks of herring.
- Continue to implement management measures in close coordination with other Federal and State FMPs and the Atlantic States Marine Fisheries Commission (ASMFC) management plan for Atlantic herring, and promote real-time management of the fishery.

The 2016-2018 river herring/shad (RH/S) catch caps proposed in this document (Section 4.3) help ensure that the Atlantic herring management program reduces RH/S catch and bycatch to the extent practicable. These measures are intended to meet the objectives specified in Framework 3 to the Atlantic Herring FMP:

- Provide strong incentive for the industry to continue to avoid river herring/shad and reduce river herring/shad catch to the extent practicable;
- Enhance coordination with the Mid-Atlantic Fishery Management Council to address overlapping fisheries; and
- Promote flexibility to adjust the catch cap(s) in the future as more information becomes available.

3.4 DEFINITIONS AND FORMULAS

The following definitions/formulas were adopted in the Atlantic Herring FMP (modified in Amendment 4) and are described below as they apply to the 2016-2018 Atlantic herring fishery specifications.

Overfishing Limit (OFL). The catch that results from applying the maximum fishing mortality threshold to a current or projected estimate of stock size. When the stock is not overfished and overfishing is not occurring, this is usually F_{MSY} or its proxy.

$$\mathbf{OFL \geq ABC \geq ACL}$$

The proposed Atlantic herring OFL specification for 2016-2018 is derived from short-term projections following the 2015 Atlantic herring update assessment and was recommended by the SSC at its May 20, 2015, meeting (NEFMC 2015).

Acceptable Biological Catch (ABC). The maximum catch that is recommended for harvest, consistent with meeting the biological objectives of the management plan. The MSA interpretation of ABC includes consideration of biological uncertainty (stock structure, stock mixing, other biological/ecological issues), and recommendations for ABC should come from the NEFMC SSC. ABC can equal but never exceed the OFL.

OFL – Scientific Uncertainty = ABC (Determined by SSC)

The proposed Atlantic herring ABC specification for 2016-2018 is derived from short-term projections following the 2015 Atlantic herring update assessment and was recommended by the SSC at its May 20, 2015, meeting (NEFMC 2015).

ABC Control Rule (ABC CR). The specified approach to setting the ABC for a stock or stock complex as a function of scientific uncertainty in the estimate of OFL and any other scientific uncertainty. The ABC control rule will consider uncertainty in factors such as stock assessment issues, retrospective patterns, predator-prey issues, and projection results. The ABC control rule will be specified and may be modified based on guidance from the SSC during the specifications

process. Modifications to the ABC control rule can be implemented through specifications or framework adjustments to the Herring FMP (in addition to future amendments), as appropriate.

Current (interim) ABC Control Rule: Under the current ABC control rule, ABC will be specified for three years based on the annual catch that is projected to produce a probability of exceeding F_{MSY} in the third year that is less than or equal to 50%. For 2016-2018, this value is 110,000 mt (Section 4.1.1, p. 11).

The current ABC control rule is considered an interim control rule, i.e., a placeholder until the Council can develop a long-term control rule through a more comprehensive management action. The Council initiated Amendment 8 to the Atlantic Herring FMP in January 2015 to consider a range of alternatives to establish a long-term ABC CR for Atlantic herring, including alternatives that explicitly account for Atlantic herring's role in the ecosystem. For the 2016-2018 Atlantic herring fishery specifications, the Council, based on recommendations from its SSC (May 20, 2015), will continue to base the annual specification of ABC on the interim ABC CR, which does not explicitly account for herring's role as forage, but should meet forage demands in the short-term due to relatively high herring abundance that will maintain biomass at levels consistent with forage-based control rules. It is anticipated that Amendment 8 will be adopted prior to development of the next fishery specifications (2019-2021).

Annual Catch Limit (ACL). A stockwide ACL will be established that accounts for both scientific uncertainty (through the specification of ABC) and management uncertainty (through the specification of the stockwide ACL and buffer between ABC and the ACL).

The ACL is the annual catch level specified such that the risk of exceeding the ABC is consistent with the management program. The ACL can equal but never exceed the ABC. ACL should be set lower than the ABC as necessary due to uncertainty over the effectiveness of management measures. The stockwide Atlantic herring ACL equates to the U.S. optimum yield (OY) for the Atlantic herring fishery and serves as the level of catch that determines whether accountability measures (AMs) become effective. The AM for the stockwide ACL, total fishery closure at 95%, reduces the risk of overfishing.

ABC – Management Uncertainty = Stockwide ACL = OY

Sub-ACL. Area-based sub-divisions of the stockwide/total Atlantic herring ACL, intended to minimize the risk of overfishing any stock sub-component. The Council has chosen to apply AMs to the sub-ACLs (closure of the area at 92%), further reducing the risk of overfishing.

Accountability Measure(s) (AMs). Management measures established to ensure that (1) the ACL is not exceeded during the fishing year; and (2) any ACL overages, if they occur, are mitigated and corrected.

Domestic Annual Harvest (DAH). DAH is established based on the expected catch from U.S. fishing vessels during the upcoming fishing year(s). The Herring FMP, as modified in Amendment 4, specifies that OY may equal DAH.

OY ≥ DAH

The Herring FMP, as modified in Amendment 4, also specifies that domestic annual harvest (DAH) will be composed of domestic annual processing (DAP) and the amount of Atlantic herring that can be taken in U.S. waters and transferred to Canadian herring carriers for transshipment to Canada (BT).

DAH = DAP + BT

Domestic Annual Processing (DAP). The amount of U.S. harvest that domestic processors will use, combined with the amount of the resource that will be sold as fresh fish (including bait). The Herring FMP specifies that DAP is a subset of DAH and is composed of estimates of production from U.S. shoreside and at-sea processors. The Herring FMP authorizes the allocation of a portion of DAP for at-sea processing by domestic processing vessels that exceed the current size limits (U.S. at-sea processing, USAP).

U.S. At-Sea Processing (USAP). Domestic at-sea processing capacity by U.S. vessels that exceed current size limits (0 mt for 2013-2015 fishery specifications). When determining the USAP allocation, the Council should consider the availability of other processing capacity, development of the fishery, status of the resource, and opportunities for vessels to enter the herring fishery.

Border Transfer (BT). The amount of herring that can be taken in U.S. waters and transferred to Canadian herring carriers for transshipment to Canada, (4,000 mt for 2013-2015 and previous specifications).

Research Set-Aside (RSA). RSAs are allowed in any or all of the herring management areas with a sub-ACL of 0-3%.

Fixed Gear Set-Aside (FGSA). FGSA can be specified up to 500 mt in Area 1A and will be returned to the 1A sub-ACL if not utilized by November 1.

4.0 ALTERNATIVES UNDER CONSIDERATION

This section describes the 2016-2018 Atlantic herring fishery specifications and RH/S catch caps proposed by the New England Fishery Management Council as well as other alternatives that the Council considered during the specifications process.

- The alternatives for the fishery specifications, including the ***Preferred Alternative***, are described in Section 4.1 (p. 9). The alternatives differ in terms of the ABC and ACL (driven by the choice of management uncertainty buffer). Specification of BT, RSA, and FGSA remain unchanged from 2013-2015.
- Information and rationale to support the Council's ***Preferred Alternative*** for the 2016-2018 Atlantic herring fishery specifications is in Section 4.2 (p. 15).
- The alternatives for the 2016-2018 RH/S catch caps, including the ***Preferred Alternative***, are described in Section 4.3 (p. 34).

4.1 ALTERNATIVES FOR 2016-2018 ATLANTIC HERRING FISHERY SPECIFICATIONS

The development of the 2016-2018 Atlantic herring fishery specifications was a multi-step decision-making process that involved the Council, the Scientific and Statistical Committee (SSC), and the Herring Plan Development Team (PDT), with input from the Herring Committee and Herring Advisory Panel (AP). The alternatives under consideration by the Council for the 2016-2018 specifications are described individually in the following subsections and are summarized in Table 7 below. These alternatives are based on the SSC's recommendations for OFL and ABC (see discussion in following subsection).

Table 7 - Alternatives under consideration for 2016-2018 Atlantic herring fishery specifications

Specifications	No Action Alternative (2015 Specifications)	Alternative 2	Alternative 3 *Preferred Alternative*
OFL	114,000	2016 – 138,000 2017 – 117,000 2018 – 111,000	2016 – 138,000 2017 – 117,000 2018 – 111,000
ABC	114,000	111,000	111,000
Management Uncertainty	6,200 (3 year avg. 2009-2011)	3,000 (3 year avg. 2012-2014)	6,200 (Value in 2015)
ACL/OY	107,800	108,000	104,800[1]
DAH	107,800	108,000	104,800
DAP	103,800	104,000	100,800
USAP	0	0	0
BT	4,000	4,000	4,000
1A Sub-ACL	31,200	31,212	30,300
1B Sub-ACL	4,600	4,644	4,500
2 Sub-ACL	30,000	30,024	29,100
3 Sub-ACL	42,000	42,120	40,900
RSA	3%	3%	3%
FGSA	295	295	295

[1]***NB Weir Payback Option (Alternative 3) –*** If, by considering landings through **October 1,** NMFS determines that less than 4,000 mt has been caught in the NB weir fishery, NMFS will allocate an additional 1,000 mt to the Area 1A sub-ACL to be made available to the directed herring fishery as soon as possible, through the remainder of the fishing year (until the AM is triggered).

Seasonal (Monthly) Sub-ACL Divisions (Apply to All Alternatives)

Area 1A: 0% January-May; 100% June-December;

Area 1B: 0% January-April; 100% May-December.

Note: The Preferred Alternatives are shaded in grey.

4.1.1 Development of OFL and ABC Specifications for 2016-2018

Following the Atlantic herring operational (update) assessment meeting (April 2015), the SSC met on May 20, 2015 to review the operational assessment results and develop recommendations for the Atlantic herring overfishing limit (OFL) and acceptable biological catch (ABC) specifications for the 2016-2018 fishing years. The SSC reviewed a number of projections and possible approaches for specifying ABC (control rules) and recommended that the Council specify ABC for the 2016-2018 fishing years based on the interim ABC control rule for Atlantic herring (adopted in the 2013-2015 fishery specifications). The interim ABC control rule uses a constant catch approach, with the annual ABC set such that the probability of overfishing does not exceed 50% in any of those years (but may reach 50% in the third year). This approach produces an ABC specification of 111,000 mt for 2016, 2017 and 2018, and associated OFLs of 138,000 mt in 2016, 117,000 mt in 2017, and 111,000 mt in 2018. The SSC provided the following rationale for this recommendation:

- Key attributes of the stock and assessment (SSB, recruitment, F, survey indices, etc.) have not changed substantially since the benchmark assessment, on which the current control rule was based. However, survey indices suggest that the 2011 year class is the second largest in time series and will contribute significantly to the total population abundance and biomass in 2016-2018.
- The most substantial change since the benchmark stock assessment (NEFSC 2012) is that the retrospective pattern has become worse in the operational assessment. The assessment implemented a Mohn's rho correction to SSB in an attempt to account for the retrospective pattern, but there is no guarantee that the retrospective pattern will persist in sign and magnitude.
- Although the probability of overfishing may reach 50% in the third year, the probability of the stock becoming overfished is close to 0% in all years (see OFL/ABC projections in Section 7.1.1.2, p 108).
- The realized catch in the Atlantic herring fishery is generally well below the ABC, which reduces the expected risk of overfishing.
- In the assessment model, the current ratio of catch to estimated consumption is 1:4, which means that fishing is likely not the largest driver of stock abundance at present, however this does not negate the need to manage the fishing removals on this stock.
- A constant catch strategy is the preferred approach of the Council and the industry.

The considerations above led the SSC to conclude that ABC should remain relatively constant for 2016-2018, or perhaps be reduced modestly. The recommended ABC of 111,000 mt, compared with status quo estimate of 114,000 mt, achieves that outcome. Additionally, the SSC noted that the current high herring biomass, bolstered by two very large year classes, likely meets ecosystem goals, including forage considerations, by default and not design, as ecosystem goals are not explicitly identified in the current ABC control rule (NEFMC 2015).

4.1.2 Alternative 1: No Action

No Action. Alternative 1 would maintain the 2015 Atlantic herring fishery specifications for the 2016-2018 fishing years (Table 8). Specification of Atlantic herring ABC would remain at 114,000 mt, which is above the SSC recommendation for 2016-2018 (111,000 mt). Specification of the management uncertainty buffer would be based on the most recent three-year average catch in the New Brunswick weir fishery (2009-2011, based on 2013-2015 Atlantic herring fishery specifications).

Table 8 - Alternative 1 (No Action) for 2016-2018 Atlantic herring specifications (mt)

Specifications	No Action Alternative 2015 Specifications (metric tons)
OFL	114,000
ABC	114,000
Management Uncertainty	6,200 (3 year average 2009-2011)
ACL/OY	107,800
DAH	107,800
DAP	103,800
USAP	0
BT	4,000
Area 1A Sub-ACL (28.9%)	31,200
Area 1B Sub-ACL (4.3%)	4,600
Area 2 Sub-ACL (27.8%)	30,000
Area 3 Sub-ACL (39%)	42,000
RSA	3%
FGSA	295

Alternative 1 Seasonal (Monthly) Sub-ACL Divisions (2016-2018)

- Area 1A: 0% January-May; 100% June-December;
- Area 1B: 0% January-April; 100% May-December.

4.1.3 Alternative 2: Status Quo

Alternative 2 would specify Atlantic herring ABC at the level recommended by the SSC (111,000 mt), and would maintain a status quo approach to specifying the management uncertainty buffer for 2016-2018, using the most recent three-year average catch in the NB weir fishery (Table 9). In this case, the average from 2012-2014 was 3,000 mt. Alternative 2 would also maintain a status quo approach to all other Atlantic herring fishery specifications, including set-asides and the seasonal (monthly) distribution of sub-ACLs.

Table 9 - Alternative 2 for 2016-2018 Atlantic herring specifications (mt)

Specifications	Alternative 2 (metric tons)
OFL	2016 – 138,000 2017 – 117,000 2018 – 111,000
ABC	111,000
Management Uncertainty	3,000 (3 year average 2012-2014)
ACL/OY	108,000
DAH	108,000
DAP	104,000
USAP	0
BT	4,000
Area 1A Sub-ACL (28.9%)	31,212
Area 1B Sub-ACL (4.3%)	4,644
Area 2 Sub-ACL (27.8%)	30,024
Area 3 Sub-ACL (39%)	42,120
RSA	3%
FGSA	295

Alternative 2 Seasonal (Monthly) Sub-ACL Divisions (2016-2018)

- Area 1A: 0% January-May; 100% June-December;
- Area 1B: 0% January-April; 100% May-December.

4.1.4 Alternative 3 (*PREFERRED ALTERNATIVE*)

Alternative 3 is the Council's ***Preferred Alternative*** for the 2016-2018 Atlantic herring fishery specifications (Table 10). Alternative 3 would specify Atlantic herring ABC at the level recommended by the SSC (111,000 mt) and would maintain the 2013-2015 specification of management uncertainty for 2016-2018. The management uncertainty buffer would be specified at 6,200 mt to account for catch in the NB weir fishery (average catch 2009-2011). Alternative 3 would maintain a status quo approach to all other Atlantic herring fishery specifications for 2016-2018, including set-asides and the seasonal (monthly) distribution of sub-ACLs. Alternative 3 has a provision that would allow for 1,000 mt of Atlantic herring to be returned to the Area 1A fishery from the management uncertainty buffer if certain conditions are met.

Table 10 - Alternative 3 (*Preferred Alternative*) for 2016-2018 Atlantic herring specifications (mt)

Specifications	Alternative 3 *Preferred Alternative*
OFL	2016 – 138,000 2017 – 117,000 2018 – 111,000
ABC	111,000
Management Uncertainty	6,200 (Value in 2015)
ACL/OY	104,800
DAH	104,800
DAP	100,800
USAP	0
BT	4,000
Area 1A Sub-ACL (28.9%)	30,300
Area 1B Sub-ACL (4.3%)	4,500
Area 2 Sub-ACL (27.8%)	29,100
Area 3 Sub-ACL (39%)	40,900
RSA	3%
FGSA	295

Options for NB Weir Payback Provision - If, by considering landings of the NB weir fishery through a certain date (options below)**,** NMFS determines that less than 4,000 mt has been caught, NMFS would allocate an additional 1,000 mt to the Area 1A sub-ACL to be made available to the directed herring fishery as soon as possible, through the remainder of the fishing year (until the AM is triggered). If this occurs, the stockwide Atlantic herring ACL would increase to **105,800 mt** under this alternative.

Option A - October 1 ***(PREFERRED ALTERNATIVE)***

Option B - October 15

Alternative 3 Seasonal (Monthly) Sub-ACL Divisions (2016-2018)

- Area 1A: 0% January-May; 100% June-December;
- Area 1B: 0% January-April; 100% May-December.

4.2 SUPPORTING INFORMATION AND RATIONALE FOR PROPOSED 2016-2018 ATLANTIC HERRING SPECIFICATIONS

This section provides updated information and rationale to support the Council's ***Preferred Alternative*** for the 2016-2018 Atlantic herring fishery specifications. Because the specification of ABC for the 2016-2018 fishing years (recommended by the SSC; Section 4.1.1) only differs from the 2013-2015 ABC specification by 3,000 mt (2.6%), and because available stock/fishery information does not indicate a need to consider major changes to the distribution of allowable catch or other specifications, the alternatives that the Council considered maintain the status quo for many of the specifications (e.g., RSA, FGSA); they differ primarily through the specification of ABC, the management uncertainty buffer, and thus the stockwide Atlantic herring ACL.

4.2.1 Specification of Overfishing Limit and Acceptable Biological Catch

In recommending an overfishing limit and acceptable biological catch, the Council agreed with the conclusions and recommendations of its SSC – that although the probability of overfishing may reach 50% in the third year with the recommended OFL, the probability of the stock becoming overfished is close to 0% in all years. Also, that ABC should remain relatively constant for 2016-2018, or perhaps be reduced modestly. The recommended ABC of 111,000 mt, compared with status quo estimate of 114,000 mt, achieves that outcome. Additionally, the SSC noted and the Council concurred that the current high herring biomass, bolstered by two very large year classes, likely meets ecosystem goals by default and not design, as ecosystem goals are not explicitly identified in the current ABC control rule. Thus, the Council concluded that it is not necessary to increase scientific uncertainty above the SSC-recommended level at this time.

4.2.2 Specification of Management Uncertainty and Stockwide Atlantic Herring ACL/OY

The difference between the Atlantic herring ABC and the stockwide ACL equates to what the Council specifies as management uncertainty. The management uncertainty specification further ensures that Atlantic herring catch will not exceed the ABC in a given year by buffering against uncertainty related to the management system. The deduction for management uncertainty occurs based on the SSC recommendation for ABC (111,000 mt) to derive a stockwide ACL, which is the U.S. Atlantic herring OY for 2016-2018.

During the specifications process, the Council considered a range of deductions for management uncertainty based on three possible factors:

1. Canadian catch of Atlantic Herring (New Brunswick (NB) Weir Fishery);
2. Uncertainty around estimates of state waters Atlantic herring catch; and
3. Uncertainty around estimates of Atlantic herring discards.

4.2.2.1 Canadian Catch of Atlantic Herring (New Brunswick Weir Fishery)

Catch of the Atlantic herring stock complex in Canadian waters consists primarily of fish caught in the New Brunswick (NB) weir fishery. During the benchmark stock assessment for Atlantic herring (2012), the SARC 54 Panel noted that the contribution of the Atlantic herring stock on the Scotian Shelf region is unknown. It is generally assumed that juvenile fish (age 1 and 2) caught in the NB weir fishery are from the inshore (GOM) component of the Atlantic herring stock complex, while adult fish (age 3+) caught in the NB weir fishery are from the SW Nova Scotia stock complex (4WX).

Table 11 provides the time series of Atlantic herring catch that was used in the 2015 Atlantic herring operational (update) assessment, including catch from the NB weir fishery through the 2014 fishing year. The column labeled "NB Weir (Incl. Shutoff)" is used to represent catch from the NB weir fishery. For the most part, however, shutoffs are not located in the same area as weirs, and herring catch from shutoffs are thought to be from the 4WX stock component (not the inshore GOM Atlantic herring stock component). NB weir fishery catch is not tracked in-season against the U.S. Atlantic herring ACL. Rather, the annual expected catch in the NB weir fishery is estimated and then subtracted from the ABC, as an element of the management uncertainty buffer, to calculate the stockwide Atlantic herring ACL, which is OY for the U.S. fishery.

Table 12 shows the number of active weirs and the average catch per weir reported for the NB weir fishery from 1978-2014. The NB weir catch estimates only include weir catch and not catch from the shutoff fishery. Catch from shutoffs generally represent a small component of the total NB weir fishery catch.

Table 11 - Total Atlantic herring catch (mt), 1970 – 2014

Year	Mobile	U.S. Fixed	NB Weir (Incl. Shutoff)
1970	302,107	4,316	15,070
1971	327,980	5,712	12,136
1972	225,726	22,800	31,893
1973	247,025	7,475	19,053
1974	203,462	7,040	19,020
1975	190,689	11,954	30,816
1976	79,732	35,606	29,207
1977	56,665	26,947	19,973
1978	52,423	20,309	38,842
1979	33,756	47,292	37,828
1980	57,120	42,325	13,526
1981	26,883	58,739	19,080
1982	29,334	15,113	25,963
1983	29,369	3,861	11,383
1984	46,189	471	8,698
1985	27,316	6,036	27,864
1986	38,100	2,120	27,885
1987	47,971	1,986	27,320
1988	51,019	2,598	33,421
1989	54,082	1,761	44,112
1990	54,737	670	38,778
1991	78,032	2,133	24,574
1992	88,910	3,839	31,968
1993	74,593	2,288	31,572
1994	63,161	539	22,242
1995	106,179	6	18,248
1996	116,788	631	15,913
1997	123,824	275	20,551
1998	103,734	4,889	20,092
1999	110,200	654	18,644
2000	109,087	54	16,830
2001	120,548	27	20,210
2002	93,176	46	11,874
2003	102,320	152	9,008
2004	94,628	96	20,685
2005	93,670	68	13,055
2006	102,994	1,007	12,863
2007	81,116	403	30,944
2008	84,650	31	6,448
2009	103,458	98	4,031
2010	67,191	1,263	10,958
2011	82,022	421	3,711
2012	87,164	9	504
2013	95,182	9	6,431
2014	92,651	518	2,149
Source: NEFSC (2012).			

Table 12 - Number of active weirs and catch per weir in the NB weir fishery, 1978-2014

Year	NB Weir Catch (mt)	No. Active Weirs	Catch Per Weir (mt)
1978	33,570	208	162
1979	32,477	210	155
1980	11,100	120	92
1981	15,575	147	102
1982	22,183	159	140
1983	10,594	143	88
1984	8,374	116	72
1985	26,724	156	171
1986	27,515	105	262
1987	26,622	123	216
1988	32,554	191	200
1989	43,475	171	255
1990	38,224	154	258
1991	23,713	143	166
1992	31,899	151	212
1993	31,431	145	216
1994	20,622	129	160
1995	18,198	106	172
1996	15,781	101	156
1997	20,416	102	200
1998	19,113	108	181
1999	18,234	100	191
2000	16,472	77	213
2001	20,064	101	199
2002	11,807	83	142
2003	9,003	78	115
2004	20,620	84	245
2005	12,639	76	166
2006	11,641	89	131
2007	30,145	97	311
2008	6,041	76	79
2009	3,603	38	95
2010	10,671	77	139
2011	2,643	37	71
2012	494	4	124
2013	5,902	49	120
2014	1,571	26	60
Long-Term	18,962 mt	110 weirs	163 mt
3-Year	2,656 mt	26	101 mt
5-Year	4,256 mt	39	103 mt
10-Year	8,535 mt	57	130 mt
Source: Department of Fisheries and Oceans Canada.			

Table 13 lists herring landings by month for weirs located in New Brunswick from 1978 to 2014. Landings from the NB weir fishery have always been somewhat variable; however, the fishery occurs primarily during the late summer and fall months (June-October). The NB weir fishery is dependent on many factors including weather, fish migration patterns, and environmental conditions. Over the time series, catch from the NB weir fishery occurring after October (November/December) averaged less than 4% of the total reported for the year from the fishery.

Table 13 - Monthly weir landings (mt) for weirs located in New Brunswick, 1978 to 2014

	MONTH												
YEAR	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Total
1978	3	0	0	0	512	802	5,499	10,275	10,877	4,972	528	132	33,599
1979	535	96	0	0	25	1,120	7,321	9,846	4,939	5,985	2,638	74	32,579
1980	0	0	0	0	36	119	1,755	5,572	2,352	1,016	216	0	11,066
1981	0	0	0	0	70	199	4,431	3,911	2,044	2,435	1,686	192	14,968
1982	0	17	0	0	132	30	2,871	7,311	7,681	3,204	849	87	22,181
1983	0	0	0	0	65	29	299	2,474	5,382	3,945	375	0	12,568
1984	0	0	0	0	6	3	230	2,344	2,581	3,045	145	0	8,353
1985	0	0	0	0	22	89	4,217	8,450	6,910	4,814	2,078	138	26,718
1986	43	0	0	0	17	0	2,480	10,114	5,997	6,233	2,564	67	27,516
1987	39	21	6	12	10	168	2,575	10,893	6,711	5,362	703	122	26,621
1988	0	12	1	90	657	287	5,993	11,975	8,375	8,457	2,343	43	38,235
1989	0	24		95	37	385	8,315	15,093	10,156	7,258	2,158	0	43,520
1990	0	0	0	0	93	20	4,915	14,664	12,207	7,741	168	0	39,808
1991	0	0	0	0	57	180	4,649	10,319	6,392	2,028	93	0	23,717
1992	0	0	0	15	50	774	5,477	10,989	9,597	4,395	684	0	31,981
1993	0	0	0	0	14	168	5,561	14,085	8,614	2,406	470	10	31,328
1994	0	0	0	18	0	55	4,529	10,592	3,805	1,589	30	0	20,618
1995	0	0	0	0	15	244	4,517	8,590	3,956	896	10	0	18,228
1996	0	0	0	0	19	676	4,819	7,767	1,917	518	65	0	15,781
1997	0	0	0	8	153	1,017	6,506	7,396	5,316	0	0	0	20,396
1998	0	0	0	0	560	713	3,832	8,295	5,604	525	0	0	19,529
1999	0	0	0	0	690	805	5,155	9,895	2,469	48	0	0	19,063
2000	0	0	0	0	10	7	2,105	7,533	4,940	1,713	69	0	16,376
2001	0	0	0	0	35	478	3,931	8,627	5,514	1,479	0	0	20,064
2002	0	0	0	0	84	20	1,099	6,446	2,878	1,260	20	0	11,807
2003	0	0	0	0	257	250	1,423	3,554	3,166	344	10	0	9,003
2004	0	0	0	0	21	336	2,694	8,354	8,298	913	3	0	20,620
2005	0	0	0	0	0	213	802	7,145	3,729	740	11	0	12,639
2006	0	0	0	0	8	43	1,112	3,731	3,832	2,328	125	462	11,641
2007	182	0	20	30	84	633	3,241	11,363	7,637	6,567	314	73	30,145
2008	0	0	0	0	0	81	1,502	2,479	1,507	389	49	32	6,041
2009	0	0	0	0	5	239	699	1,111	1,219	330	0	0	3,603
2010	0	0	0	6	64	1,912	2,560	3,903	1,933	247	46	0	10,671
2011	0	0	0	0	0	250	656	1,097	500	140	0	0	2,643
2012	0	0	0	0	29	140	5	5	98	217	0	0	494
2013	0	0	0	0	7	612	1,517	1,797	1,051	919	0	0	5,902
2014	0	0	0	0	0	70	130	147	449	774	0	0	1,571

For the 2016-2018 Atlantic herring fishery specifications, the Council considered possible deductions from the ABC to account for management uncertainty based on updated (most recent) 3-year, 5-year, and 10-year average catch totals from the NB weir fishery (Table 14). This is consistent with the range of deductions that the Council considered during the 2013-2015 fishery specifications process.

The Council recommends that the 2013-2015 management uncertainty deduction of 6,200 mt be maintained for 2016-2018 to account for the potential catch of Atlantic herring in the Canadian (NB) weir fishery. This management uncertainty deduction is greater than the most recent three-year and five-year average catch in the NB weir fishery and would be a more conservative buffer than using the same approach that was used for the 2013-2015 fishery specifications to specify management uncertainty (most recent three-year average NB weir catch). Moreover, the management uncertainty buffer is based on average catch from the NB weir *and* shutoff fishery (catch reported in Table 11 versus Table 12). For the most part, shutoffs are not located in the same area as weirs, and landings from shutoffs are thought to be from the 4WX stock component, not the Atlantic herring stock component. This provides additional buffer against removals of the U.S. Atlantic herring stock component that may occur in the NB weir fishery over the next three years.

Table 14 - Possible deductions for management uncertainty (NB Weir Fishery) in 2016-2018 Atlantic Herring Specifications

Option	Management Uncertainty Deduction (mt, rounded)	Stockwide Atlantic Herring ACL/OY (ABC = 111,000 mt)
2013-2015 Specifications	**6,200**	**104,800**
3-year average NB weir catch (2012-2014)	3,000	108,000
5-year average NB weir catch (2010-2014)	4,800	106,200
10-year average NB weir catch (2005-2014)	9,100	101,900
Note: The Council's recommendation for 2016-2018 is shaded in grey.		

The Council's recommendation of 6,200 mt is based on recent performance in the NB weir fishery, including the total annual catch and the average number of active weirs. This recommendation is more conservative than the five-year average NB weir catch, including catch from shutoffs (4WX stock). There does not appear to be a need to buffer against the 10-year average NB weir catch for the next three years. Information provided by the Canadian industry suggests that the 2015 NB weir fishery catch has been very low, totaling no more 150 tons as of August 27, 2015. (*The DFO Herring Fishery Report as of February 16, 2016 reports that 146 mt was caught in the NB weir fishery during the 2015 calendar year.*). At this time, effort in the fishery appears to about 25 weirs. Many fishermen who were participating in the historical NB weir fishery have shifted to other fisheries and are reluctant to re-invest in the weir fishery. While the reasons for reduced NB weir catch are not entirely clear, the industry speculates that this is due to environmental conditions, as Canadian seiners have reported seeing fish in offshore areas (Connors Bros., personal communication with Council staff, 2015).

4.2.2.2 Atlantic Herring Catch in State Waters

The vast majority of the Atlantic herring resource is harvested in Federal waters. Catch by Federal permit holders that occurs in State waters is reported and counted against the sub-ACLs. Catch by state-only permit holders is monitored by the ASMFC and is not large enough to substantially affect management of the Federal fishery and the ability to remain under the sub-ACLs. Total Atlantic herring catch by vessels fishing in state waters was about 41,000 pounds in 2015.

The non-federally permitted commercial landings of Atlantic herring are by fishermen Maine, primarily using fixed gear and a small number of seines. Table 15 provides updated catch estimates from the fixed gear fishery through 2013. The Council specifies a set-aside for West of Cutler fixed gear fishermen (FGSA), currently 295 mt. The unused portion of the FGSA is returned to the Area 1A fishery after November 1. The ASMFC's requirement that fixed gear fishermen must report through IVR (and therefore have catch counted against the sub-ACL) has reduced any management uncertainty associated with State waters landings to an unsubstantial amount.

Table 15 - Atlantic herring landings from fixed gear fishery, before and after November 1 rollover date

Year	Sub-ACL Closure Date	Area 1A Sub-ACL (mt)	Cumulative Catch (mt) by Dec 31	Fixed Gear Landings (mt)	
				Jan-Oct	Nov-Dec
2004	11/19/2004	60,000	60,071	49	0
2005	12/2/2005	60,000	61,570	53	0
2006	10/21/2006	50,000	59,980	528	0
2007	10/25/2007	50,000	49,992	392	0
2008	11/14/2008	43,650	42,257	24	0
2009	11/26/2009	43,650	44,088	81	0
2010	11/17/2010	26,546	27,741	823	0
2011	10/27/2011	29,251	29,359	23	0
2012	11/5/2012	27,668	25,057	0	0
2013	10/15/2013	29,775	29,820	C	C
2014	10/26/2014	33,031	33,428	C	C

Source: ASMFC.

Note: "C" denotes that the value cannot be reported due to confidentiality.

4.2.2.3 Atlantic Herring Discards

The 2012 benchmark assessment for Atlantic herring incorporated Atlantic herring discards from the VTR data provided to them by NMFS. Discard estimates have only been available since 1996 and are generally less than 1% of the landings and do not represent a substantial source of mortality. However, this is not considered problematic to the Atlantic herring stock assessment, according to SAW 54 (NEFSC 2012).

Atlantic herring discards are estimated by NMFS using vessel and observer data and are counted against the management area sub-ACLs. To date, uncertainty related to estimating Atlantic herring discards has not been a substantial source of management uncertainty. There does not appear to be a need to change this conclusion when considering management uncertainty for the 2016-2018 Atlantic herring fishery specifications. This is because increased sampling has improved bycatch accounting and reduced uncertainty associated with estimating Atlantic herring discards in recent years. In 2010, the Northeast Fisheries Observer Program (NEFOP) revised the training curriculum for observers deployed on herring vessels to focus on effectively sampling in high-volume fisheries. NEFOP also developed a discard log to collect detailed information on discards in the herring fishery, such as why catch was discarded, the estimated amount of discarded catch, and the estimated composition of discarded catch. Moreover, management measures implemented through Amendment 5 (NEFMC 2012) and other future actions will continue to improve catch monitoring and the accuracy of herring discard estimates in future years.

Table 16 provides Atlantic herring discard estimates for 2010-2013 based on three sources of data: VMS, VTR, and observer data expansion. VMS discards were summed together by year using the Greater Atlantic Regional Fisheries Office (GARFO) Atlantic herring VMS catch report database. The VTR discards were summed together by year using the GARFO VTR databases. Lastly, the observer extrapolated data were acquired from the 2010-2013 year-end summary reports. Catch reporting through VMS was not required until 2011, so no discard estimates from VMS catch reports can be generated for 2010. With the exception of 2013, Atlantic herring discard reports from NMFS and VTRs are generally similar; discard estimates extrapolated from observer data tend to be more variable and have decreased in more recent years. Overall, regardless of data source, Atlantic herring discards represent a very small fraction of total catch. Total Atlantic herring catch in 2013 was 95,764 mt, so discards represented 0.01% - 0.2% of the total 2013 Atlantic herring catch. Given recent actions to enhance catch monitoring and reporting, there is no indication that the uncertainty regarding the Atlantic herring discard estimation is expected to increase during the upcoming fishery specifications cycle (2016-2018).

Table 16 - Atlantic herring discards (mt) by reporting method, 2010-2013

Year	VMS*	VTR**	Observer – Fleet Expansion***
2010	N/A	263	137
2011	179	179	210
2012	144	154	87
2013	113	169	18

Source: VMS, VTR databases and herring year end reports as of 8/28/2015.
*GARFO herring VMS catch report table fso_admin.vms_herring_catch_report_stg.
**GARFO VTR databases under the NOAA schema.
***Year-End discard calculation using observer data extrapolated out to the herring fleet.

Framework 4 Management Measures to Address Net Slippage

Consideration of recent management actions adopted by the Council to further address net slippage and a review of 2014 observer data regarding *catch that is not brought on board* support the Council's rationale for the proposed 2016-2018 management uncertainty specification. Framework 4 to the Atlantic Herring FMP was finalized by the Council in 2014 (NEFMC 2014c), and publication of the Final Rule is pending. In Framework 4, the Council proposed additional management measures to address net slippage on limited access herring vessels carrying an observer on board. If the measures to address net slippage are approved/implemented by NMFS, the following rules would apply to limited access Atlantic herring vessels:

- Observed slippage events (*catch not brought on board*) due to *safety, mechanical failure, or spiny dogfish* would be considered "allowable" slippage events and would be subject to existing requirements for a Released Catch Affidavit as well as a 15-nm move along rule.
- Observed slippage events (catch *not brought on board* for reasons other than safety, mechanical failure, and spiny dogfish) would be considered "non-allowable" slippage events and would be subject to existing requirements for a Released Catch Affidavit as well as trip termination.
- Operational discards reported by observers would *not* be prohibited outside the groundfish closed areas; although operational discards represent catch that is not brought on board, they would *not* be treated like slippage events.
- Catch reported by observers as "*not brought on board due to gear damage"* would be considered the same as "*not brought on board due to mechanical failure"* for the purposes of complying with and enforcing the regulations to address net slippage. In other words, when catch is released due to gear damage, vessels would be subject to current requirements for a Released Catch Affidavit as well as the 15-mile move along requirement.
- Fish that are documented by observers to fall out of gear (and therefore are not brought on board the vessel) would *not* be treated like slippage events (no additional consequences).

The Northeast Fisheries Observer Program (NEFOP) implemented a discard log in 2010 to obtain more detailed information regarding catch that may not be brought on board in high-volume fisheries. The discard log is being completed for every haul, and it includes fields to provide information on what kind of discard event may have occurred, whether or not the observer could see the contents of the codend when pumping stopped, why catch may have been discarded, information about the composition of discarded catch, and any challenges the observer may have experienced when observing the haul. Observers are also documenting released catch (including operational discards and slippage events) with photographs whenever possible, and bringing in samples of fish from every trip to confirm species identification. Operational discards have been confirmed by observers to be relatively small amounts of fish that may remain in the net following a successful haul/pump; these fish are usually caught in the net and/or cannot be pumped on board. Information collected by observers about operational discards has improved, and hauls with operational discards are considered to be "observed" hauls; the operational discards are estimated by the observers. Observers document operational discards as *Herring NK* if they are able to see the fish that are not pumped and confirm that the discards are all herring-bodied fish. Otherwise, the discards are documented as *Fish NK*.

When reviewing the data on the following pages, it is important to understand that an observed "event" is not synonymous with a "haul," as multiple events may occur within a single haul. For example, a haul may have three different reasons for not bringing catch onboard the vessel: a species fell from the net into the water as the net is being reeled in; clearing a blockage during pumping caused additional fish to be released; and after pumping was completed, a small amount of fish remained in the net (operational discards).

Table 17 and Table 18 summarize data from any observed purse seine trips on which catch was documented as "not brought on board" during 2014. These tables supplement the observer data for catch not brought on board/slippage from 2010-2013, in Framework 4 to the Atlantic Herring FMP. Information about observer coverage on purse seine vessels during 2014 is in Section 6.2.1 (p. 46). Overall, 13 slippage events and 29 operational discard events were observed on 26 purse seine trips during 2014. None of these slippage events were cited due to safety, mechanical failure, or spiny dogfish. Slippage was observed on purse seine vessels in 2014 due primarily to vessel capacity filled and not enough fish to pump; if the Framework 4 measures to address slippage are implemented (Final Rule pending), these events would require trip termination. Five events were observed where fish were released on the purse seine vessel due to gear damage, which are not considered slippage events. Release from gear damage represented the largest component of catch that was documented as not brought on board observer purse seine trips during 2014.

Table 17 - NEFOP observer data for catch not brought on board, 2014 observed purse seine trips

Herring Management Area	Not Brought on Board Vessel		
	Slippage Events		Non-Slippage Events (other)
Area 1A and Area 2. (Due to confidentiality constraints, data are combined).	**13**		**36** 29 = operational discards 5 = not brought onboard, gear damage prevented capture 2 = not brought onboard, fell out/off of gear
Total Trips	**Total Observed Kept Atl. Herring**	**Total Observed Slipped Catch**	**Total Observed Non-Slipped Catch**
26	**3,915,757 lbs.**	**116,850 lbs.**	**262,203 lbs.**
Total Trips	**Total (all areas)**	**Total (all areas)**	**Total (all areas)**
26	**3,915,757 lbs.**	**116,850 lbs.**	**262,203 lbs.**
Total slippage (or total non-slippage)/Total kept	**N/A**	**2.98%**	**6.70%**

Total Slipped Catch (all areas)	**116,850 lbs.**
% Dogfish	0%
% Safety	0%
% Mechanical Failure	0%
Note: Slippage was not due to safety, dogfish, or mechanical failure.	

Table 18 - Disposition code reported for catch not brought on board, 2014 observed purse seine trips

Fish Disposition Code	**Hail Weight**
040 (not brought onboard, operational discards, non-slippage)	1,188 lbs
041 (not brought onboard, reason not specified, slippage)	10,000 lbs
042 (not brought onboard, gear damage prevented capture, non-slippage)	260,000 lbs
043 (Not brought onboard, fell out/off of gear, non-slippage)	1,015 lbs
044 (not brought onboard, no market value, slippage)	65 lbs
048 (not brought onboard, vessel capacity filled, slippage)	92,000 lbs
049 (not brought onboard, not enough fish to pump, slippage)	14,850 lbs

Table 19 and Table 20 summarize data from any observed midwater trawl trips (single and paired) on which catch was documented as “not brought on board” across all management areas in 2014. This table supplements the observer data for catch not brought on board/slippage from 2010-2013 that was in Framework 4 to the Atlantic Herring FMP. Information about observer coverage on midwater trawl vessels during 2014 is in Section 6.2.1 (p. 46).

Overall, 41 slippage events and 123 operational discard events were observed on 125 midwater trawl (single and paired) trips during the 2014 fishing year. 32 of the observed slippage events occurred in Area 3 (Georges Bank). Slippage represented just under 1% of the total observed midwater trawl catch, and catch not brought on board for other reasons represented 0.05% of the total observed catch on midwater trawl vessels during 2014. Observed slippage events were not reported due to spiny dogfish. There were three observed slippage events associated with mechanical failure and one observed slippage event associated with safety. Slippage was observed on midwater trawl vessels in 2014 due primarily to vessel capacity filled, not enough fish to pump, and no market value; if the Framework 4 measures to address slippage are implemented (Final Rule pending), these events would require trip termination.

Table 19 - Summary of NEFOP observer data for catch not brought on board, 2014 observed midwater trawl trips (single and paired) in all areas

Herring Management Area	Not Brought on Board Vessel		
	Slippage Events		Slippage Events
Area 1A and Area 2. (Due to confidentiality constraints, data are combined).	6		25 23: Operational Discards 1: Not brought onboard, fell out/off of gear 1: Not brought onboard, gear damage prevented capture
Total Trips	**Total Observed Kept Atl. Herring (lbs)**	**Total Observed Slipped Catch (lbs)**	**Total Observed Non-Slipped Catch (lbs)**
28	**11,887,010**	**70,250**	**12,499**
AREA 2	3		3 3: Operational Discards
Total Trips	**Total Observed Kept Atl. Herring (lbs)**	**Total Observed Slipped Catch (lbs)**	**Total Observed Non-Slipped Catch (lbs)**
8	2,034,817	61,000	120
AREA 3	32		102 97: Operational discards 4: Not brought onboard, fell out/off of gear 1: Not brought onboard, gear damage prevented capture
Total Trips	**Total Observed Kept Atl. Herring (lbs)**	**Total Observed Slipped Catch (lbs)**	**Total Observed Non-Slipped Catch (lbs)**
89	33,198,161	310,118	11,067
Total Trips	**Total (all areas)**	**Total (all areas)**	**Total (all areas)**
125	47,119,988 lbs	441,368 lbs	23,686 lbs
Total slippage (or total non-slippage)/Total kept	N/A	0.94%	0.05%

Total Slipped Catch (all areas)	**441,368 lbs**
% Dogfish	0%
% Safety	2.27%
% Mechanical Failure	2.04%
Note: Observed slippage was not due to dogfish. There were 3 observed slippage events associated with mechanical failure and one observed slippage event associated with safety.	

Table 20 - Disposition code reported for catch not brought on board, 2014 observed midwater trawl trips

Fish disposition	Hailweight
AREA 1A and 1B	
040 (not brought onboard, operational discards, non-slippage)	489 lbs
042 (not brought onboard, gear damage prevented capture, non-slippage)	12,000 lbs
043 (not brought onboard, fell out/off of gear, non-slippage)	10 lbs
048 (not brought onboard, vessel capacity filled, slippage)	65,000 lbs
049 (not brought onboard, not enough fish to pump, slippage)	5,000 lbs
071 (not brought onboard, clogged other, slippage)	250 lbs
AREA 2	
040 (not brought onboard, operational discards, non-slippage)	120 lbs
041 (not brought onboard, reason not specified, slippage)	50,000 lbs
046 (not brought onboard, mechanical failure, slippage)	5,000 lbs
048 (not brought onboard, vessel capacity filled, slippage)	6,000 lbs
AREA 3	
040 (not brought onboard, operational discards, non-slippage)	3,537 lbs
041 (not brought onboard, reason not specified, slippage)	20,818 lbs
042 (not brought onboard, gear damage prevented capture, non-slippage)	5,000 lbs
043 (not brought onboard, fell out/off of gear, non-slippage)	2,530 lbs
044 (not brought onboard, no market value, slippage)	111,350 lbs
045 (not brought onboard, safety reason, slippage)	10,000 lbs
046 (not brought onboard, mechanical failure, slippage)	4,000 lbs
048 (not brought onboard, vessel capacity filled, slippage)	100,000 lbs
049 (not brought onboard, not enough fish to pump, slippage)	43,000 lbs
071 (not brought onboard, clogged other, slippage)	20,950 lbs

4.2.3 Specification of DAH, DAP, BT, and USAP

The Council did not consider a range of alternatives for these specifications, thus, they are considered to maintain the status quo. However, some are formulaic, stemming from the specification of ACL.

DAH Specification

The Atlantic Herring FMP specifies that domestic annual harvest (DAH) is set less than or equal to OY Domestic annual harvest (DAH) is established based on the expected catch from U.S. fishing vessels during the upcoming fishing year and equals OY for the U.S. fishery.

$$\textbf{Stockwide ACL} = \textbf{OY} \leq \textbf{DAH}$$

The Herring FMP, as modified by Amendment 4, also specifies that domestic annual harvest (DAH) will be composed of domestic annual processing (DAP) and the amount of Atlantic herring that can be taken in U.S. waters and transferred to Canadian herring carriers for transshipment to Canada (BT).

$$\textbf{DAH} = \textbf{DAP} + \textbf{BT}$$

When specifying DAH for the Atlantic herring fishery, important considerations relate to the actual and potential capacity of the U.S. harvesting fleet. Recent fishery performance (landings) is also an important factor in this fishery. The Herring FMP became effective during the 2001 fishing year, and since 2001, total landings in the U.S. fishery have decreased. Table 47 (p. 89) summarizes total Atlantic herring catch as a percentage of the total available catch in each year from 2003-2014. Atlantic herring catch has been somewhat consistent over the time period (and in previous years), averaging about 91,925 mt from 2003-2014, with the highest catch of the time series observed in 2009 (103,943 mt) and lowest in 2010 (72,852 mt). However, the quota allocated to the fishery (stockwide ACL/OY) has decreased 50% over the twelve-year period. Consequently, and without increasing fishing effort, the Atlantic herring fishery has become more fully utilized in recent years, and the fishery utilized 100% of the total Atlantic herring ACL for the first time in 2012. The 2013-2015 Atlantic herring fishery specifications increased the stockwide Atlantic herring ACL by more than 15,000 mt from the 2010-2012 specifications; an additional 5,000 mt was caught under the higher quota in 2013 and 2014, and overall, the fishery utilized about 90% of the stockwide Atlantic herring ACL.

In prior years when considering the DAH specification, the Council has evaluated the harvesting capacity of the directed Atlantic herring fleet and determined that the herring fleet is capable of fully utilizing the available yield from the fishery. Therefore, the **DAH specification for the 2016-2018 fishing years would remain equal to the stockwide Atlantic herring ACL**, i.e., the U.S. OY specified by the Council for each of the 2016-2018 fishing years.

DAP Specification

Domestic Annual Processing (DAP) is defined in the Herring FMP as the amount of U.S. harvest that domestic processors will use, combined with the amount of the resource that will be sold as fresh fish (including bait). DAP was set equal DAH minus 4,000 mt for BT during the 2013-2015 fishing years and in prior specifications.

Processing, with respect to the Atlantic herring fishery, is defined in the regulations as *the preparation of Atlantic herring to render it suitable for human consumption, bait, commercial uses, industrial uses, or long-term storage, including but not limited to cooking, canning, roe*

extraction, smoking, salting, drying, freezing, or rendering into meat or oil. The definition of processing does not include trucking and/or transporting fish.

While it is difficult to predict whether or not the U.S. processing sector will utilize all of the available DAP in 2016-2018, it is certainly possible given the capacity of the domestic processing sector. Therefore, the **DAP specification for the 2016-2018 fishing years would remain equal to the DAH specification minus the BT specification**.

BT Specification

The Border Transfer specification is U.S.-caught herring transshipped to Canada via Canadian carrier vessels and used for human consumption. This specification is not a set-aside; rather, it is a maximum amount of Atlantic herring caught from Area 1A that can be transshipped to Canadian vessels for human consumption. GARFO tracks BT utilization through a separate dealer code. Specification of BT has remained at 4,000 mt since the implementation of the Atlantic Herring FMP, and there was no change for the 2013-2015 fishing years. There does not appear to be a need to change this specification for 2016-2018. Therefore, the **BT specification would remain 4,000 mt for the 2016-2018 fishing years**.

Table 21indicates a decrease in BT from 1994-2013, with 2011 utilizing 838 mt (21% of 4,000 border transfer mt). No BT was utilized from 2008-2010, but some amount was utilized in 2011-2013. Information about BT utilization in 2014 is not available at this time.

Table 21 - Use of border transfer (mt)

Year	MT Utilized in BT
1994	2,456
1995	2,117
1996	3,690
1997	1,280
1998	1,093
1999	839
2000	1,546
2001	445
2002	688
2003	1,311
2004	184
2005	169
2006	653
2007	53
2008	0
2009	0
2010	0
2011	946
2012	788
2013	838
Source: NMFS.	

USAP Specification

The Atlantic Herring FMP states that "part of DAP may be allocated for at-sea processing by domestic vessels that exceed the vessel size limits (Herring FMP Section 3.6.6). This allocation will be called the 'U.S. at-sea processing' (USAP) allocation. The term 'at-sea processing' refers to processing activities that occur in the Exclusive Economic Zone outside State waters. When determining this specification, the Council will consider the availability of other processing capacity, development of the fishery, status of the resource, and opportunities for vessels to enter the herring fishery." The USAP specification serves as a cap for USAP activities and is not a specific allocation to this processing sector.

During the 2007-2009 fishing years, the Council maintained a USAP specification of 20,000 mt (Areas 2/3 only) based on information received about a new at-sea processing vessel that intended to utilize a substantial amount of the USAP specification. At that time, landings from Areas 2 and 3 – where USAP is authorized – were considerably lower than allocated sub-ACLs for each of the past several years. Moreover, the specification of 20,000 mt for USAP did not restrict either the operation or the expansion of the shoreside processing facilities during the 2007-2009 fishing years. However, this operation never materialized, and none of the USAP specification was used during the 2007-2009 fishing years. Consequently, the Council set USAP at zero for the 2010-2012 fishing years and the 2013-2015 fishing years. The Council has not received any information that would suggest changing this specification for the 2016-2018 fishing years. Therefore, **the specification of USAP for the 2016-2018 fishing years would remain at 0 mt.**

4.2.4 Specification of Management Area Sub-ACLs for 2016-2018

Because the Atlantic herring ABC specification recommended by the SSC for 2016-2018 (111,000 mt) is not substantially different than the 2013-2015 ABC specification (114,000 mt), the Council, based on a recommendation from the Herring Committee, has determined that there is no need to consider modifying the distribution of the total ACL among the Atlantic herring management areas for 2016-2018. Additionally, information from the Atlantic herring operational assessment report (April 2015) does not suggest that there is a biological need to consider modifying the distribution of the stockwide ACL. To this end, a "status quo" approach for 2016-2018 Atlantic herring sub-ACLs is recommended by the Council (Table 22), based on an ABC specification of 111,000 mt. The status quo approach applies the same (2013-2015) proportional distribution of the stockwide Atlantic herring ACL among the management areas. This approach is applied to determine the sub-ACLs under both Alternative 2 (status quo, Section 4.1.3) and Alternative 3 (***Preferred Alternative***, Section 4.1.4). The Council has also determined that there is no need to consider changing the seasonal (monthly) divisions of the Area 1A and Area 1B sub-ACLs; these sub-ACL seasons are therefore carried over to Alternatives 2 and 3.

Table 22 - Status quo approach for 2016-2018 Atlantic herring sub-ACLs

	2013-2015	2016-2018
OFL (mt)	169,000/136,000/114,000	138,000/117,000/111,000
ABC (mt)	114,000	111,000*
ACL (mt)	107,800	104,800
Sub-ACL Area 1A	**31,200 (28.9%)**	**30,300 (28.9%)**
Sub-ACL Area 1B	**4,600 (4.3%)**	**4,500 (4.3%)**
Sub-ACL Area 2	**30,000 (27.8%)**	**29,100 (27.8%)**
Sub-ACL Area 3	**42,000 (39%)**	**40,900 (39%)**
RSA	**3%**	**3%**
FGSA	**295**	**295**
*Based on SSC recommendation of 111,000 mt for ABC.		

Proposed Seasonal (Monthly) Sub-ACL Divisions (2016-2018)

- Area 1A: 0% January-May; 100% June-December;
- Area 1B: 0% January-April; 100% May-December

According to the catch information in Table 46 (p. 88), it is anticipated that there will be a deduction from the 2016 sub-ACL for Area 1B to account for the overage that occurred in this areas during the 2014 fishing year. There should also be a carryover of some portion (up to 10%) of the unused 2014 sub-ACL from Areas 2 and 3 to the 2016 sub-ACLs for these areas (but the stockwide Atlantic herring ACL will not increase, consistent with Framework 2 to the Atlantic Herring FMP).

4.2.5 Specification of Research Set-Asides (RSAs)

The RSA process is a competitive grants process administered by the Northeast Fisheries Science Center. Proposals are requested for research, and incoming proposals are reviewed and ranked by a technical body. With competitive grants awarded through this process, different entities will apply. For catch monitoring, it is important to ensure that only qualified entities apply, and it would be difficult to ensure a consistent monitoring program with multiple entities potentially competing for the available funds in any given year. The 2013-2015 Atlantic herring fishery specifications deducted a 3% RSA from the ACL for all management areas and identified river herring bycatch avoidance and portside sampling as top priorities for cooperative research to be funded by herring RSA in 2014 and 2015.

For the 2016-2018 Atlantic herring fishery specifications, the Council is proposing to maintain the specification of 3% RSA from each management area in each fishing year. Establishing a RSA for 2016-2018 with the priorities identified by the Council is consistent with goals, objectives, and long-term management strategies to be implemented through Amendment 5. The measures to be implemented in Amendment 5 promote cooperation with the industry and acknowledge the need to better understand bycatch problems to develop effective solutions. A

3% RSA for the 2016-2018 fishing years encourages the industry to participate in the collection of scientific information and conduct research to reduce interactions with non-target species affected by the operation of the Atlantic herring fishery.

Top Priorities for Cooperative Research 2016-2018

In January 2015, the Council recommended the following four research priorities under any RSAs that may be allocated in the 2016-2018 Atlantic herring fishery specifications (without ranking, i.e., equally-important):

1. Portside sampling
2. River herring bycatch avoidance
3. Electronic monitoring
4. Research to support/enhance Atlantic herring stock assessments

In addition, the Council unanimously passed a motion to request input from the NEFSC regarding the fourth cooperative research priority. The NEFSC identified four research projects that would support or enhance the Atlantic herring assessment, while at the same time being appropriate for Atlantic herring RSA. These topics include: stock structure/spatial management; availability and detectability; fishery acoustic indices; and volume-to-weight conversion. The NEFSC provided some additional information to the Council regarding the applicability of these research topics to the Atlantic herring RSA program.

4.2.6 Specification of Fixed Gear Set-Aside (FGSA)

Amendment 1 to the Atlantic Herring FMP allows up to 500 mt of Atlantic herring to be set-aside until November 1 for fixed gear fishermen fishing West of Cutler. Amendment 2 to the Interstate FMP requires fishermen East of Cutler to report catch weekly through the federal IVR system. MEDMR requires the Maine state commercial fixed gear fishermen to comply with the federal IVR weekly reporting requirements and regulations as well as reporting monthly to MEDMR. The FGSA was set to 295 mt for the 2013-2015 specifications in Area 1A.

Table 15 (p. 21) provides Atlantic herring catch estimates from the fixed gear fishery through 2013. According to Table 15, none of the FGSA has been used since 2012, and it has all been returned to the Area 1A fishery after November 1. At its July 22, 2015, meeting, the Herring Committee recommended that the Council maintain the specification of 295 mt for the FGSA for the 2016-2018 fishing years.

4.3 ALTERNATIVES FOR 2016-2018 RIVER HERRING/SHAD (RH/S) CATCH CAPS

The alternatives under consideration for specifying the 2016-2018 RH/S catch caps, as well as information/rationale to support the ***Preferred Alternative***, are in the following subsections. Appendix I includes the Herring PDT's analysis, *Development of Options for River Herring and Shad Catch Caps in the Atlantic Herring Fishery, 2016-2018*, and can be referenced for more detailed information.

4.3.1 RH/S Alternative 1: No Action (Framework 3 Catch Caps)

No Action. Alternative 1 would maintain the 2014/2015 RH/S catch caps implemented in Framework 3 for the 2016-2018 fishing years. The 2016-2018 RH/S catch caps would be based on the median value of estimated RH/S catch from 2008-2012 from Framework 3 (Table 23). The RH/S catch caps under Alternative 1 would continue to apply to midwater trawl vessels in the Gulf of Maine and Cape Cod Catch Cap Areas, and to both midwater trawl and small mesh bottom trawl vessels in the southern New England/Mid-Atlantic Catch Cap Area (see RH/S Catch Cap Areas shaded on Figure 1, p. 3) on all trips landing more than 6,600 pounds of Atlantic herring. No RH/S catch cap would be adopted for the GB Catch Cap Area.

Table 23 - RH/S Alternative 1 (No Action)

RH/S Catch Cap Area	2016-2018 RH/S Catch Cap (mt)
GOM	Midwater Trawl – 85.5
CC	Midwater Trawl – 13.3
SNE/MA	Midwater Trawl – 123.7 Bottom Trawl – 88.9
GB	0

4.3.2 RH/S Alternative 2: Revised Data with Five-year Time Series

Under RH/S Alternative 2, the 2016-2018 RH/S catch caps would be based on the Herring PDT's updates/revisions to the 2008-2012 RH/S catch estimates from Framework 3 (Section 6.2.3.1; Appendix I). The same five-year time series that was utilized in Framework 3 (2008-2012 with updated/revised data) would be utilized to determine the RH/S catch caps under Alternative 2, with options to select either the median or weighted mean from the time series (Table 24). The RH/S catch caps under Alternative 2 would continue to apply to midwater trawl vessels in the Gulf of Maine and Cape Cod Catch Cap Areas, and to both midwater trawl and small mesh bottom trawl vessels in the southern New England/Mid-Atlantic Catch Cap Area (see RH/S Catch Cap Areas shaded on Figure 1, p. 3) on all trips landing more than 6,600 pounds of Atlantic herring. No RH/S catch cap would be adopted for the GB Catch Cap Area.

Additionally, the catch cap data used in Framework 3 were also revised/updated by the Herring PDT to: (1) Incorporate some shad landings that were previously omitted, (2) include trips from multiple catch cap areas that were previously omitted because sub-trips (catch from one cap area) did not meet the 6,600-pound Atlantic herring landings threshold, and (3) improve matching of trips sampled by multiple agencies (for removal of redundancies; Appendix I).

Option 1: Median. Option 1 would base the 2016-2018 RH/S catch caps on the median values of the 2008-2012 revised RH/S catch estimates.

Option 2: Weighted Mean. Option 2 would base the 2016-2018 RH/S catch caps on the weighted mean values of the 2008-2012 revised RH/S catch estimates. The weighted mean is the arithmetic average of the total RH/S catch per year (by area and gear type for each of the five years in the time series), weighted by the number of sampled trips in that stratum (see Appendix I for more information).

Table 24 - RH/S Alternative 2

RH/S Catch Cap Area	2016-2018 RH/S Catch Cap (mt)	
	Option 1 (Median)	**Option 2 (Weighted Mean)**
GOM	Midwater Trawl – 98.1	Midwater Trawl – 98.3
CC	Midwater Trawl – 8.9	Midwater Trawl – 27.6
SNE/MA	Midwater Trawl – 83.9 Bottom Trawl – 19.6	Midwater Trawl – 115.4 Bottom Trawl – 28.2
GB	0	0

4.3.3 RH/S Alternative 3: Revised Data with Seven-year Time Series *(PREFERRED ALTERNATIVE)*

Under RH/S Alternative 3, the 2016-2018 RH/S catch caps would be specified based on RH/S catch estimates from 2008-2014, using the Herring PDT's revised/updated data (Section 6.2.3.1; Appendix I). Alternative 3 would incorporate RH/S catch estimates from the most recent two years, extending the time series to seven years, with options to select either the median or weighted mean values as the 2016-2018 RH/S catch caps (Table 25). The RH/S catch caps would continue to apply to midwater trawl vessels in the Gulf of Maine and Cape Cod Catch Cap Areas, and to both midwater trawl and small mesh bottom trawl vessels in the southern New England/Mid-Atlantic Catch Cap Area (see RH/S Catch Cap Areas shaded on Figure 1, p. 3) on all trips landing more than 6,600 pounds of Atlantic herring. No RH/S catch cap would be adopted for the GB Catch Cap Area. Alternative 3 (using Option 2, the weighted mean) is the ***Preferred Alternative*** for specifying 2016-2018 RH/S catch caps at this time.

Additionally, the catch cap data used in Framework 3 were also revised/updated by the Herring PDT to: (1) Incorporate some shad landings that were previously omitted, (2) include trips from multiple catch cap areas that were previously omitted because sub-trips (catch from one cap area) did not meet the 6,600-pound Atlantic herring landings threshold, and (3) improve matching of trips sampled by multiple agencies (for removal of redundancies; Appendix I).

Option 1: Median. Option 1 would base the 2016-2018 RH/S catch caps on the median values of the 2008-2014 revised RH/S catch estimates.

Option 2: Weighted Mean. ***(PREFERRED ALTERNATIVE)*** Option 2 would base the 2016-2018 RH/S catch caps on the weighted mean values of the 2008-2014 revised RH/S catch estimates. The weighted mean is the arithmetic average of the total RH/S catch per year (by area and gear type for each of the seven years in the time series), weighted by the number of sampled trips in that stratum (Appendix I). Option 2 is the ***Preferred Alternative*** for specifying the 2016-2018 RH/S catch caps.

Table 25 - RH/S Alternative 3 (*Option 2 Preferred*)

RH/S Catch Cap Area	2016-2018 RH/S Catch Cap (mt)	
	Option 1 (Median)	**Option 2 (Weighted Mean)**
GOM	Midwater Trawl – 11.3	Midwater Trawl – 76.7
CC	Midwater Trawl – 29.5	Midwater Trawl – 32.4
SNE/MA	Midwater Trawl – 83.9 Bottom Trawl – 24.0	Midwater Trawl – 129.6 Bottom Trawl – 122.3
GB	0	0

Rationale for Preferred Alternative

The Council selected Alternative 3, Option 2 as the ***Preferred Alternative,*** because it uses the best technical approach to determining recent RH/S catch estimates in support of the goals and objectives of Framework 3, particularly the primary objective to provide strong incentive for the industry to continue to avoid river herring/shad and reduce river herring/shad catch to the extent practicable.

- The Herring PDT reiterated that using the median value of a short time series, as in Alternative 1, can be problematic, especially given the time series variability of these data. In the case of RH/S catch estimation, using a weighted mean would be mathematically more appropriate to account for sampling variability.
- Of the alternatives under consideration for the 2016-2018 RH/S catch caps, the Herring PDT agreed that Alternative 3 Option 2 (weighted mean) is the most technically-sound approach for specifying the 2016-2018 catch caps *if the Council's intent is to specify the caps based on recent estimates of RH/S catch in the directed herring fishery*. Using the longer time series (seven years) and weighted mean (versus median) better accounts for variability in catch sampling (by at-sea observers and portside samplers) and RH/S catch encounters.

Catch cap data used for Alternative 3 revised/updated by the Herring PDT from Framework 3 to: (1) Incorporate some shad landings that were previously omitted, (2) include trips from multiple catch cap areas that were previously omitted because sub-trips (catch from one cap area) did not meet the 6,600-pound Atlantic herring landings threshold, and (3) improve matching of trips sampled by multiple agencies (for removal of redundancies).

4.3.4 Summary of RH/S Catch Cap Alternatives Under Consideration

Table 26 below summarizes the alternatives under consideration for specifying the 2016-2018 RH/S catch caps for the directed Atlantic herring fishery (trips landing more than 6,600 pounds of Atlantic herring).

Table 26 - Alternatives/options for specifying 2016-2018 RH/S catch caps

RH/S Catch Cap Area	Alternative	Options			
		Bottom Trawl		Midwater Trawl	
		Median	Wgt. Mean	Median	Wgt. Mean
GOM	1 - Fw3 (08-12)			85.5	
	2 - Fw3 Revised (08-12)			98.1	98.3
	3 - Seven Years (08-14)			11.3	76.7
CC	1 - Fw3 (08-12)			13.3	
	2 - Fw3 Revised (08-12)			8.9	27.6
	3 - Seven Years (08-14)			29.5	32.4
SNE/MA	1 - Fw3 (08-12)	88.9		123.7	
	2 - Fw3 Revised (08-12)	19.6	28.2	83.9	115.4
	3 - Seven Years (08-14)	24.0	122.3	83.9	129.6

Note: The ***Preferred Alternative*** is shaded in grey. No RH/S catch caps are proposed for the Georges Bank Catch Cap Area for 2016-2018.

5.0 ALTERNATIVES CONSIDERED BUT REJECTED

The alternatives for the 2016-2018 Atlantic herring fishery specifications were developed over the course of several meetings of the Council, Herring Committee, Herring Advisory Panel, and PDT during 2015. The Council approved the final measures for this action at its September 29 – October 2, 2015 meeting. The alternatives that were eliminated from further consideration were deemed by the Council not to meet the purpose and need for this action. The alternatives considered but rejected are discussed below, along with the Council's rationale for eliminating them. If appropriate and/or necessary, the Council may reconsider any of these alternatives in a future action related to the Atlantic Herring FMP (Framework Adjustment, Amendment, fishery specifications). In some cases, details and preliminary analyses may have already been provided, laying the groundwork for reconsideration of these measures in the future.

Because the specification of ABC for the 2016-2018 fishing years (recommended by the SSC, Section 4.1.1) only differs from the 2013-2015 ABC specification by 3,000 mt (2.6%), and because available stock/fishery information does not indicate a need to consider major changes to the distribution of allowable catch or other fishery specifications, the alternatives for the 2016-2018 fishery specifications were designed to not substantially change the current fishery. The Council considered a range of alternatives based on different buffers for management uncertainty and different resulting stockwide Atlantic herring ACLs. These alternatives were fully evaluated in these specifications, and alternatives that the Council did not select remain as non-preferred alternatives, i.e., they were not explicitly rejected by the Council.

The Council did consider a wider range of alternatives for the 2016-2018 RH/S catch caps and rejected alternatives that would have scaled the catch caps to the 2016-2018 stockwide Atlantic herring ACL. The scaled alternatives that were rejected by the Council appear in Table 27. The scaling alternatives were considered to account for changes to the stockwide herring ACL over the reference period (2008-2012), essentially making the RH/S cap a maximum allowable catch rate (i.e., lbs. of RH/S per lbs. of Atlantic herring ACL). The Council rejected these alternatives primarily because the 2016-2018 stockwide herring ACL is not expected to change substantially from 2013-2015 levels. The Herring PDT also agreed that a scaling factor would not be necessary if the intent of the Council is to cap RH/S catch/removals at the actual amount estimated under the reference time frame.

Table 27 - RH/S catch estimates and options for 2016-2018 RH/S catch caps, scaled to the herring stockwide ACL (Rejected)

		Bottom Trawl		Midwater Trawl	
		Median	**Wgt Mean**	**Median**	**Wgt Mean**
GOM	Fw3 (08-12)			85.5	96.3
	Fw3 Revised (08-12)			73.7	93.8
	Seven Years (08-14)			11.3	73.4
CC	Fw3 (08-12)			13.3	32.5
	Fw3 Revised (08-12)			10.3	30.5
	Seven Years (08-14)			29.5	34.2
SNE/MA	Fw3 (08-12)	88.9	61.5	123.7	235.3
	Fw3 Revised (08-12)	33.8	40.9	89.0	159.7
	Seven Years (08-14)	42.6	126.0	89.0	159.9

Note: "Wgt Mean" is the arithmetic average of the total RH/S catch per year, weighted by the number of sampled trips. The Framework 3 catch cap values are shaded in gray.

6.0 AFFECTED ENVIRONMENT

The Affected Environment is described in this document based on valued ecosystem components (VECs). VECs represent the resources, areas, and human communities that may be affected by the management measures under consideration in this management action. VECs are the focus since they are the "place" where the impacts of management actions are exhibited. The VECs for consideration in the 2016-2018 Atlantic herring fishery specifications include: Atlantic Herring; Non-Target Species (with particular focus on river herring/shad); Physical Environment and Essential Fish Habitat (EFH); Protected Resources; and Fishery-Related Businesses and Communities.

The 2013-2015 Atlantic herring fishery specifications (which also served as Framework 2), Framework 3 (RH/S catch caps), and Framework 4 to the Atlantic Herring FMP (measures to address slippage/dealer reporting) provide detailed information about the VECs addressed in this document. To the extent possible, information from these recent documents is not repeated in the following subsections, but has been updated to support the Council's decision-making regarding the 2016-2018 Atlantic herring fishery specifications.

6.1 ATLANTIC HERRING

The Council manages the Atlantic herring fishery under the Atlantic Herring FMP. A complete description of the Atlantic herring resource is in Section 7.1 of the FEIS for Amendment 1 to the Herring FMP. Updated information is in the Amendment 5 EIS and Framework 2 to the Herring FMP (which includes the 2013-2015 Atlantic herring fishery specifications). The following subsections update information through 2013/2014 where possible and summarize the stock status and recent biological information for Atlantic herring. Based on the best available science, the Atlantic herring resource is not overfished at this time and overfishing is not occurring (the stock is considered rebuilt).

The Atlantic herring (*Clupea harengus*), is widely distributed in continental shelf waters of the Northeast Atlantic, from Labrador to Cape Hatteras. Herring is in every major estuary from the northern Gulf of Maine to the Chesapeake Bay. They are most abundant north of Cape Cod and become increasingly scarce south of New Jersey (Kelly & Moring 1986).

Spawning occurs in the summer and fall, starting earlier along the eastern Maine coast and southwest Nova Scotia (August – September) than in the southwestern GOM (early to mid-October in the Jeffreys Ledge area) and GB (as late as November - December; Reid et al. 1999). In general, GOM herring migrate from summer feeding grounds along the Maine coast and on GB to SNE/MA areas during winter, with larger individuals tending to migrate farther distances. Presently, herring from the GOM (inshore) and GB (offshore) stock components are combined for assessment purposes into a single coastal stock complex.

6.1.1 Atlantic Herring Stock Status

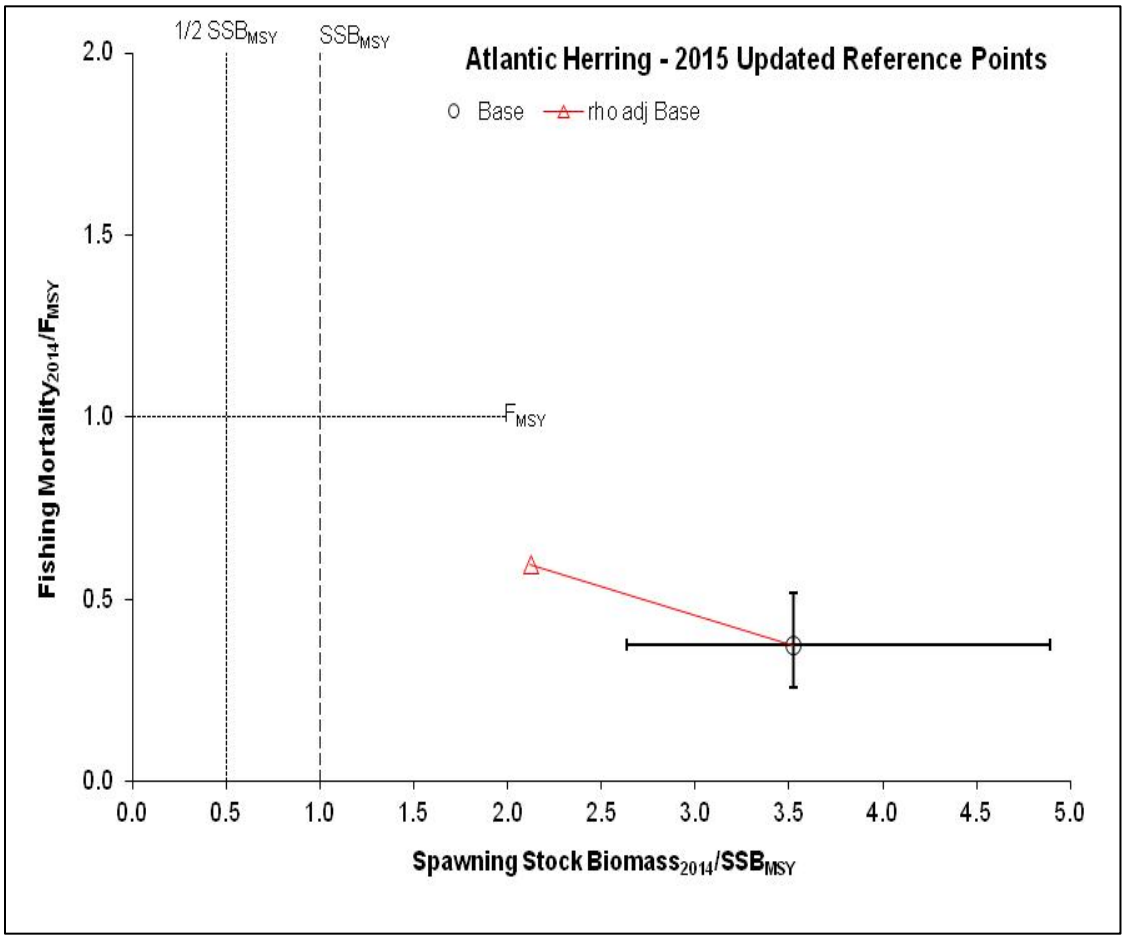
The Atlantic herring operational (update) assessment meeting was held in Woods Hole, MA on April 8-9, 2015. This assessment serves as an update to the SAW/SARC 54 benchmark assessment conducted in 2012.

Overall, the updated assessment indicates that the Atlantic herring resource continues to remain well above its biomass target (rebuilt), and fishing mortality remains well below the F_{MSY} threshold (not overfishing). A retrospective pattern re-emerged when updating the assessment model, which suggests that Atlantic herring spawning stock biomass (SSB) is likely to be overestimated and fishing mortality (F) is likely to be underestimated in the terminal year of the assessment. Resolution of a technical error in the contribution of recruitment to the objective function (i.e., negative log-likelihood) of the assessment model also affected the severity of the retrospective pattern. As a result, the assessment review panel applied a retrospective adjustment to the SSB and F values for the terminal year (2014) using Mohn's Rho. The retrospective adjustments resulted in approximately a 40% decrease in the terminal year (2014) SSB estimate and a 60% increase in the 2014 F estimate. Even with the retrospective adjustments, the Atlantic herring stock complex remains above the biomass target and below the fishing mortality threshold (Table 28, Figure 2).

Table 28 - Atlantic herring reference points and terminal year SSB/F estimates from the Benchmark Assessment (2012) and Update Assessment (2015)

	2012 SAW 54 Benchmark	**2015 Update (Non-Adjusted)**	**2015 Update (Retro-Adjusted)**
Terminal Year SSB	518,000 mt (2011)	1,041,500 mt (2014)	**622,991 mt (2014)**
Terminal Year F	0.14 (2011)	0.10 (2014)	**0.16 (2014)**
SSB_{MSY}	157,000 mt	311,145 mt	
F_{MSY}	0.27	0.24	
MSY	53,000 mt	77,247 mt	

Figure 2 Atlantic herring operational assessment: 2014 fishing mortality and SSB relative to F_{MSY} and SSB_{MSY} reference points, including retrospective adjustment (red line)



Note: Error bars represent 10th and 90th percentiles of 2014 F/SSB estimates.

The results of the 2015 operational assessment form the basis of the SSC and Council recommendations for the 2016-2018 specifications of OFL and ABC. The operational assessment report and the May 20, 2015 SSC report contain more detailed information.

6.1.2 Considerations Related to Scientific Uncertainty

With respect to the 2015 Atlantic herring operational assessment, the re-emerging retrospective pattern, assumptions about natural mortality (M), and the mismatch between implied consumption and estimated consumption appear to be the primary sources of uncertainty (see discussion in following subsections).

The size/strength of the 2011 year class and other sources of uncertainty were also identified in the assessment report. However, signals related to the 2011 year class (possibly the second-largest on record) are similar to those for the 2008 year class that were noted in the 2012 Atlantic herring benchmark stock assessment. The update assessment indicates that the 2008 year class has persisted through the fishery as the strongest on record.

6.1.2.1 Retrospective Pattern

Since the benchmark assessment, an issue with the contribution of recruitment to the negative log likelihood in the assessment framework, ASAP, was discovered. This issue was resolved for the operational assessment. Differences in results and diagnostics between the benchmark and the update are partially attributable to the likelihood issue. Resolving the likelihood issue had the effect of changing the scale of estimates (e.g., increasing abundance estimates), particularly in recent years. Regardless of the likelihood issue, diagnostic problems (e.g., retrospective patterns) were present in the update assessment. Resolving the likelihood issue only amplified these diagnostic problems (e.g., worsening retrospective patterns). To account for retrospective bias, the assessment review panel made a retrospective adjustment to the terminal year (2014) estimates of SSB (40%) and F (60%). The retrospective-adjusted estimates of SSB, F, and numbers-at-age are utilized for the short-term (2016-2018) catch projections (see Section 7.1.1 for catch projections). No retrospective adjustment was applied to the benchmark terminal year (2011) biomass and fishing mortality estimates that were utilized in the projections for the 2013-2015 Atlantic herring fishery specifications.

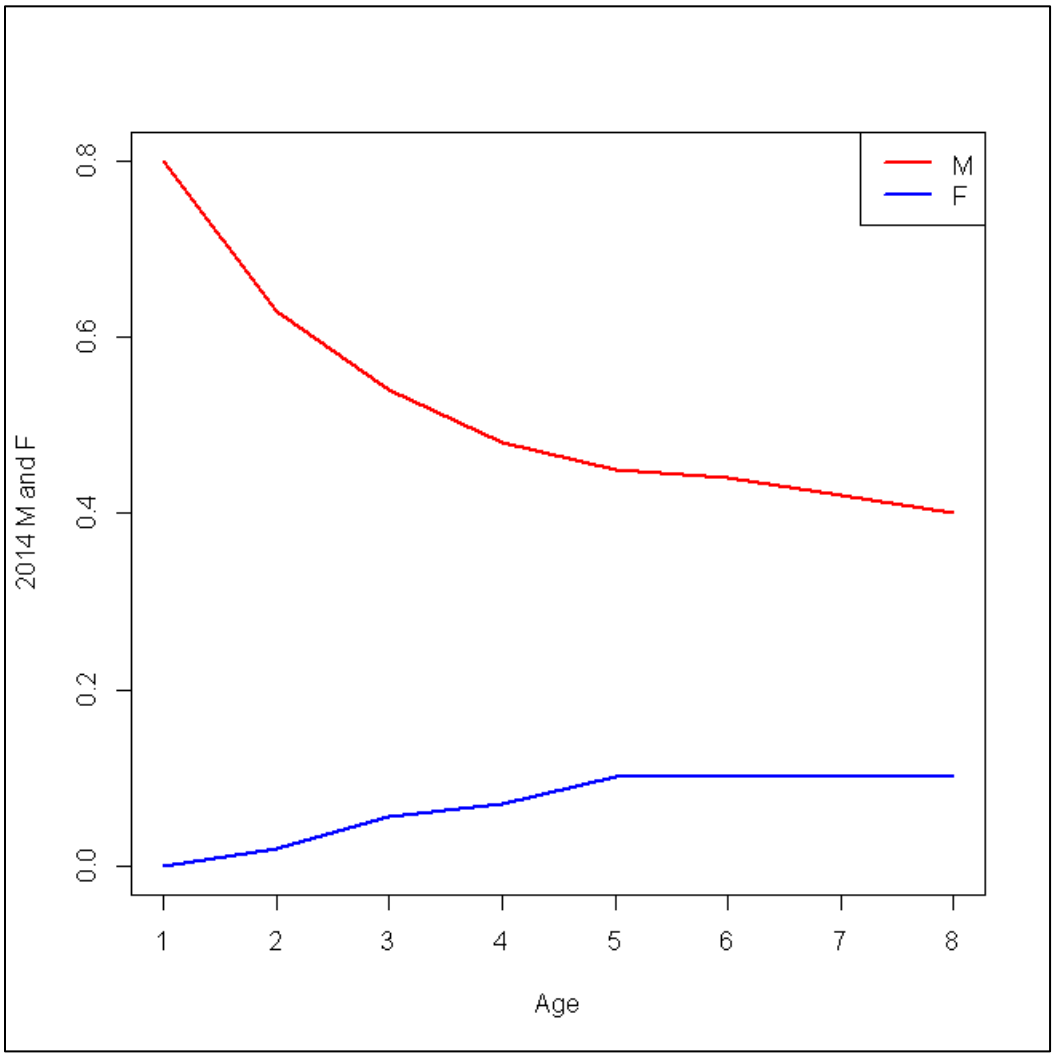
The re-emergence of the retrospective pattern suggests a fundamental diagnostic problem with the assessment model that remains a cause for concern. However, it appears that the stock would remain above the biomass target and below the fishing mortality thresholds even if the 80% confidence intervals (i.e., 90th and 10th percentiles) associated with the terminal year estimates of F and SSB (Figure 2, p. 42) are applied to the retrospective-adjusted estimates (i.e., stock status would not change, 2014 F would remain below the threshold, and 2014 SSB would remain above the target).

6.1.2.2 Natural Mortality and Consumption

Additional uncertainty is associated with the treatment of natural mortality (M) in the assessment model and the divergence between NMFS' consumption estimates (based on stomach content data) and levels of consumption implied by the input M values in the assessment model. The mismatch between estimated and implied consumption became apparent when the assessment model was updated. This may not be of significant concern because of the possible inaccuracy of consumption estimates derived from the food habits data. These data can be extremely sensitive to presence/absence of herring in just a few stomach samples. While food habits data are used to estimate consumption by teleost predators (fish), estimates of consumption by marine mammals, seabirds, and some larger predators (ex. tuna) are derived from prior research and assumed to be constant in recent years; these data may not be complete. Moreover, consumption of Atlantic herring and other species may change due to factors other than M (e.g., herring abundance, spatial overlap).

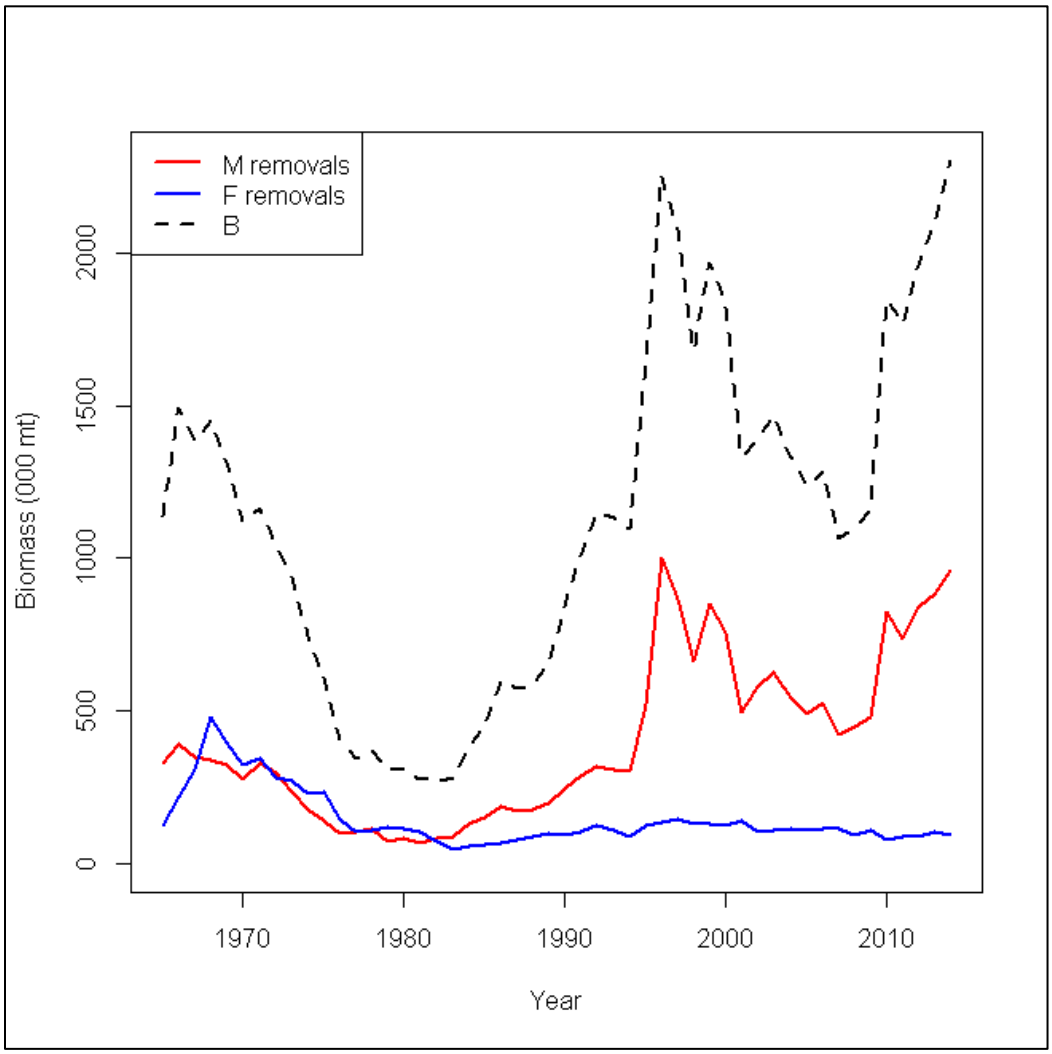
The assessment model assumes a significant amount of natural mortality on Atlantic herring, particularly at younger ages, before the fish experience mortality from the fishery. Figure 3shows how the assessment model treats natural mortality (red line) and fishing mortality (blue line) by age class in 2014. Thus, the model assumes that M is a much higher fraction of total mortality than fishing mortality. Figure 4 illustrates removals from fishing mortality and natural mortality estimated from the assessment model relative to total biomass over the entire time series.

Figure 3 - Atlantic Herring Operational Assessment: 2014 estimated natural mortality (M) and fishing mortality (F) by age



Source: Atlantic Herring Operational Assessment Meeting, April 8-9, 2015.

Figure 4 - Atlantic Herring Operational Assessment: Estimated removals from natural mortality (M) and fishing mortality (F) relative to total estimated biomass (B)



Source: Atlantic Herring Operational Assessment Meeting, April 8-9, 2015.

6.2 NON-TARGET SPECIES

6.2.1 Overview

Non-target species refers to species other than Atlantic herring which are caught/landed by federally permitted vessels while fishing for herring. The MSA defines *bycatch* as fish that are harvested in a fishery, but are not retained (sold, transferred, or kept for personal use), including economic discards and regulatory discards (16 U.S.C. § 1802(2)). The MSA mandates the reduction of *bycatch*, as defined, to the extent practicable (16 U.S.C.§ 1851(a)(9)). Incidental catch, on the other hand, is typically considered to be non-targeted species that are harvested while fishing for a target species and is retained and/or sold. In contrast to bycatch, there is no statutory mandate to reduce incidental catch. When non-target species are encountered in the Atlantic herring fishery, they are either discarded (bycatch) or they are retained and sold as part of the catch (incidental catch). The majority of catch by herring vessels on directed trips is Atlantic herring, with extremely low percentages of bycatch (discards). Atlantic mackerel is targeted in combination with Atlantic herring during some times of the year in the southern New England and Mid-Atlantic area and is therefore not considered a non-target species.

Due to the high-volume nature of the Atlantic herring fishery, non-target species, including river herring (blueback herring and alewives), shad (hickory shad and American shad), and some groundfish species (particularly haddock), are often retained once the fish are brought on board (Amendment 5 FEIS, p. 173). The catch of non-target species in the directed Atlantic herring fishery can be identified through sea sampling (observer) data collected by the Northeast Fisheries Observer Program (NEFOP). Portside sampling data collected by MADMF and MEDMR can be utilized to estimate catch of any non-target species that are landed. Dealer and VTR data can be used to identify/cross-check incidental landings of some non-target species that may be separated from Atlantic herring.

The primary non-target species in the directed Atlantic herring fishery are **groundfish (particularly haddock)** and the **river herring/shad (RH/S) species**. Dogfish, squid, butterfish, Atlantic mackerel are also common non-target species in the directed Atlantic herring fishery (mackerel and some other non-target species catch is often landed and sold). Comprehensive information about the catch of these species in the Atlantic herring fishery is in Section 5.2 of Amendment 5 and Sections 3.2 (River Herring/Shad) and 3.3 (Other Non-Target Species) of Framework 3 to the Atlantic Herring FMP. Summary information is below, updated where possible. For this management action, particular focus is given to RH/S and the potential impacts of the proposed RH/S catch caps.

6.2.1 Observer Coverage in the Atlantic Herring Fishery

The catch of non-target species in the directed Atlantic herring fishery can be identified through sea sampling (observer) data collected by the Northeast Fisheries Observer Program (NEFOP). Table 29 summarizes NEFOP observer coverage rates by gear type and herring management area during the 2012 fishing year for trips taken by the primary gears involved in the Atlantic herring fishery. Coverage rates in this table are calculated based on NEFOP observed herring pounds caught/VTR-reported herring pounds landed.

Table 29 - 2012 NEFOP coverage rates by gear type and Herring Management Area (pounds observed/pounds landed)

Gear Type	Atlantic Herring Management Area			
	1A	1B	2	3
Midwater Trawl (Single)	6.4%	0%	2.6%	71.2%
Pair Trawl	17.6%	36.5%	23.8%	75%
Purse Seine	16.3%	N/A	N/A	0%
Small Mesh Bottom Trawl	4.9%	0%	24.30%	0%
Note: VTR data were preliminary when these estimates were generated.				

Table 30 summarizes 2013 observer coverage rates on midwater trawl trips (single and paired) by month. As of November 2013, the Northeast Fisheries Observer Program (NEFOP) had achieved 526 midwater trawl sea days during the 2013 fishing year (360 sea days were tasked to this fishery for the entire 2013 year). By the end of the fishing year, NEFOP observers sampled a total of 127 midwater trawl trips (Table 30). Observer coverage on midwater trawl vessels was relatively high during September and October 2013, but not as high as 2012. The average observer coverage rate for midwater trawl vessels (% of trips) in 2013 was **26**%.

The percent of midwater trawl trips observed in 2013 is lower than in 2012 primarily because there were significantly less pre-trip notifications for CAI, which requires 100% observer coverage. In 2012, there were 158 trips that notified for CAI and were covered, thereby increasing the overall coverage on midwater trawl vessels. In 2013, there were far fewer trip notifications to CAI, and the Area 3 (Georges Bank) herring fishery closed in October. NEFOP personnel noted that call-in compliance was 100% over the 2013 summer season.

Table 30 - 2013 NEFOP observer coverage on midwater trawl trips

	# Declared Trips	# Observed Trips	% Trips Covered
January	78	9	**12**
February	59	7	**12**
March	40	13	**33**
April	16	2	**13**
May	19	11	**58**
June	34	16	**47**
July	44	6	**14**
August	47	9	**19**
September	41	23	**56**
October	33	19	**58**
November	5	2	**40**
December	75	10	**13**

Table 31 provides a preliminary summary of observer coverage in the Atlantic herring fishery by month for 2014 and 2015 YTD. The observed trips were identified based on VMS gear declaration, and declared gear type and target species for small mesh bottom trawl vessels. VMS gear declarations do not specify single midwater trawl versus pair trawl, so the numbers in Table 31 account for single and paired midwater trawl combined. The data are still considered preliminary and require further investigation to cross-check errors in VMS declarations (for example, 120% coverage on small mesh bottom trawl vessels during December 2014 is likely the result of an error with a gear declaration.

In 2014, NEFOP observers covered almost 41% of all declared midwater trawl trips (single and paired), 8.7% of all declared purse seine trips, and 26.2% of all declared small mesh bottom trawl trips targeting Atlantic herring. Observer coverage decreased dramatically during the first half of 2015, primarily due to budget restrictions and funding limitations imposed by the omnibus amendment to revise the Region's standardized bycatch reporting methodology (SBRM). From January – June 2015, preliminary estimates indicate that observer coverage on declared midwater trawl trips was just under 6%, just under 7% on declared purse seine trips, and just over 31% on small mesh bottom trawl trips targeting Atlantic herring.

Table 31 - NEFOP observer coverage on trips in the Atlantic herring fishery, 2014 and 2015 YTD (Preliminary)

2014	Midwater Trawl			Purse Seine			Small Mesh Bottom Trawl		
	Observed Trips	VMS Declared Trips	**% Coverage**	Observed Trips	VMS Declared Trips	**% Coverage**	Observed Trips	VMS Declared Trips	**% Coverage**
Jan	15	68	**22**	1	0	**0**	13	40	**33**
Feb	22	62	**35**	0	0	**0**	4	27	**15**
March	11	30	**37**	0	0	**0**	2	10	**20**
April	2	2	**100**	0	0	**0**	0	2	**0**
May	13	26	**50**	0	0	**0**	0	0	**0**
June	18	38	**47**	7	34	**21**	0	1	**0**
July	5	34	**15**	6	66	**9**	2	26	**8**
August	11	44	**25**	5	97	**5**	3	36	**8**
Sept	29	34	**85**	6	85	**7**	8	13	**62**
Oct	35	36	**97**	3	40	**8**	0	3	**0**
Nov	5	11	**45**	0	0	**0**	0	0	**0**
Dec	5	35	**14**	0	0	**0**	12	10	**120***
2015	**Midwater Trawl**			**Purse Seine**			**Small Mesh Bottom Trawl**		
	Observed Trips	VMS Declared Trips	**% Coverage**	Observed Trips	VMS Declared Trips	**% Coverage**	Observed Trips	VMS Declared Trips	**% Coverage**
Jan	10	83	**12**	0	0	**0**	12	34	**35**
Feb	0	28	**0**	0	0	**0**	2	9	**22**
March	2	58	**3**	0	0	**0**	0	2	**0**
April	1	27	**4**	0	2	**0**	0	0	**0**
May	1	32	**3**	0	0	**0**	0	0	**0**
June	2	44	**5**	3	42	**7**	0	0	**0**

*Coverage levels over 100% are likely the result of an incorrect gear declaration; this will be corrected when the data are finalized.

6.2.2 Haddock

Haddock comprises the largest component of groundfish bycatch by midwater trawl vessels, and the catch of haddock by these vessels is managed by the Council through a catch cap (Framework 46 to the Multispecies FMP) and increased sampling/monitoring (Amendment 5 to the Atlantic Herring FMP). Vessels issued a Category A/B Atlantic herring permit and on a declared herring trip, regardless of gear or area fished, and or a vessel issued a Category C permit and/or an Category D permit (open access) that fishes with midwater trawl gear in Areas 1A, 1B, and 3 are prohibited from discarding haddock at-sea. These vessels are limited to possessing/landing up to 100 lb. of other NE multispecies. Atlantic herring processors and dealers are required to separate out, and retain such haddock for at least 12 hours for inspection by authorized NMFS officers. However, haddock or other NE multispecies separated from the herring catch may not be sold, purchased, received, traded, bartered, or transferred, or attempted to be sold, purchased, received, traded, bartered, or transferred for, or intended for, human consumption.

Table 32 summarizes haddock catch by the herring midwater trawl vessels from 2011-2014. Starting in 2011, data used to estimate/monitor the cap include observer data, vessel trip reports (VTR), and dealer reports. During the 2012 groundfish fishing year, the haddock catch cap was fully utilized in the GB area. The 2013 Georges Bank cap was slightly exceeded. As a result, the 2014 catch cap was adjusted downward from 179 mt to 162 mt to account for the overage. There remains very little catch of Gulf of Maine haddock by midwater trawl vessels in the Atlantic herring fishery.

Table 32 - Haddock catch by midwater trawl vessels subject to haddock catch cap, 2011-2015

FY	Georges Bank			Gulf of Maine		
	Haddock cap (mt)	Haddock catch (mt)	% caught	Haddock cap (mt)	Haddock catch (mt)	% caught
2011	318	101	32%	11	3	23%
2012	286	285	100%	9	0	0%
2013	273	285	105%	3	0.1	2%
2014	162	114	70%	3	0	0%
2015	227	235.54*	104%*	14	0*	0%*

Note: Catch Caps are based on groundfish fishing year (May 1 – April 30).
Source: NOAA/NMFS (http://www.nero.noaa.gov/ro/fso/reports/reports_frame.htm)
*Preliminary totals

The haddock catch caps for FY2015 (May 1, 2015 – April 30, 2016) are 227 mt for the Georges Bank stock and 14 mt for the Gulf of Maine stock. Based on data reported through August 12, 2015, almost 8% of the GB catch cap and none of the GOM catch cap had been used by the midwater trawl fleet.

6.2.3 River Herring and Shad (RH/S)

River herring and shad are non-target species of particular concern, and catch of RH/S in the directed Atlantic herring fishery is managed through gear and area-specific catch caps, which are proposed to be specified for 2016-2018 in this management action. For the purposes of this document, the term "river herring" refers to the species of alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*), and the term "shad" refers to the species of American shad (*Alosa sapidissima*) and hickory shad (*Alosa mediocris*). Collectively, these four species are referred to throughout this document as "RH/S." The following section provides some updated information about RH/S as non-target species in the Atlantic herring fishery; a comprehensive description of the RH/S resources is in Section 3.2 of Framework 3 to the Atlantic Herring FMP (NEFMC, 2014). RH/S catch by Atlantic herring vessels is summarized in Section 3.2.4.4 of the Framework 3 document and updated in Appendix I to this document.

River herring and shad are anadromous fish that spend the majority of their adult lives at sea, only returning to freshwater in the spring to spawn. Historically, RH/S spawned in virtually every river and tributary along the coast. The oceanic ranges of all four species extend beyond the northern and southern latitudinal range of the NEFSC spring and fall surveys, which occur from the Gulf of Maine to Cape Hatteras, NC (35° 30' to 44° 30' N). The geographic range of blueback herring in the northwest Atlantic extends from Cape Breton, Nova Scotia, to the St. Johns River in FL and the range of American shad extends from the Sand Hill River in Labrador to the St. John's River in FL (Page & Burr 1991). The geographic range of alewife extends from Red Bay, Labrador, to SC. Hickory shad have a narrower geographic range than these three species and is most abundant between Cape Cod, MA and the St. John's River in FL, but is also infrequently found in the Gulf of Maine (Munroe 2002).

Targeting RH/S occurs almost exclusively in State waters, and river herring and shad are managed under the Atlantic States Marine Fisheries Commission (ASMFC) Shad and River Herring Fishery Management Plan (FMP), which was developed in 1985. A more detailed description of the ASMFC Interstate Management Program for RH/S is in Section 3.2.3 of Framework Adjustment 3 (NEFMC 2014b).

RH/S Stock Status

A stock assessment for American shad was completed in 1997 and submitted for peer review in early 1998 based on new information and the Board recommended terms of reference. The 1998 assessment estimated fishing mortality rates for nine shad stocks and general trends in abundance for 13 shad stocks. A coastwide American shad stock assessment was completed and accepted in 2007 and found that American shad stocks are currently at all-time lows and do not appear to be recovering (ASMFC 2007). Recent declines of American shad were reported for Maine, New Hampshire, Rhode Island, and Georgia stocks, and for the Hudson (NY), Susquehanna (PA), James (VA), and Edisto (SC) rivers. Low and stable stock abundance was indicated for Massachusetts, Connecticut, Delaware, the Chesapeake Bay, the Rappahannock River (VA), and some South Carolina and Florida stocks. Stocks in the Potomac and York Rivers (VA) have shown some signs of recovery in recent years. There are no coastwide reference points for American shad. There is currently no stock assessment available for hickory shad.

The 2007 assessment of American shad identified primary causes for stock decline as a combination of overfishing, pollution, and habitat loss due to dam construction. In recent years, coastwide harvests have been on the order of 500-900 mt, nearly two orders of magnitude lower

than in the late 19th century. Given these findings, the peer review panel recommended that current restoration actions need to be reviewed and new ones need to be identified and applied. The peer review panel suggested considering multiple approaches including a reduction in fishing mortality, enhancement of dam passage, mitigation of dam-related fish mortality, stocking, and habitat restoration.

The ASMFC completed the river herring benchmark stock assessment and peer review in 2012, examining 52 stocks of alewife and blueback herring with available data in U.S. waters. The stock assessment technical team examined indices from fishery-dependent (directed river herring landings and bycatch estimates in ocean fisheries) and fishery-independent (young-of-year indices, adult net and electrofishing indices, coastal waters trawl surveys, and run count indices) datasets. From this information, the status of 23 stocks was determined to be *depleted* relative to historic levels, and one stock was increasing. Statuses of the remaining 28 stocks could not be determined, citing times-series of available data being too short. The term "d*epleted*" was used, rather than "*overfished* and "*overfishing.*" It was determined that many factors (i.e., directed fishing, incidental fishing/bycatch, habitat loss, predation, and climate change) contributed to the decline of river herring populations, and the stock assessment did not determine estimates of river herring abundance and fishing mortality due to lack of adequate data. For many of these reasons, the stock assessment team suggested reducing the full range of impacts on river herring populations.

NMFS River Herring ESA Determination

On August 12, 2013, NMFS published its determination in the *Federal Register* regarding the 2011 petition to list alewife and blueback herring as threatened or endangered throughout all or a significant portion of their range under the Endangered Species Act (ESA). Based on the best scientific and commercial information available, NMFS determined that listing alewife and blueback herring as threatened or endangered under the ESA is not warranted at this time.

While neither species of river herring is currently considered endangered or threatened, both species are at low abundance compared to historical levels, and NMFS indicated that monitoring both species is warranted. Given the uncertainties and data deficiencies for both species, NMFS committed to revisiting both species of river herring in 3 – 5 years. During this 3- to 5-year period, NMFS is coordinating with ASMFC, the Mid-Atlantic Fishery Management Council (MAFMC), and the NEFMC on a strategy to develop a long-term and dynamic conservation plan (e.g., priority activities and areas) for river herring considering the full range of both species and with the goal of addressing many of the high priority data gaps for river herring (see TEWG below).

River Herring Technical Expert Working Group (TEWG)

When NOAA Fisheries published the ESA listing decision for river herring in August 2013, NMFS indicated that it would partner with ASMFC to form a Technical Expert Working Group (TEWG). The TEWG is focused on developing a dynamic conservation plan to help restore river herring throughout their range from Canada to Florida, identifying and implementing important conservation efforts, and conducting research to fill in some of the critical data gaps for the river herring species, including the following:

- Identify threats to both species throughout their range
- Identify and create a priority list of conservation actions to address critical threats and associated costs

- Identify key data gaps
- Create a priority list of research projects and associated costs to fill existing data gaps
- Provide/compile information for NMFS/ASMFC to use in the development of a dynamic, long term conservation plan
- Track and monitor progress of conservation actions and research
- Revise actions as needed

The goal of the TEWG meetings was information gathering, whereby individual expert opinion on data, ideas, or recommendations will be sought from all participants. The meetings were not consensus-driven.

Because of its comprehensive scope and extensive membership, the TEWG includes subgroups (by topic) to focus discussions, as well as an overarching committee comprised of chairs/co-chairs from the subgroups. The TEWG first met in March 2014 to discuss river herring conservation planning and the structure and process for TEWG participation. Additional meetings were held in June, September, and December 2014, and subgroups are also meeting in between larger TEWG meetings. As this effort expands, NOAA Fisheries continues to coordinate with all of management partners including the Mid-Atlantic and the New England Councils to maximize resources and identify ways to complement ongoing efforts to promote river herring restoration. The TEWG's work products, including recommendations for a comprehensive restoration plan, were recently released (see http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/conserv/index.html). NMFS is scheduled to brief the Council regarding the conservation/restoration plan at an upcoming Council meeting.

As part of the effort for conservation planning, NMFS recently provided a grant to ASMFC ($295K) to support research projects that seek to address data gaps identified through the TEWG process – (1) *Linking life stages: marine bycatch mortality, freshwater productivity, and spawning stock recruitment*; (2) *Determination of extant herring runs in the Barnegat Bay and Raritan River watersheds*. Continued leadership by ASMFC and NMFS is expected to stimulate additional research efforts. For example, *NMFS has provided funds to the NEFSC to develop habitat models to predict river herring (and shad) distribution in relation to Atlantic herring and Atlantic mackerel distribution. These environmentally-driven, predictive species distribution models would be used to try to forecast river herring and shad catch, and be iteratively improved through close cooperation with fishing industry partners* (GARFO, personal communication).

Ongoing Efforts to Minimize RH/S Bycatch (NEFMC and MAFMC)

In Federal waters, the NEFMC continues to manage and minimize RH/S interactions through the Atlantic Herring FMP and its associated amendments and framework adjustments. Most recently, Framework 3 to the Atlantic Herring FMP established catch caps for RH/S and related provisions to manage and minimize interactions with these species in the directed Atlantic herring fishery. The RH/S catch caps established in Framework 3 became effective in late 2014. 2015 is the first full fishing year in which the directed Atlantic herring fishery will operate under RH/S catch caps.

The Mid-Atlantic Fishery Management Council (MAFMC) manages RH/S bycatch issues in the Atlantic mackerel fishery primarily through its Mackerel, Squid, and Butterfish (MSB) FMP. Recently, Amendment 14 to the MSB FMP (MAFMC 2013) was developed in coordination with Amendment 5 to the Herring FMP and implemented a comprehensive catch monitoring system

for the MSB fishery. Many of the actions contained with both amendments were developed to compliment and/or replicate each other to avoid conflicting overlaps of restrictions on vessels that participate in both the herring and mackerel fisheries. Similarly, the MAFMC implemented a RH/S catch cap for the directed mackerel fishery through its specifications process. During the MSB specifications process (June 2015), the MAFMC recommended a catch cap of 82 mt for the directed mackerel fishery for the 2016 fishing year. This is a reduction from the 89 mt catch cap during 2015. The MAFMC's intent is to continue to provide a strong incentive for vessels participating in the Atlantic mackerel fishery to avoid RH/S to preserve their ability to harvest the mackerel quota.

The MAFMC also formed the RH/S Committee as part of a proactive coordinated effort to conserve RH/S stocks. Three members of the NEFMC currently serve on the RH/S Committee. The RH/S Committee held its first meeting in April 2014. There will be opportunity for the two Councils to better align the catch caps in the overlapping southern New England/Mid-Atlantic area for the 2016 fishing year and beyond. This has been identified as an important objective by the MAFMC RH/S Committee. The NEFMC built flexibility into the RH/S catch cap process in Framework 3 to allow development of a joint herring/mackerel fishery RH/S catch cap for the southern New England/Mid-Atlantic area with the MAFMC.

6.2.3.1 Updated RH/S Trawl Survey Data

NEFSC spring and fall bottom trawl survey data for RH/S species are updated through 2014 in Figure 5 – Figure 9 below. An abbreviated set of strata was utilized in the figures for the spring survey because the 2014 spring survey did not sample stations south of Delaware Bay due to mechanical issues with the vessel (using the abbreviated strata set did not affect trends). Overall, NEFSC bottom trawl survey trends for river herring and shad have been somewhat variable but appear to be increasing. Estimates of relative abundance and biomass of alewife, blueback herring, and American shad derived from the trawl survey in recent years are higher than the median numbers-per-tow and median weights-per-tow across the time series. Relative abundance of alewife and American shad decreased in 2013-2014 from a peak in 2012, but 2014 spring survey estimates are above the time series medians for all three species.

Figure 5 - Alewife relative abundance (stratified mean number-per-tow) and biomass (stratified mean kg-per-tow) indices (top) and the proportion of positive tows (bottom) from the NEFSC Spring Bottom Trawl Survey, 1976-2014 (abbreviated strata set)

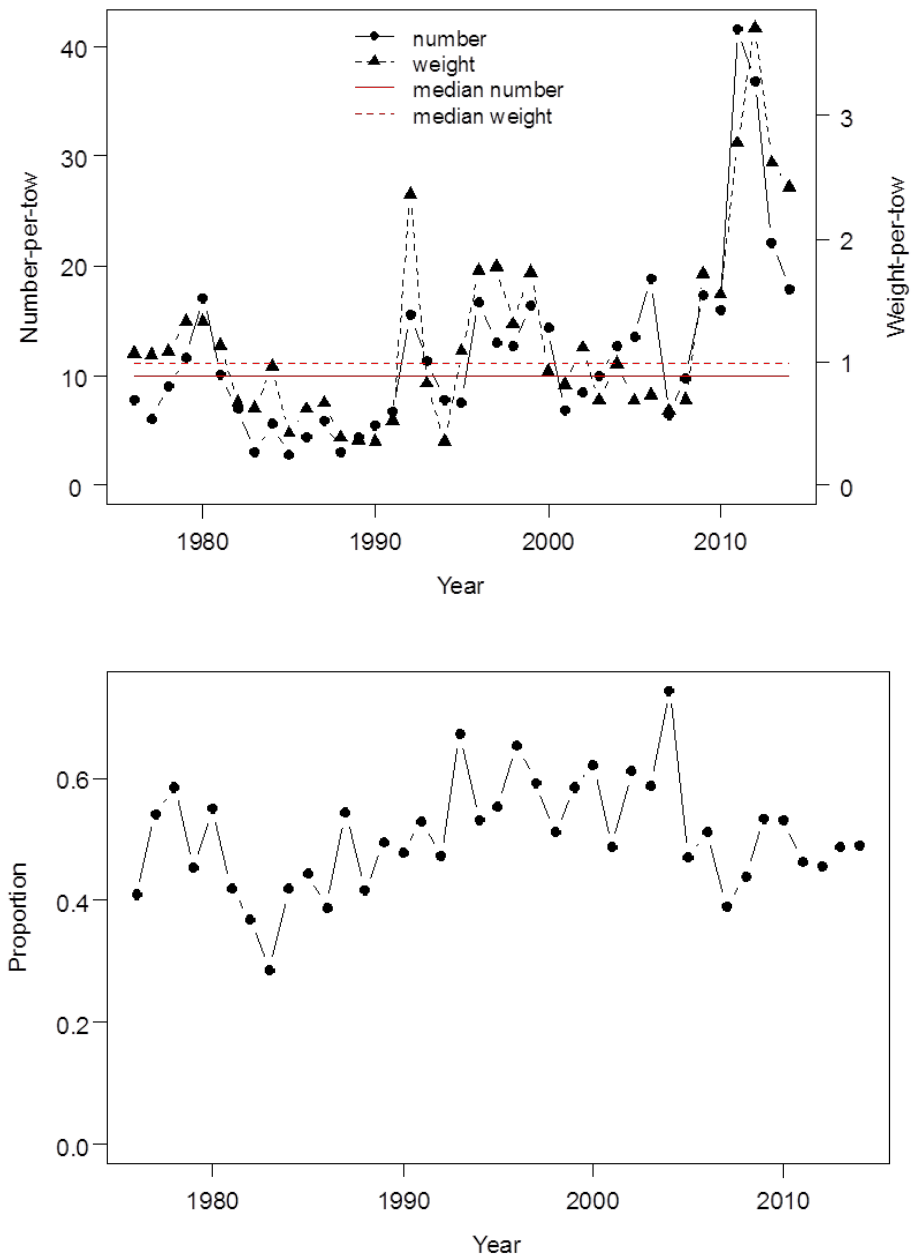


Figure 6 - Alewife relative abundance (stratified mean number-per-tow) and biomass (stratified mean kg-per-tow) indices (top) and the proportion of positive tows (bottom) from the NEFSC Fall Bottom Trawl Survey, 1975-2014

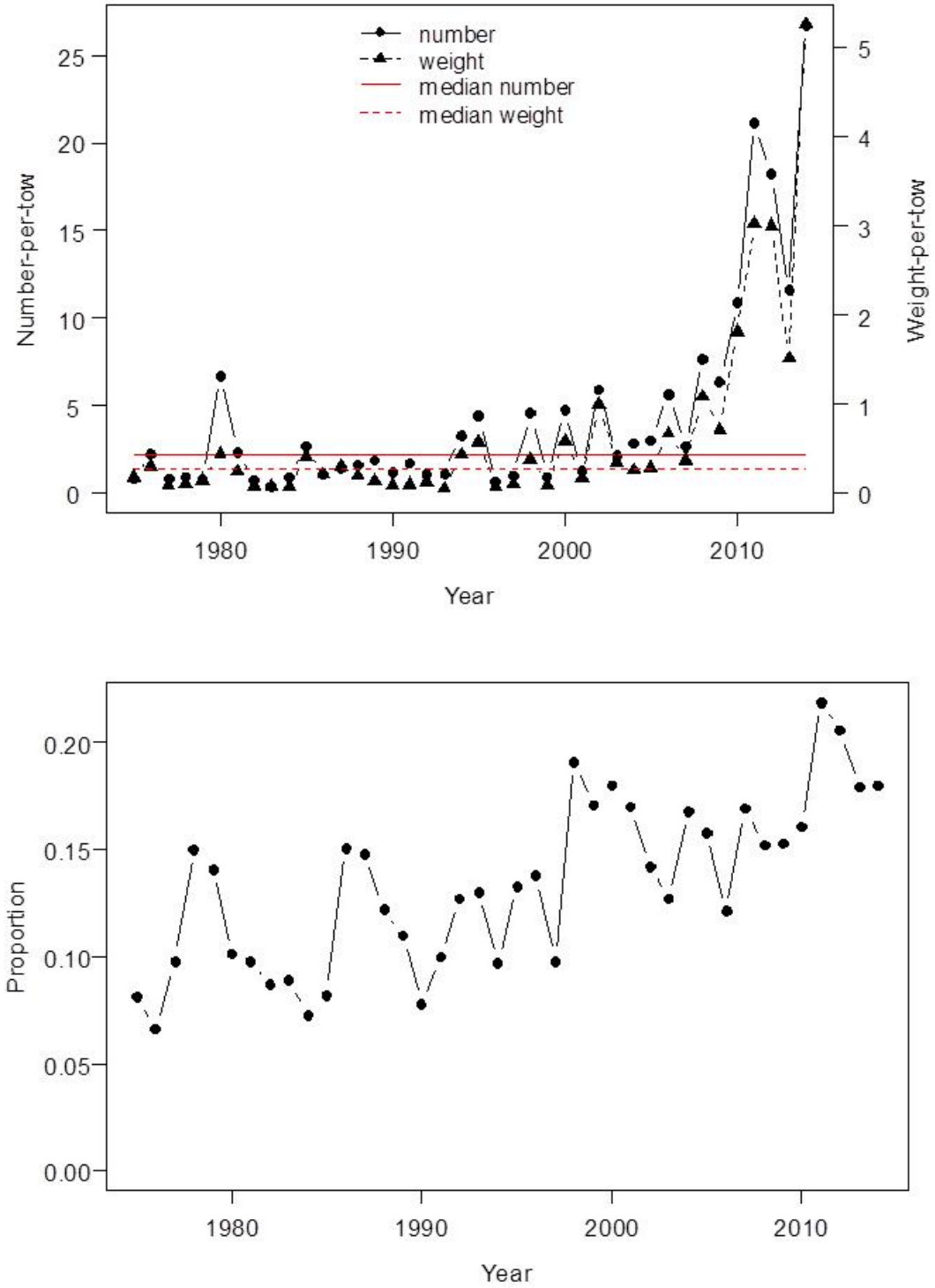
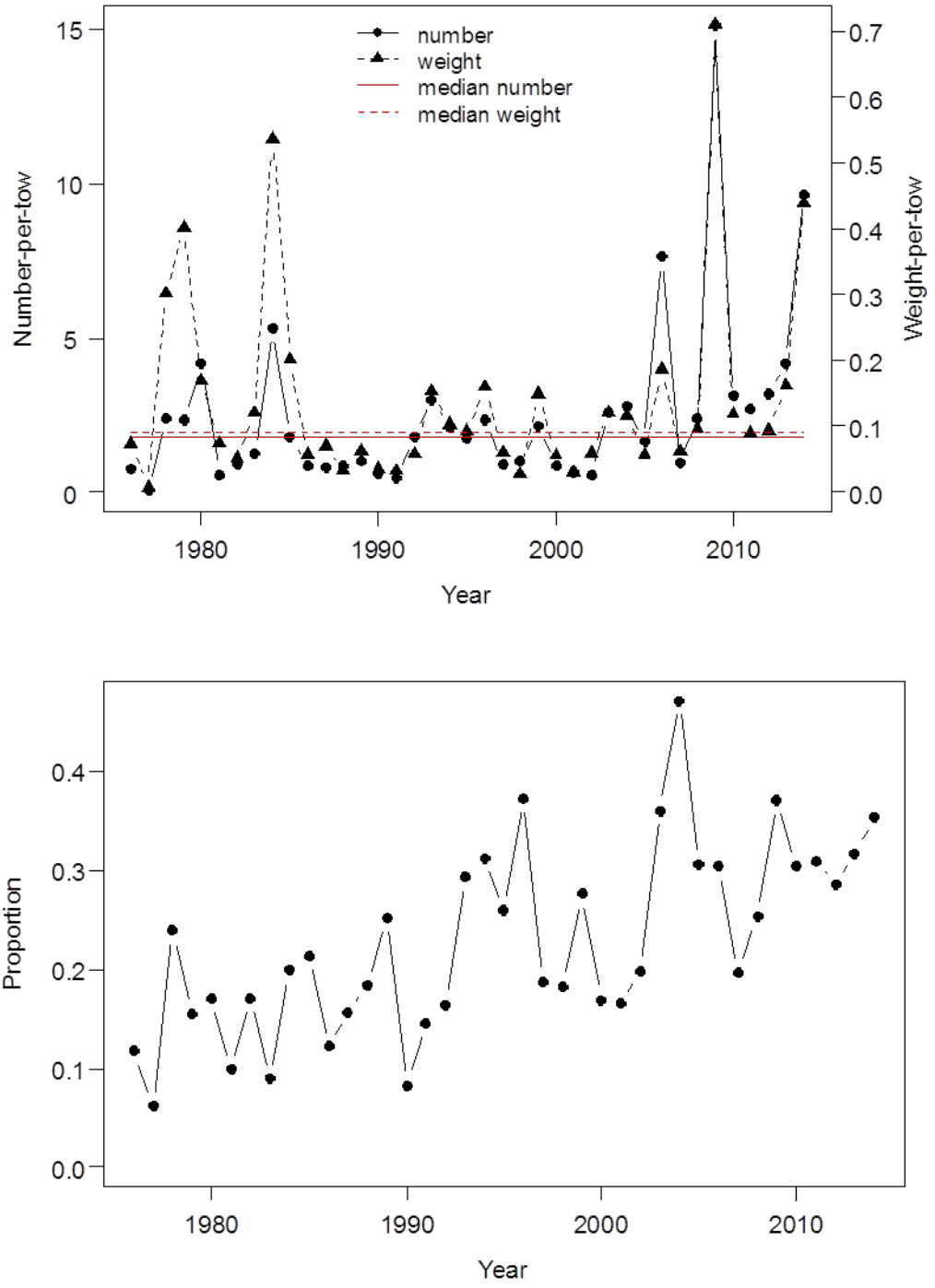


Figure 7 - Blueback herring relative abundance (stratified mean number-per-tow) and biomass (stratified mean kg-per-tow) indices (top) and the proportion of positive tows (bottom) from the NEFSC Spring Bottom Trawl Survey, 1976-2014 (abbreviated strata set)



Note: The abbreviated set is those strata that were sampled during the 2014 spring survey.

Figure 8 - Blueback herring relative abundance (stratified mean number-per-tow) and biomass (stratified mean kg-per-tow) indices (top) and the proportion of positive tows (bottom) from the NEFSC Fall Bottom Trawl Survey, 1975-2014

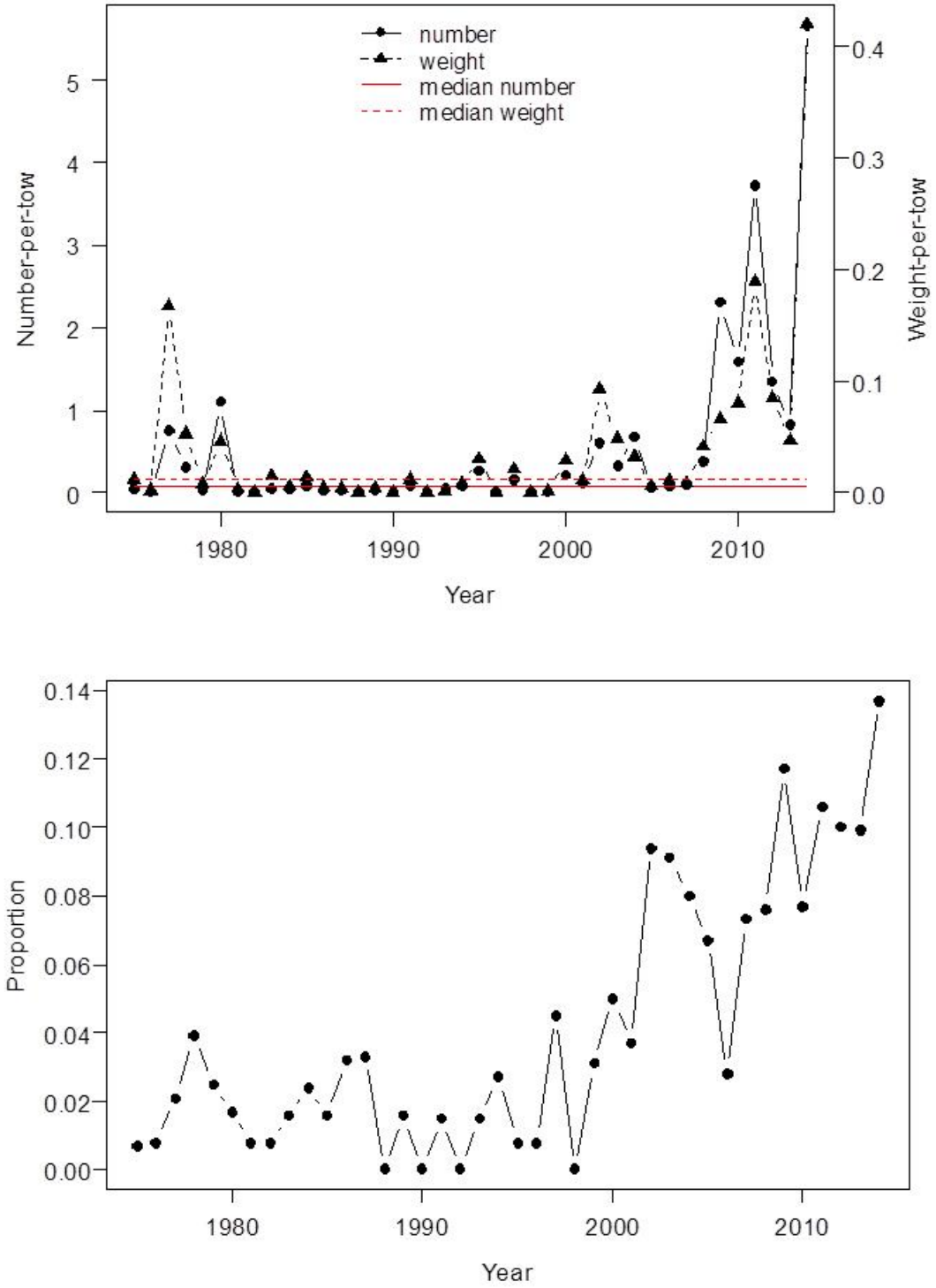
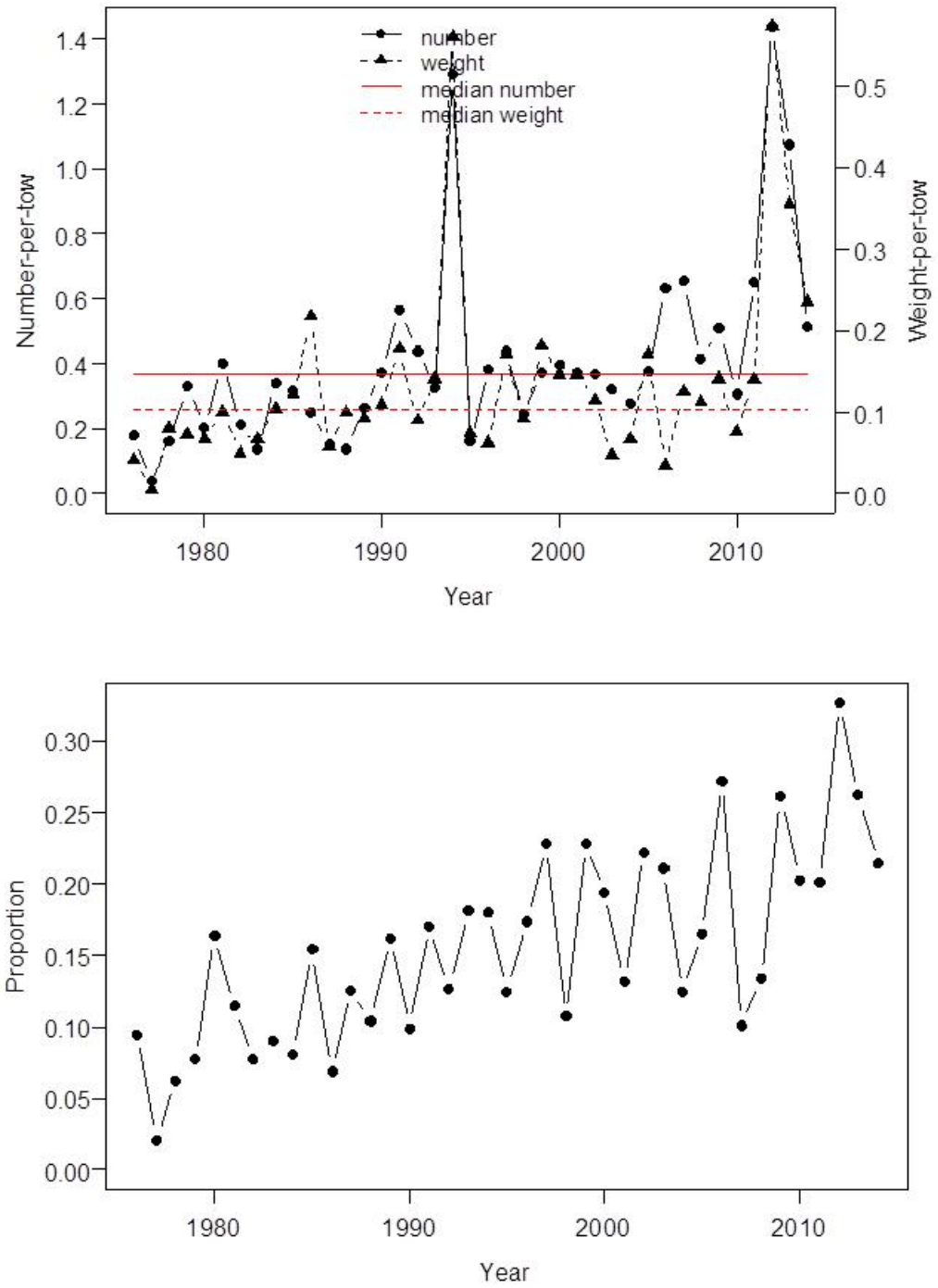


Figure 9 - American shad relative abundance (stratified mean number-per-tow) and biomass (stratified mean kg-per-tow) indices (top) and the proportion of positive tows (bottom) from the NEFSC Spring Bottom Trawl Survey, 1976-2014 (abbreviated strata set)



6.2.3.2 Updated RH/S Catch Data (Herring PDT)

To develop alternatives for the 2016-2018 RH/S catch caps, the Herring PDT updated RH/S catch data and estimates of RH/S catch by gear type and RH/S catch cap area for the 2013 and 2014 fishing years, providing a longer time series of data (2008-2014) than Framework 3 (2008-2012). As part of this process, the 2008-2012 RH/S catch cap data used in Framework 3 were also revised/updated by the Herring PDT to:

1. Incorporate some shad landings that were previously omitted;
2. Include trips from multiple catch cap areas that were previously omitted because sub-trips (catch from one cap area) did not meet the 6,600-pound Atlantic herring landings threshold; and
3. Improve matching of trips sampled by multiple agencies (for removal of redundancies).

A complete discussion of the Herring PDT analysis and updated RH/S catch data is in Appendix I (*Development of Options for River Herring and Shad Catch Caps in the Atlantic Herring Fishery, 2016-2018*, Herring PDT). Summary information is below.

The tables/figures on the following pages provide updated RH/S catch estimates by gear/area/year and encompass all of the changes from the Framework 3 data/methods listed below (discussed in more detail in Appendix I):

- Includes shad landings that were previously omitted from RH/S catch estimates;
- Includes trips that were previously omitted because sub-trips did not meet 6,600 lbs Atlantic herring criteria;
- Improved matching of trips sampled by multiple agencies (for removal of redundancies);
- Use of *true ratio estimator*, expanded by KALL of all cap trips: $\mathbf{RHS_{tot}} = \mathbf{KALL_{tot}} * \frac{\sum \mathbf{RHS_{obs}}}{\sum \mathbf{KALL_{obs}}}$
- Use of DMIS KALL (total lbs of all species kept from NOAA-reconciled dealer/fishermen data) in all expansions (to the trip and to the fishery);
- $RHS_{obs} = RHS_{kept} + RHS_{discard}$; RHS_{kept} is based on a pooled at-sea and portside dataset, whereas $RHS_{discard}$ is based only on at-sea data.

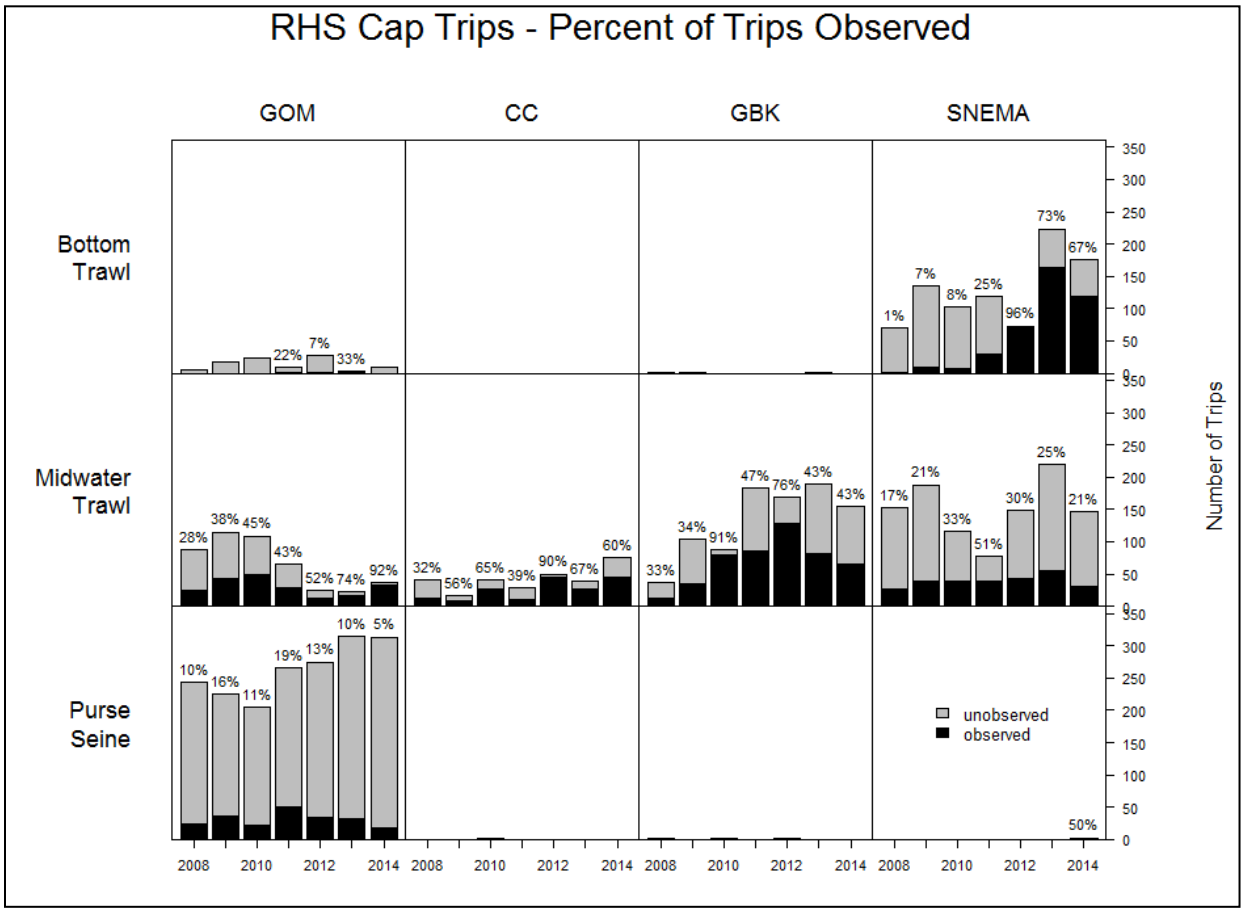
Table 33summarizes the total number of RH/S catch cap trips (trips landing more than 6,600 pounds of Atlantic herring) that occurred in each gear-area strata during each year from 2008-2012. The proportion of these trips that were sampled – either at-sea (observers) or portside (portside samplers) is represented by the shaded bars in Figure 10. Table 34 reports annual estimates of total RH/S catch (landed + discarded) on directed Atlantic Herring trips, estimated by the Herring PDT for each year/area/gear type from 2008-2014. These catch estimates form the basis of the alternatives under consideration for the 2016-2018 RH/S catch caps.

Table 33 - RH/S catch cap trips and landings by strata, 2008-2014

Trips with Atlantic Herring Landings >6,600 lbs									
Gear	**Cap Area**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
Bottom Trawl	**GOM**	5	18	24	9	27	3	9	**95**
	CC	0	0	0	0	0	0	0	**0**
	SNEMA	70	135	103	118	73	223	175	**897**
	GB	1	0	1	0	2	0	0	**4**
Midwater Trawl	**GOM**	88	115	109	65	25	23	36	**461**
	CC	40	16	40	28	50	39	75	**288**
	SNEMA	152	188	116	77	148	219	146	**1,046**
		36	103	87	183	169	189	154	**921**
Purse Seine	**GOM**	243	225	205	265	275	314	313	**1,840**
	CC	0	0	1	0	0	0	0	**1**
	SNEMA	0	0	0	0	0	0	2	**2**
	GB	0	0	0	0	0	0	0	**0**
	Total	**635**	**800**	**686**	**745**	**769**	**1,010**	**910**	**5,555**
Total Landings (mt) from Trips with Atlantic Herring Landings >6,600 lbs									
Gear	**Cap Area**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
Bottom Trawl	**GOM**	32	100	109	40	121	10	39	**451**
	CC	0	0	0	0	0	0	0	**0**
	SNEMA	3,186	5,952	4,558	4,629	4,935	9,422	5,503	**38,185**
	GB	67	0	66	0	89	0	0	**222**
Midwater Trawl	**GOM**	17,663	22,803	18,628	12,875	4,258	6,563	7,381	**90,171**
	CC	7,280	2,806	5,522	5,769	12,569	6,002	17,199	**57,147**
	SNEMA	26,460	36,070	22,158	9,799	18,207	16,788	14,230	**143,712**
	GB	7,564	26,669	14,237	32,172	30,355	35,795	27,052	**173,844**
Purse Seine	**GOM**	25,200	21,694	8,272	17,001	19,295	22,981	27,247	**141,690**
	CC	0	0	9	0	0	0	0	**9**
	SNEMA	0	0	0	0	0	0	58	**58**
	GB	0	0	0	0	0	0	0	**0**
	Total	**87,452**	**116,094**	**73,559**	**82,285**	**89,829**	**97,561**	**98,709**	**645,489**

Note: If a trip occurred in multiple areas, it was assigned to the area where the majority of catch occurred.

Figure 10 - Number of trips that caught >6,600 lbs of Atlantic herring by year, gear, and RH/S catch cap area, 2008-2014



Note: The dark portion of each bar is the proportion of total trips that was observed in that year, with the % observed shown above each bar.

Table 34 - Annual estimates of total RH/S catch (landed + discarded) on directed Atlantic herring trips, 2008-2014

Gear	Cap Area	2008	2009	2010	2011	2012	2013	2014	Median	Weighted Mean
Bottom Trawl	**GOM**				0.6	0.1	0.0		0.1	0.3
	SNE/MA	0.0	105.9	13.5	19.6	24.0	236.5	58.5	24.0	122.3
Midwater Trawl	**GOM**	157.2	98.1	146.8	5.9	1.9	11.3	6.7	11.3	76.7
	CC	39.8	0.0	0.7	8.9	49.6	29.5	45.3	29.5	32.4
	SNE/MA	348.7	83.9	28.0	29.6	157.3	231.5	30.3	83.9	129.6
	GB	0.0	0.2	1.6	0.9	0.5	1.3	0.4	0.5	0.8
Purse Seine	**GOM**	2.0	2.8	2.9	0.1	1.2	4.1	66.5	2.8	7.0
	Total	**547.7**	**290.8**	**193.5**	**65.6**	**234.4**	**514.2**	**207.6**		

6.2.3.3 RH/S Catch YTD Under 2015 Catch Caps

As previously noted, RH/S catch in the directed Atlantic herring fishery is managed through gear-specific and area-specific caps implemented through Framework 3 to the Atlantic Herring FMP (November 2014). The RH/S catch caps are monitored based on the Atlantic herring fishing year (January 1-December 31). Once a RH/S catch cap is harvested, a 2,000 pound Atlantic herring possession limit goes into effect for that Catch Cap AM Area and gear type for the remainder of the fishing year.

The method for estimating RH/S catch by Atlantic herring vessels is similar to the method for estimating RH/S catch in the Atlantic mackerel fishery. This method replaces estimated pounds with observed pounds where available. The cumulative method uses catch from the entire year to estimate a RH/S catch ratio for each RH/S catch cap area and gear type. The RH/S catch ratio is calculated for a catch cap area and gear type by dividing observed RH/S catch for the year by the observed kept all (total amount of all species) for the year. RH/S pounds per unobserved trip are then estimated by multiplying the catch ratio by the kept all from unobserved Atlantic herring vessels fishing in that RH/S catch cap area with that gear type.

Table 35 summarizes RH/S catch on midwater trawl and SNE/MA small mesh bottom trawl trips landing more than 6,600 pounds of Atlantic herring during 2015. Under the 2015 catch caps, 57% of the RH/S catch allowed under the 2015 RH/S catch caps was taken on trips landing 6,600 pounds or more Atlantic herring. The majority (57%) of RH/S catch in the directed Atlantic herring fishery has occurred in the SNE/MA Area, which is where the Area 2 Atlantic herring fishery occurs (Figure 1, p. 3). Much of the RH/S catch occurred prior to April 1, consistent with the timing of the winter fishery for Atlantic herring (Figure 12), and effort increased again late in the year. Small mesh bottom trawl vessels directing on Atlantic herring in Area 2 caught 113% of the RH/S catch cap, and midwater trawl vessels caught 52% of their SNE/MA catch cap.

Table 35 - RH/S catch on trips subject to RH/S catch cap, 2015

RH/S Catch Cap Area	Cumulative Catch (mt)	Catch Cap (mt)	Percent of Catch Cap
Gulf of Maine MWT	11.1	86	12.95%
Cape Cod MWT	0.7	13	5.38%
SNE/MA Bottom Trawl	100.7	89	113.19%
SNE/MA MWT	64.0	124	51.59%
Total	**176.5**	**312**	**56.58%**
Source: *http://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/reports_frame.htm* Data reported through January 14, 2016.			

Figure 11 - 2015 RH/S catch by herring midwater trawl vessels in the Cape Cod Catch Cap Area

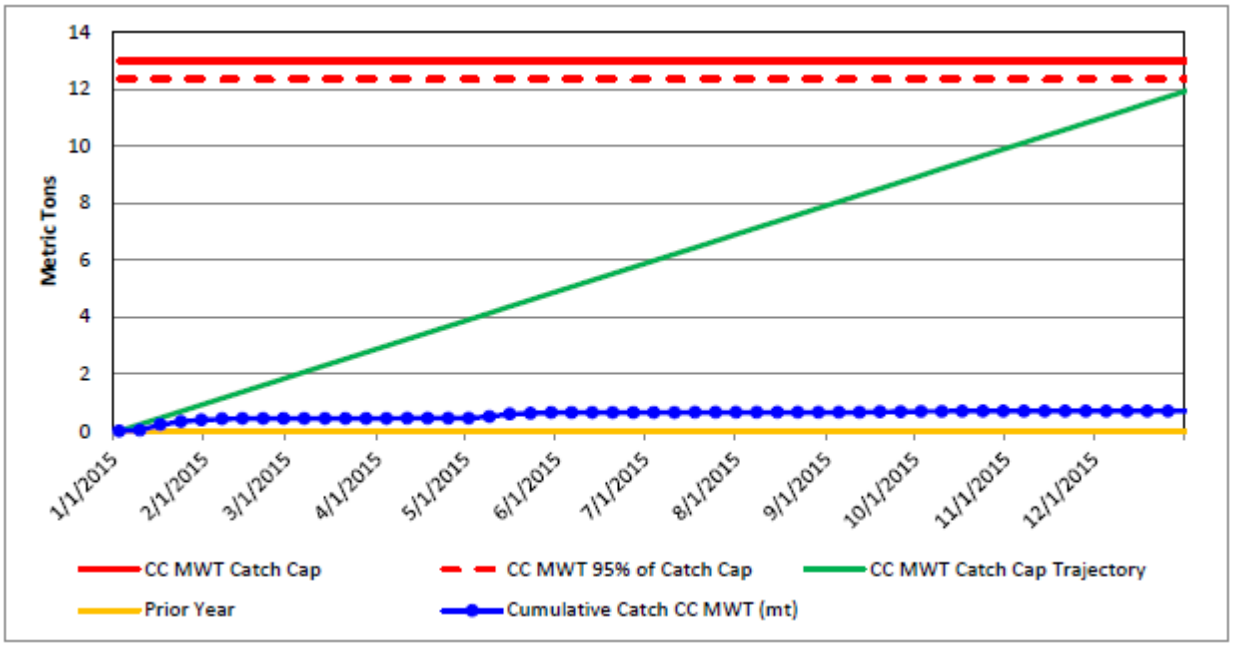


Figure 12 - 2015 RH/S catch by herring small mesh bottom trawl vessels in the SNE/MA Catch Cap Area

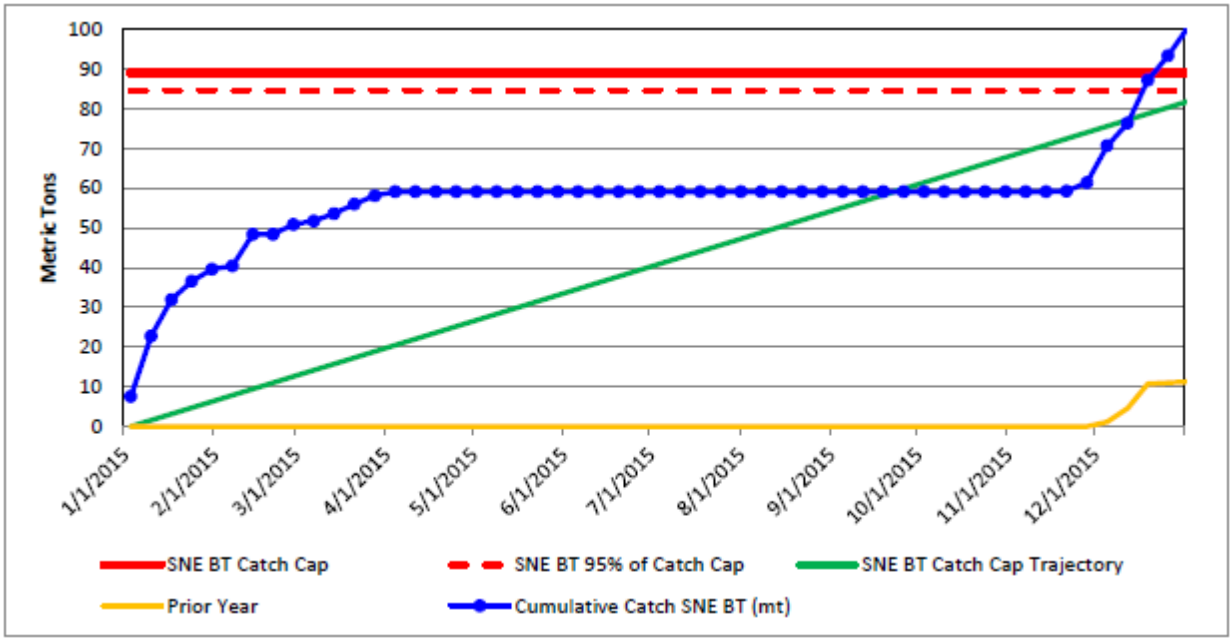
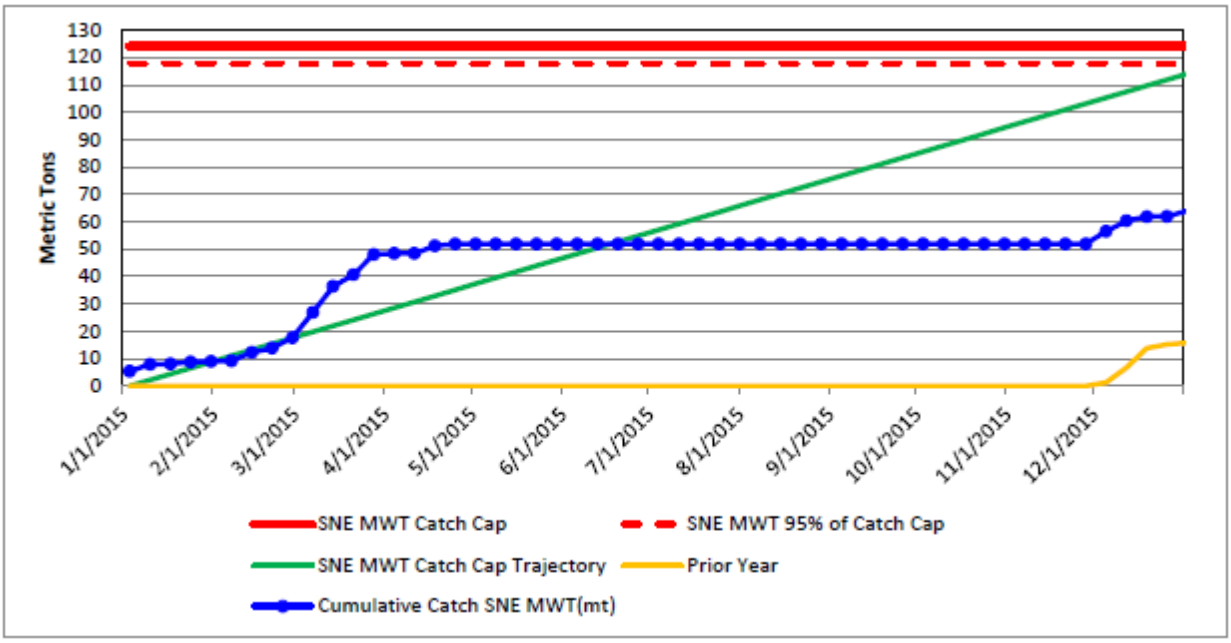


Figure 13 - 2015 RH/S catch by herring midwater trawl vessels in the SNE/MA Catch Cap Area



Source: http://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/reports_frame.htm

Note: Figures above based on data reported through January 14, 2016.

6.2.3.4 SMAST/MADMF/SFC River Herring Bycatch Avoidance Program

Since fisheries managers alerted the industry in 2006 that the river herring species complex was depressed, minimizing incidental catch of river herring and American shad (alosines) has become a goal of the midwater trawl fleet. To help achieve this goal, members of the midwater trawl fishery (Sustainable Fisheries Coalition, SFC) joined with the Massachusetts Division of Marine Fisheries (MADMF) and the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) to develop alosine (river herring and shad) bycatch avoidance methods. This collaboration with the industry sought to (1) create a bycatch avoidance fleet communication system, (2) additional support for portside sampling and (3) a predictive model of where alosines are likely to occur in space and time (SMAST).

Since January 2011, herring midwater trawl vessels and some small mesh bottom trawl vessels have participated in six alosine bycatch avoidance systems coordinated by SMAST and MADMF. Much of the work has occurred during times and in locations where observed encounters with alosines have been highest, i.e., in the southern New England/Mid-Atlantic area, as well as some focused work around Cape Cod. In 2011, the project also included a small area in the Gulf of Maine. During 2013, participation in the program included all herring midwater trawl vessels and several bottom trawl vessels fishing in Area 2 (southern New England/Mid-Atlantic).

In January 2015, the New England Fishery Management Council received an overview/update of the river herring bycatch avoidance program coordinated by MADMF with SMAST and the SFC. Overall, the Council expressed continued support for the bycatch avoidance program as well as the portside sampling programs conducted by MADMF and MEDMR.

Catch caps for RH/S established in Framework 3 and maintained through the 2016-2018 Atlantic herring fishery specifications may result in synergy between regulatory and voluntary bycatch mitigation efforts. The avoidance systems could provide fishermen with a tool that will help them stay below alosine catch limits, enabling them to fully harvest Atlantic herring and mackerel quotas. This could increase the incentive to voluntarily avoid alosine bycatch, by creating tangible economic consequences. However, continued creation of alosine catch caps based on historical catch could undermine the avoidance system. This method of cap determination creates an incentive for the fleet to maintain an alosine catch history. Thus, participation may not occur until alosine limits are close to being reached or could incentivize the fleet to target areas with high amounts of alosines if Atlantic herring quotas are close to being reached. This will be an important consideration as the Council moves forward specifying RH/S catch caps in the future.

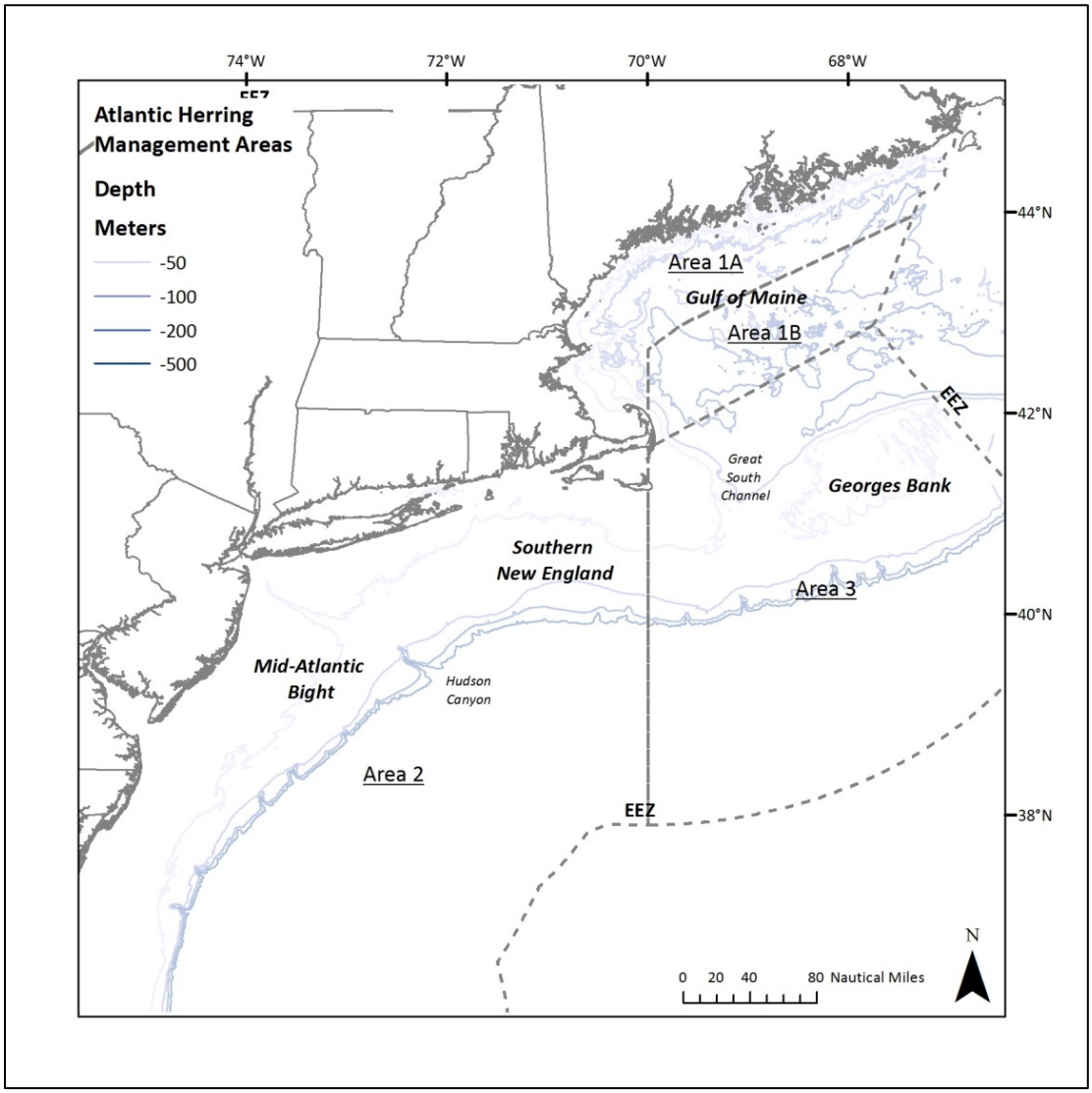
A more complete description of the SMAST/SFC/MADMF river herring avoidance program is in Section 3.6.4 of Framework 3 to the Atlantic Herring FMP.

6.3 PHYSICAL ENVIRONMENT AND ESSENTIAL FISH HABITAT

1.1.1 Physical Environment

The Atlantic herring fishery is prosecuted in four areas defined as Areas 1A, 1B, 2, and 3 (Figure 14). These areas collectively cover the entire northeast U.S. shelf ecosystem, which has been defined as the Gulf of Maine south to Cape Hatteras, North Carolina, extending from the coast seaward to the edge of the continental shelf, including offshore to the Gulf Stream (Sherman et al. 1996). Three distinct sub-regions, the Gulf of Maine, Georges Bank, and the southern New England/Mid-Atlantic region, were described in the Affected Environment section of Amendment 5 to the Atlantic Herring FMP, based on a summary compiled for the gear effects technical memo authored by Stevenson et al. (2004). Roughly, Areas 1A and 1B cover the Gulf of Maine, Area 2 covers southern the New England/Mid-Atlantic region, and Area 3 covers Georges Bank.

Figure 14 - Atlantic Herring Management Areas and the Northeast U.S. shelf ecosystem



1.1.2 Essential Fish Habitat

Since 1996, the MSA has included a requirement to evaluate the potential adverse effects of the Atlantic herring fishery on Essential Fish Habitat (EFH) of Atlantic herring and other species. The EFH final rule specifies that measures to minimize impacts should be enacted when adverse effects that are 'more than minimal' and 'not temporary in nature' are anticipated.

The magnitude of adverse effects resulting from a fishery's operations is generally related to (1) the location of fishing effort, because habitat vulnerability is spatially heterogeneous, and (2) the amount of fishing effort, specifically the amount of seabed area swept or bottom time. To the extent that adoption of a particular alternative would shift fishing to more vulnerable habitats, and/or increase seabed area swept, adoption would be expected to cause an increase in habitat impacts as compared to no action. If adoption of an alternative is expected to reduce seabed area swept or cause fishing effort to shift away from more vulnerable into less vulnerable habitats, a decrease in habitat impacts would be expected. The magnitude of an increase or decrease in adverse effects relates to the proportion of total fishing effort affected by a particular alternative.

Bearing in mind that both the direction and magnitude of changes are difficult to predict, because changes in fishing behavior in response to management actions can be difficult to predict, potential shifts in adverse effects are discussed for each of the alternatives proposed in this action. However, changes in the magnitude of fishing effort as a result of individual measures should be viewed in the context of the overall impacts that the herring fishery is estimated to have on seabed habitats. *Specifically, previous analyses have concluded that adverse effect to EFH that result from operation of the herring fishery do not exceed the more than minimal or more than temporary thresholds.*

An assessment of the potential effects of the directed Atlantic herring commercial fishery on EFH for Atlantic herring and other federally-managed species in the Northeast region of the U.S. was conducted as part of an EIS that evaluated impacts of the Atlantic herring fishery on EFH (NMFS 2005). This analysis was included in Appendix VI, Volume II of the FEIS for Amendment 1 to the Atlantic Herring FMP. It found that midwater trawls and purse seines do occasionally contact the seafloor and may adversely impact benthic habitats utilized by a number of federally-managed species, including EFH for Atlantic herring eggs. However, after reviewing all the available information, the conclusion was reached that if the quality of EFH is reduced as a result of this contact, the impacts are minimal and/or temporary and, pursuant to MSA, do not need to be minimized, i.e., that there was no need to take specific action at that time to minimize the adverse effects of the herring fishery on benthic EFH. This conclusion also applied to pelagic EFH for Atlantic herring larvae, juveniles, and adults, and to pelagic EFH for any other federally-managed species in the region.

EFH for Atlantic Herring

The EFH designation for Atlantic herring was developed as part of EFH Omnibus Amendment 1 in 1998. EFH Omnibus Amendment 2, which includes updates to the EFH designation for herring, as well as for other Council-managed species, is currently in development and designations will be updated during early 2016. The new designations for adults and juvenile identify nearly the entire Gulf of Maine as EFH, and designate additional areas on the southern half of Georges Bank. The updated larval designation will be similar to current one. The egg designation is the most different as proposed in the habitat amendment, with many additional areas identified as EFH based on the distribution of very small larvae. Based on the 1998

designation, which is currently in effect, EFH for Atlantic herring is described in as those areas of the coastal and offshore waters (out to the offshore U.S. boundary of the exclusive economic zone) that are designated in Figure 15 and in Table 36 and meet the following conditions:

Eggs: Bottom habitats with a substrate of gravel, sand, cobble and shell fragments, but also on aquatic macrophytes, in the Gulf of Maine and Georges Bank (Figure 15). Eggs adhere to the bottom, forming extensive egg beds which may be many layers deep. Generally, the following conditions exist where Atlantic herring eggs are found: water temperatures below 15° C, depths from 20 - 80 meters, and a salinity range from 32 - 33‰. Herring eggs are most often found in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots. Atlantic herring eggs are most often observed during the months from July through November.

Larvae: Pelagic waters in the Gulf of Maine, Georges Bank, and southern New England that comprise 90% of the observed range of Atlantic herring larvae (Figure 15). Generally, the following conditions exist where Atlantic herring larvae are found: sea surface temperatures below 16° C, water depths from 50 – 90 meters, and salinities around 32‰. Atlantic herring larvae are observed between August and April, with peaks from September through November.

Juveniles: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras (Figure 15). Generally, the following conditions exist where Atlantic herring juveniles are found: water temperatures below 10° C, water depths from 15 – 135 meters, and a salinity range from 26 – 32‰.

Adults: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras (Figure 15). Generally, the following conditions exist where Atlantic herring adults are found: water temperatures below 10° C, water depths from 20 – 130 meters, and salinities above 28‰.

Spawning Adults: Bottom habitats with a substrate of gravel, sand, cobble and shell fragments, but also on aquatic macrophytes, in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay (Figure 15). Generally, the following conditions exist where spawning Atlantic herring adults are found: water temperatures below 15° C, depths from 20 - 80 meters, and a salinity range from 32 - 33‰. Herring eggs are spawned in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots. Atlantic herring are most often observed spawning during the months from July through November.

All of the above EFH descriptions include those bays and estuaries listed in Table 36, according to life history stage. The Council acknowledges potential seasonal and spatial variability of the conditions generally associated with this species.

Table 36 - EFH designation of estuaries and embayments for Atlantic herring

Estuaries and Embayments	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Passamaquoddy Bay		m,s	m,s	m,s	
Englishman/Machias Bay	s	m,s	m,s	m,s	s
Narraguagus Bay		m,s	m,s	m,s	
Blue Hill Bay		m,s	m,s	m,s	
Penobscot Bay		m,s	m,s	m,s	
Muscongus Bay		m,s	m,s	m,s	
Damariscotta River		m,s	m,s	m,s	
Sheepscot River		m,s	m,s	m,s	
Kennebec / Androscoggin Rivers		m,s	m,s	m,s	
Casco Bay	s	m,s	m,s	s	
Saco Bay		m,s	m,s	s	
Wells Harbor		m,s	m,s	s	
Great Bay		m,s	m,s	s	
Merrimack River		m	m		
Massachusetts Bay		s	s	s	
Boston Harbor		s	m,s	m,s	
Cape Cod Bay	s	s	m,s	m,s	
Waquoit Bay					
Buzzards Bay			m,s	m,s	
Narragansett Bay		s	m,s	m,s	
Long Island Sound			m,s	m,s	
Connecticut River					
Gardiners Bay			s	s	
Great South Bay			s	s	
Hudson River / Raritan Bay		m,s	m,s	m,s	
Barnegat Bay			m,s	m,s	
Delaware Bay			m,s	s	
Chincoteague Bay					
Chesapeake Bay				s	

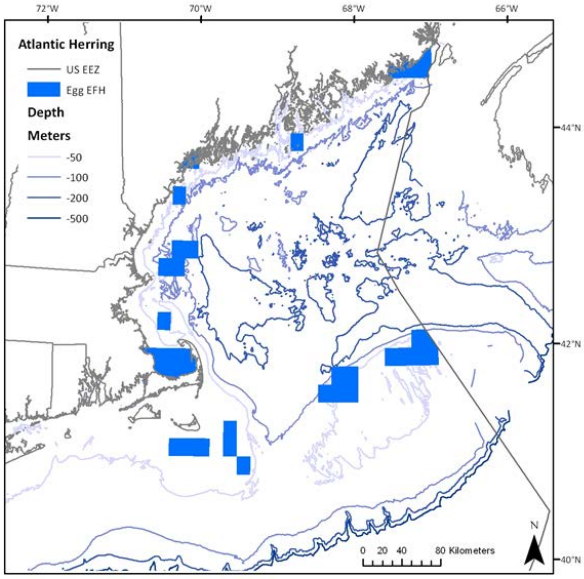
Notes:

S = The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M = The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).
F = The EFH designation for this species includes the tidal freshwater salinity zone of this bay or estuary (0.0 < salinity < 0.5‰).

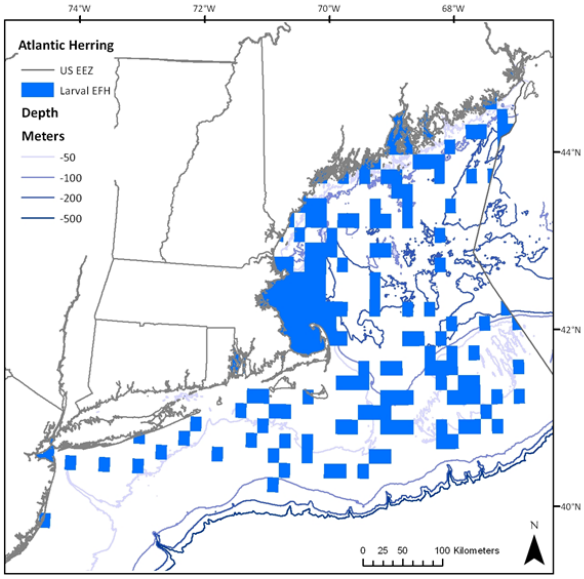
Source: These EFH designations of estuaries and embayments are based on the NOAA Estuarine Living Marine Resources (ELMR) program (Jury et al. 1994; Stone et al. 1994).

Figure 15 - Current essential fish habitat designation for Atlantic herring

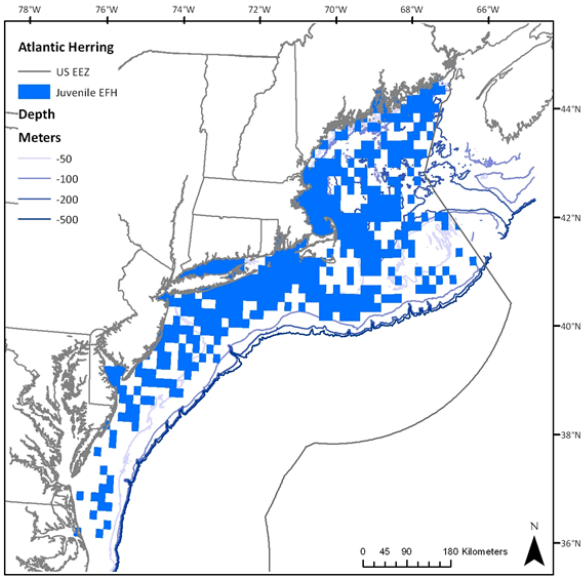
Eggs



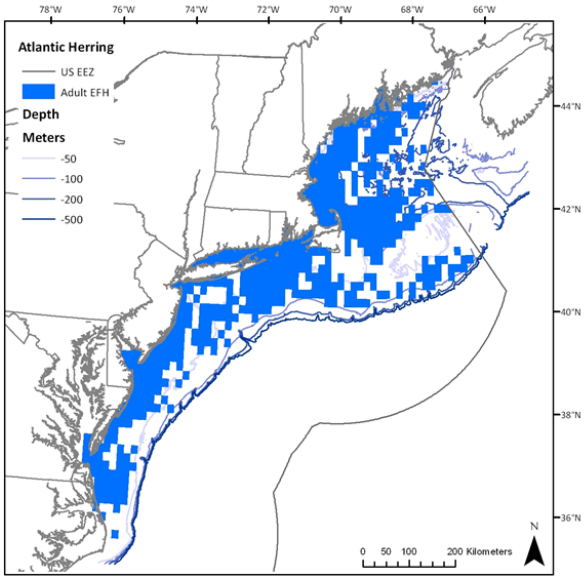
Larvae



Juveniles



Adults



EFH for Other Species

The environment that could potentially be affected by the Proposed Action has been identified as EFH for the benthic life stages of the species listed in Table 37. Additional information is in the FMP document that most recently updated each species' EFH designation (last column in Table 37). NOAA's EFH Mapper is also a good source of information and is a useful way to visualize

the designations in a particular location: http://www.habitat.noaa.gov/protection/efh/efhmapper/index.html.

Table 37 - Sources for current EFH designation information

Species	Authority	Plan Managed Under	Last update
Monkfish	NEFMC, MAFMC	Monkfish	Amendment 1
Atlantic herring	NEFMC	Atlantic Herring	Original FMP
Atlantic salmon	NEFMC	Atlantic salmon	Original FMP
Atlantic sea scallop	NEFMC	Atlantic Sea Scallop	Amendment 9
American plaice	NEFMC	NE Multispecies	Amendment 11
Atlantic cod	NEFMC	NE Multispecies	Amendment 11
Atlantic halibut	NEFMC	NE Multispecies	Amendment 11
Atlantic wolffish	NEFMC	NE Multispecies	Amendment 16
Haddock	NEFMC	NE Multispecies	Amendment 11
Ocean pout	NEFMC	NE Multispecies	Amendment 11
Offshore hake	NEFMC	NE Multispecies	Amendment 12
Pollock	NEFMC	NE Multispecies	Amendment 11
Red hake	NEFMC	NE Multispecies	Amendment 12
Redfish	NEFMC	NE Multispecies	Amendment 11
Silver hake	NEFMC	NE Multispecies	Amendment 12
White hake	NEFMC	NE Multispecies	Amendment 11
Windowpane flounder	NEFMC	NE Multispecies	Amendment 11
Winter flounder	NEFMC	NE Multispecies	Amendment 11
Witch flounder	NEFMC	NE Multispecies	Amendment 11
Yellowtail flounder	NEFMC	NE Multispecies	Amendment 11
Barndoor skate	NEFMC	NE Skate Complex	Original FMP
Clearnose skate	NEFMC	NE Skate Complex	Original FMP
Little skate	NEFMC	NE Skate Complex	Original FMP
Rosette skate	NEFMC	NE Skate Complex	Original FMP
Smooth skate	NEFMC	NE Skate Complex	Original FMP
Thorny skate	NEFMC	NE Skate Complex	Original FMP
Winter skate	NEFMC	NE Skate Complex	Original FMP
Red crab	NEFMC	Red Crab	Original FMP
Spiny dogfish	MAFMC/NEFMC	Spiny Dogfish	Original FMP
Atlantic surfclam	MAFMC	Atlantic Surfclam Ocean Quahog	Amendment 12
Ocean quahog	MAFMC	Atlantic Surfclam Ocean Quahog	Amendment 12
Bluefish	MAFMC	Bluefish FMP	Amendment 1
Atlantic mackerel	MAFMC	Squid, Mackerel, Butterfish	Amendment 11
Butterfish	MAFMC	Squid, Mackerel, Butterfish	Amendment 11
Longfin squid	MAFMC	Squid, Mackerel, Butterfish	Amendment 11
Shortfin squid	MAFMC	Squid, Mackerel, Butterfish	Amendment 11
Black sea bass	MAFMC	Summer Flounder, Scup, and Black Sea Bass	Amendment 12
Scup	MAFMC	Summer Flounder, Scup, and Black Sea Bass	Amendment 12
Summer flounder	MAFMC	Summer Flounder, Scup, and Black Sea Bass	Amendment 12
Tilefish	MAFMC	Tilefish	Amendment 1
Note: Longfin squid egg EFH designation was in Amendment 9 to the Squid, Mackerel, Butterfish FMP.			

6.4 PROTECTED RESOURCES

There are numerous protected species that inhabit the affected environment of the Atlantic Herring FMP management unit (Table 38). These species are afforded protection under the Endangered Species Act (ESA) of 1973 (i.e., for those designated as threatened or endangered) and/or the Marine Mammal Protection Act (MMPA) of 1972, and are under NMFS' jurisdiction. Table 38 also includes one candidate fish species (species being considered for listing as endangered or threatened), as identified under the ESA.

Table 38 - Species and/or critical habitat protected under the ESA and/or MMPA that occur in the Affected Environment of the Atlantic herring fishery

Species	Status	Potentially affected by this action?[1]
Cetaceans		
North Atlantic right whale (*Eubalaena glacialis*)	Endangered	No
Humpback whale (*Megaptera novaeangliae*)	Endangered	Yes
Fin whale (*Balaenoptera physalus*)	Endangered	Yes
Sei whale (*Balaenoptera borealis*)	**Endangered**	**Yes**
Blue whale (*Balaenoptera musculus*)	**Endangered**	**No**
Sperm whale (*Physeter macrocephalus*	**Endangered**	**No**
Minke whale (*Balaenoptera acutorostrata*)	Protected	Yes
Pilot whale (*Globicephala spp.*)[2]	**Protected**	**Yes**
Risso's dolphin (*Grampus griseus*)	**Protected**	**Yes**
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected	Yes
Short Beaked Common dolphin (*Delphinus delphis*)[3]	Protected	Yes
Bottlenose dolphin (*Tursiops truncatus*)[4]	Protected	No
Harbor porpoise (*Phocoena phocoena*)	Protected	No
Pygmy sperm whale (*Kogia breviceps*)	**Protected**	**No**
Dwarf sperm whale (*Kogia sima*)	**Protected**	**No**
Striped dolphin (*Stenella coeruleoalba*)	**Protected**	**No**
Atlantic spotted dolphin (*Stenella frontalis*)	**Protected**	**No**
Beaked whales (*Ziphius and Mesoplodon spp*)[5]	**Protected**	**No**
Sea Turtles		
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Yes
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered	Yes
Green sea turtle (*Chelonia mydas*)	Endangered[6]	Yes
Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic DPS	Threatened	Yes

Species	Status	Potentially affected by this action?[1]
Hawksbill sea turtle (*Eretmochelys imbricate*)	Endangered	No
Fish		
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered	No
Atlantic salmon (*Salmo salar*)	Endangered	No
Atlantic sturgeon *(Acipenser oxyrinchus)*		
Gulf of Maine DPS *New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS*	Threatened Endangered	Yes Yes
Cusk (*Brosme brosme)*	Candidate	No
Pinnipeds		
Harbor seal (*Phoca vitulina*)	Protected	Yes
Gray seal (*Halichoerus grypus*)	Protected	Yes
Harp seal (*Phoca groenlandicus*)	Protected	No
Hooded seal (*Cystophora cristata*)	Protected	No
Critical Habitat		
North Atlantic Right Whale Critical Habitat[7]		No
Northwest Atlantic DPS of Loggerhead Sea Turtle Critical Habitat		No

Notes:

Bolded/shaded species prefer continental shelf edge/slope waters (i.e., >200 meters), although incursions into continental shelf waters do occur seasonally or sporadically during periods of high prey abundance.

[1] The determination for whether a species may be affected by the Atlantic herring fishery is based on whether there has been confirmed Atlantic herring fishery interaction with the species or confirmed interactions with gear types similar to those primarily used in the Atlantic herring fishery (NEFSC 2015; Waring et al. 2007; Waring et al. 2014; 2015)

[2] There are two species of pilot whales: short finned (*G. melas melas*) and long finned (*G. macrorhynchus*). Due to the difficulties in identifying the species at sea, they are often just referred to as *Globicephala spp*.

[3] Prior to 2008, this species was called "common dolphin."

[4] This includes the Western North Atlantic Offshore, Northern Migratory Coastal, and Southern Migratory Coastal Stocks of Bottlenose Dolphins.

[5] There are multiple species of beaked whales in the Northwest Atlantic. They include the cuvier's (*Ziphius cavirostris*), blainville's (*Mesoplodon densirostris*), gervais' (*Mesoplodon europaeus*), sowerbys' (*Mesoplodon bidens*), and trues' (*Mesoplodon mirus*) beaked whales. Species of *Mesoplodon*; however, are difficult to identify at sea, and therefore, much of the available characterization for beaked whales is to the genus level only.

Species	Status	Potentially affected by this action?[1]
[6] Green turtles in U.S. waters are listed as threatened except for the Florida breeding population which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters. On March 23, 2015, a proposed rule was issued to remove the current range-wide listing and, in its place, list eight DPSs as threatened and three as endangered (80 FR 15272). [7] Originally designated June 3, 1994 (59 FR 28805); newly proposed February 20, 2015 (80 FR 9314).		

Cusk, a NMFS "species of concern," as well as a "candidate species" under the ESA, occurs in the affected environment of the Atlantic herring fishery (Table 38). Candidate species are those petitioned species that NMFS is actively considering for listing as endangered or threatened under the ESA and also include those species for which NMFS has initiated an ESA status review through an announcement in the Federal Register. Once a species is proposed for listing the conference provisions of the ESA apply (50 CFR 402.10); however, candidate species receive no substantive or procedural protection under the ESA. As a result, this species will not be discussed further in this section. For additional information on cusk and proactive conservation efforts being initiated for the species, see http://www.nero.noaa.gov/prot_res/CandidateSpeciesProgram/CuskSOC.html.

6.4.1 Species and Critical Habitat Not Likely Affected by the Proposed Action

Based on available information, it has been determined that this action is not likely to affect Atlantic right whales, blue whales, sperm whales, pygmy sperm whales, dwarf sperm whales, striped dolphins, Atlantic spotted dolphins, bottlenose dolphins, harbor porpoise, beaked whales, Atlantic salmon, shortnose sturgeon, hooded seals, harp seals, or hawksbill sea turtles. Further, this action is not likely to adversely affect the Northwest Atlantic DPS of loggerhead or North Atlantic right whale critical habitats. This determination has been made because either the occurrence of the species is not known to overlap with the Atlantic herring fishery and/or there have never been documented interactions between the species and the Atlantic herring fishery (NEFSC 2015; Waring, et al. 2014; 2015). In the case of critical habitat, this determination has been made because the Atlantic herring fishery will not affect the primary constituent elements of the critical habitat, and therefore, will not result in the destruction or adverse modification of critical habitat (http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm).

6.4.2 Species Potentially Affected by the Proposed Action

6.4.2.1 Sea Turtles

There are four species of sea turtles that occur in the affected environment of the Atlantic herring fishery. Three of the four species are considered hard-shelled turtles (i.e., green, loggerhead, and Kemp's ridley). A general overview of sea turtle occurrence and distribution in waters of the Northwest Atlantic Ocean is below to assist in understanding how the Atlantic herring fishery overlaps in time and space with the occurrence of sea turtles. Additional background information on the range-wide status of the four sea turtle species, as well as a description and life history of the species, is in a number of published documents, including sea turtle status reviews and biological reports (Conant et al. 2009; Hirth 1997; NMFS & USFWS 1995; 2007a; b; 2013;

NOAA 2007; TEWG 1998; 2000; 2009), and recovery plans for the loggerhead sea turtle (Northwest Atlantic DPS; NMFS & USFWS 2008), leatherback sea turtle (NMFS & USFWS 1992; 1998b), Kemp's ridley sea turtle (NMFS & USFWS 2011), and green sea turtle (NMFS & USFWS 1991; 1998a).

Hard-shelled sea turtles

Distribution

In U.S. Northwest Atlantic waters, hard-shelled turtles commonly occur throughout the continental shelf from Florida (FL) to Cape Cod, Massachusetts (MA), although their presence varies with the seasons due to changes in water temperature (Braun-McNeill et al. 2008; Braun & Epperly 1996; Epperly, Braun & Chester 1995; Epperly, Braun, Chester, et al. 1995; Mitchell et al. 2003; Shoop & Kenney 1992; TEWG 2009). While hard-shelled turtles are most common south of Cape Cod, MA, loggerhead sea turtles are known to occur in the Gulf of Maine (GOM), feeding as far north as southern Canada. Loggerheads have been observed in waters with surface temperatures of 7˚C to 30˚C, but water temperatures ≥11˚C are most favorable (Epperly, Braun, Chester, et al. 1995; Shoop & Kenney 1992). Sea turtle presence in U.S. Atlantic waters is also influenced by water depth. While hard-shelled turtles occur in waters from the beach to beyond the continental shelf, they are most commonly found in neritic waters of the inner continental shelf (Blumenthal et al. 2006; Braun-McNeill & Epperly 2004; Griffin et al. 2013; Hawkes et al. 2006; Hawkes et al. 2011; Mansfield et al. 2009; McClellan & Read 2007; Mitchell, et al. 2003; Morreale & Standora 2005).

Seasonality

Hard-shelled sea turtles occur year-round in waters south of Cape Hatteras, North Carolina (NC). As coastal water temperatures warm in the spring, loggerheads begin to migrate to inshore waters of the southeast United States and also move up the Atlantic Coast (Braun-McNeill & Epperly 2004; Epperly, Braun & Chester 1995; Epperly, Braun, Chester, et al. 1995; Epperly, Braun & Veishlow 1995; Griffin, et al. 2013; Morreale & Standora 2005), occurring in Virginia (VA) foraging areas as early as late April and on the most northern foraging grounds in the GOM in June (Shoop & Kenney 1992). The trend is reversed in the fall as water temperatures cool. The large majority leave the GOM by September, but some remain in Mid-Atlantic and Northeast areas until late fall. By December, sea turtles have migrated south to waters offshore of NC, particularly south of Cape Hatteras, and further south (Epperly, Braun, Chester, et al. 1995; Griffin, et al. 2013; Hawkes, et al. 2011; Shoop & Kenney 1992).

Leatherback sea turtles

Leatherback sea turtles also engage in routine migrations between northern temperate and tropical waters (Dodge et al. 2014; James et al. 2005; James et al. 2006; NMFS & USFWS 1992). Leatherbacks, a pelagic species, are also known to use coastal waters of the U.S. continental shelf (Dodge, et al. 2014; Eckert et al. 2006; James, et al. 2005; Murphy et al. 2006). Leatherbacks have a greater tolerance for colder water in comparison to hard-shelled sea turtles. They are also found in more northern waters later in the year, with most leaving the Northwest Atlantic shelves by mid-November (Dodge, et al. 2014; James, et al. 2005; James, et al. 2006).

6.4.2.2 Large Cetaceans

Table 39 provides the species of large whales that occur in the affected environment of the Atlantic herring fishery. For additional information on the biology, status, and range wide distribution of each whale species, refer to: Waring et al. (2015), and NMFS (1991; 2010; 2011).

Table 39 - Large whale species present in the Affected Environment of the Atlantic herring fishery

Species	Listed Under the ESA	Protected Under the MMPA	MMPA Strategic Stock[1]
Humpback Whale	Yes-Endangered	Yes	Yes
Fin Whale	Yes-Endangered	Yes	Yes
Sei Whale	Yes-Endangered	Yes	Yes
Minke Whale	No	Yes	No

[1] A strategic stock is defined under the MMPA as a marine mammal stock: for which the level of direct human-caused mortality exceeds the potential biological removal level; which, based on the best available science, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; or which is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA.

Source: Waring et al. (2015).

Humpback, fin, sei, and minke whales are found throughout the waters of the Northwest Atlantic Ocean. In general, these species follow an annual pattern of migration between low latitude (south of 35°N) wintering/calving grounds and high latitude spring/summer foraging grounds (primarily north of 41°N; NMFS 1991; 2010; 2011; Waring, et al. 2015). This, however, is a simplification of whale movements, particularly as it relates to winter movements. It remains unknown if all individuals of a population migrate to low latitudes in the winter, although, increasing evidence suggests that for some species (e.g., humpback whales), some portion of the population remains in higher latitudes throughout the winter (Clapham et al. 1993; Swingle et al. 1993; Vu et al. 2012; Waring, et al. 2015). Although further research is needed to provide a clearer understanding of large whale movements and distribution in the winter, the distribution and movements of large whales to foraging grounds in the spring/summer is well understood. Movements of whales into higher latitudes coincide with peak productivity in these waters. As a result, the distribution of large whales in higher latitudes is strongly governed by prey availability and distribution, with large numbers of whales coinciding with dense patches of preferred forage (Payne et al. 1986; Payne et al. 1990; Schilling et al. 1992). It is important to note, these foraging areas are consistently returned annually, and therefore, can be considered important, high use areas for whales. For additional information on the biology, status, and range wide distribution of each whale species, refer to: Waring et al. (2014; 2015) and NMFS (1991; 2010; 2011).

To further assist in understanding how the Atlantic herring fishery may overlaps in time and space with the occurrence of large whales, a general overview on species occurrence and distribution in the affected environment of the Atlantic herring fishery is in Table 40.

Table 40 - Large cetacean occurrence in the Affected Environment of the Atlantic herring fishery

Species	Prevalence and Approximate Months of Occurrence
Humpback	• Distributed throughout all continental shelf waters of the Mid-Atlantic (SNE included), GOM, and GB throughout the year. • New England waters (GOM and GB regions): **Foraging Grounds** (approximately March-November). • Mid-Atlantic waters: Migratory pathway to/from northern (high latitude) foraging and southern (West Indies) calving grounds. • Increasing evidence of wintering areas (for juveniles) in Mid-Atlantic (e.g., waters in the vicinity of Chesapeake and Delaware Bays; peak presence approximately January through March).
Fin	• Distributed throughout all continental shelf waters of the Mid-Atlantic (SNE included), GOM, and GB throughout the year. • Mid-Atlantic waters: migratory pathway to/from northern (high latitude) foraging and southern (low latitude) calving grounds; possible offshore calving area (October-January) • New England/SNE waters (GOM, GB, and SNE regions): **Foraging Grounds** (greatest densities March-August; lower densities September-November). Important foraging grounds include: massachusetts Bay (esp. Stellwagen Bank), Great South Channel, Waters off Cape Cod (~40-50 meter contour), Western GOM (esp. Jeffrey's Ledge), Eastern perimeter of GB, andMid-shelf area off the east end of Long Island. • Evidence of wintering areas in mid-shelf areas east of New Jersey, Stellwagen Bank; and eastern perimeter of GB.
Sei	• Uncommon in shallow, inshore waters of the Mid-Atlantic (SNE included), GB, and GOM; however, occasional incursions during peak prey availability and abundance. • Primarily found in deep waters along the shelf edge, shelf break, and ocean basins between banks. • Spring through summer, found in greatest densities in offshore waters of the GOM and GB (eastern margin into the Northeast Channel area; along the southwestern edge in the area of Hydrographer Canyon).
Minke	• Widely distributed throughout continental shelf waters of the Mid-Atlantic (SNE included), GOM, and GB during the spring, summer and fall; however, spring through summer found in greatest densities in the GOM and GB.
Sources: Baumgartner et al. (2011), CETAP (1982), Clapham et al. (1993), NMFS (1991; 2010; 2011), Hain et al. (1992), Payne et al. (1984; 1990), Risch et al. (2013), Swingle et al. (1993), Vu et al. (2012), Waring et al. (2014; 2015).	

6.4.2.3 Small Cetaceans

The following MMPA protected small cetaceans may occur in the affected environment of the Atlantic herring fishery: Atlantic white sided dolphins, short and long finned pilot whales, Risso's dolphins, and short beaked common dolphins. These species can be found throughout the year in waters of the Northwest Atlantic Ocean (Waring, et al. 2014; 2015). Within this range; however, there are seasonal shifts in species distribution and abundance. To further assist in understanding how the Atlantic herring fishery may overlap in time and space with the occurrence of small cetaceans, a general overview of species occurrence and distribution in the affected environment of the Atlantic herring fishery is in Table 41. Waring et al. (2014; 2015) has additional information on the biology, status, and range-wide distribution of each species.

Table 41 - Small cetacean occurrence in the Affected Environment of the Atlantic herring fishery

Species	Prevalence and Approximate Months of Occurrence
Atlantic White Sided Dolphin	• Distributed throughout the continental shelf waters (primarily to 100 meter isobath) of the Mid-Atlantic (north of 35°N), Southern New England, GB, and GOM ; however, most common in continental shelf waters from Hudson Canyon (~ 39°N) onto GB, and into the GOM. • **January-May**: low densities found from GB to Jeffreys Ledge. • **June-September**: large densities found from GB, through the GOM. • **October-December**: intermediate densities found from southern GB to southern GOM. • South of GB (SNE and Mid-Atlantic), low densities found year round, with waters off VA and NC representing southern extent of species range during winter months.
Short Beaked Common Dolphin	• Regularly found throughout the continental shelf-edge-slope waters (primarily between 100-2,000 m) of the Mid-Atlantic, SNE, and GB (esp. in Oceanographer, Hydrographer, Block, and Hudson Canyons). • Less common south of Cape Hatteras, NC, although schools have been reported as far south as the Georgia (GA)/South Carolina (SC) border. • **January-May**: occur from waters off Cape Hatteras, NC, to GB (35° to 42°N). • **Mid-summer-autumn**: Occur primarily on GB with small numbers present in the GOM; *Peak abundance* found on GB in the autumn.
Risso's Dolphin	• Common in the continental shelf edge waters from FL to eastern Newfoundland; low numbers found in the GOM. • **March-November**: distributed along continental shelf edge from Cape Hatteras, NC, to GB. • **December-February**: primarily distributed in continental shelf edge of the Mid-Atlantic (including SNE), although species is in the Mid-Atlantic year round.

Pilot Whales: *Short- and Long-Finned*	**Short- Finned Pilot Whales** • Primarily occur south of 40°N (Mid-Atl and SNE waters); although low numbers have been found along the southern flank of GB, but no further than 41°N. • May through December (approximately): distributed primarily near the continental shelf break of the Mid-Atlantic and SNE; individuals begin shifting to southern waters (i.e., 35°N and south) beginning in the fall. **Long-Finned Pilot Whales** • Range from 35°N to 44°N • Winter to early spring (November through April): primarily distributed along the continental shelf edge-slope of the Mid-Atlantic, SNE, and GB. • Late spring through fall (May through October): movements and distribution shift onto/within GB, the Great South Channel, and the GOM. **Area of Species Overlap:** between 38°N and 41°N
[1] Information is representative of small cetacean occurrence in the Northwest Atlantic continental shelf waters out to the 2,000 meter isobath. *Sources:* Waring et al. (2007; 2014; 2015; 1992), Payne and Heinemann (1993), Payne et al. (1984); Jefferson et al. (2009).	

6.4.2.4 Pinnipeds

The following MMPA protected species of pinnipeds occur in the affected environment of the Atlantic herring fishery: Harbor, and grey, harp seals. Pinnipeds are found in the nearshore, coastal waters of the Northwest Atlantic Ocean. They are primarily found throughout the year or seasonally from New Jersey to Maine; however, increasing evidence indicates that some species (e.g., harbor seals) may be extending their range seasonally into waters as far south as Cape Hatteras, North Carolina (35°N) (Waring, et al. 2014; 2015). To further assist in understanding how the Atlantic herring fishery may overlap in time and space with the occurrence of pinnipeds, a general overview of species occurrence and distribution in the affected environment of the Atlantic herring fishery is in

Table 42. For additional information on the biology, status, and range-wide distribution of each species of pinniped, refer to Waring et al. (2014; 2015).

Table 42 - Pinniped occurrence in the Affected Environment of the Atlantic herring fishery

Species	Prevalence
Harbor Seal	Primarily distributed in waters from NJ to ME; however, increasing evidence indicates that their range is extending into waters as far south as Cape Hatteras, NC (35°N). Year Round - Waters of Maine September-May - Waters from New England to NJ; potential for some animals to extend range into waters as far south as Cape Hatteras, NC.
Gray Seal	Distributed in waters from NJ to ME. Year Round - Waters from ME to MA. September-May - Waters from Rhode Island to NJ.
Sources: Waring et al. (2014; 2015).	

6.4.2.5 Atlantic Sturgeon DPSs

The marine range of U.S. Atlantic sturgeon extends from Labrador, Canada, to Cape Canaveral, Florida. All five DPSs of Atlantic sturgeon have the potential to be located anywhere in this marine range (ASSRT 2007; Dadswell 2006; Dadswell et al. 1984; Dovel & Berggren 1983; Dunton et al. 2010; Erickson et al. 2011; Kynard et al. 2000; Laney et al. 2007; O'Leary et al. 2014; Stein et al. 2004b; Waldman et al. 2013; Wirgin et al. 2015; Wirgin et al. 2012). In fact, several genetic studies have been conducted to address DPS distribution and composition in marine waters (Damon-Randall et al. 2013; O'Leary, et al. 2014; Waldman, et al. 2013; Wirgin, et al. 2015; Wirgin, et al. 2012). Using samples from Atlantic sturgeon captured from various marine aggregation sites along the Northeast coast, results from these studies showed that these aggregations, regardless of location, were comprised of all five DPSs of Atlantic sturgeon; however, each DPS comprised various percentages of the aggregation depending on the area along the coast the aggregation was found and sampled (Damon-Randall, et al. 2013; O'Leary, et al. 2014; Waldman, et al. 2013; Wirgin, et al. 2012).

Based on fishery- independent and dependent data, as well as data collected from tracking and tagging studies, in the marine environment, Atlantic sturgeon appear to primarily occur inshore of the 50 meter depth contour (Dunton, et al. 2010; Erickson, et al. 2011; Stein et al. 2004a; Stein, et al. 2004b); however, Atlantic sturgeon are not restricted to these depths, as excursions into deeper continental shelf waters have been documented (Collins & Smith 1997; Dunton, et al. 2010; Erickson, et al. 2011; Stein, et al. 2004a; b; Timoshkin 1968). Data from fishery-independent surveys and tagging and tracking studies also indicate that Atlantic sturgeon undertake seasonal movements along the coast. In general, analysis of fishery-independent survey data indicates a coastwide distribution of Atlantic sturgeon from the spring through the fall, with Atlantic sturgeon being more centrally located (e.g., Long Island to Delaware) during the summer months; and a more southerly (e.g., North Carolina, Virginia) distribution during the winter (Dunton, et al. 2010; Erickson, et al. 2011). Although studies such as Erickson et al. (2011) and Dunton et al. (2010) provide some indication that Atlantic sturgeon are undertaking seasonal movements horizontally and vertically along the U.S. eastern coastline, there is no evidence to date that all Atlantic sturgeon make these seasonal movements and therefore, may be present throughout the marine environment throughout the year.

6.4.3 Interactions Between Gear and Protected Resources

The Atlantic herring fishery is prosecuted primarily with midwater trawls, and purse seines. Note, the Atlantic herring fishery only uses purse seines in the GOM. As a result, the following discussion on purse seines and interaction risks to protected species are only in reference to Atlantic herring purse seine fishery prosecuted in the GOM.

A subset of protected species of fish, marine mammals, and see turtles (Table 38) are known to be vulnerable to interactions with midwater and/or purse seines. The following sections contain available information on protected species interactions with these gear types. These sections are not a comprehensive review of all fishing gear types known to interact with a given species; emphasis is only being placed on those gear types primarily used to prosecute the Atlantic herring fishery.

6.4.3.1 Marine Mammals

Pursuant to the MMPA, NMFS publishes a List of Fisheries (LOF) annually, classifying U.S. commercial fisheries into one of three categories based on the relative frequency of incidental serious injuries and/or mortalities of marine mammals in each fishery.[1] The categorization in the LOF determines whether participants in that fishery are subject to certain provisions of the MMPA such as registration, observer coverage, and take reduction plan requirements. Individuals fishing in Category I or II fisheries must comply with requirements of any applicable take reduction plan.

Categorization of fisheries is based on the following two-tiered, stock-specific approach:

- **Tier 1**- considers the cumulative fishery mortality and serious injury for a particular stock. If the total annual mortality and serious injury rates within a stock resulting from all fisheries are less than or equal to ten percent of the stock's potential biological removal rate (PBR), all fisheries associated with this stock fall into Category III.[2] -If mortality and serious injury rates are greater than ten percent of PBR, the following Tier 2, analysis occurs.

Tier 2 -considers fishery-specific mortality and serious injury for a particular stock. Specifically, this analysis compares fishery-specific annual mortality and serious injury rates to a stock's PBR to designate the fishery as a Category I, II, or III fishery (Table 43).

Table 43 - Descriptions of the Tier 2 Fishery Classification Categories (50 CFR 229.2)

Category	Level of incidental mortality or serious injury of marine mammals	Annual mortality and serious injury of a stock in a given fishery is…
Category I	frequent	≥50% of the PBR level
Category II	occasional	between 1% and 50% of the PBR level
Category III	remote likelihood, or no known	≤1% of the PBR level

6.4.3.1.1 Large Cetaceans

Midwater Trawl Gear

Based on Waring et al. (2014; 2015) and NEFSC (2015), aside from minke whales, there has been no confirmed serious injury or mortality or documented interactions, in general, with large whales and midwater trawls. Minke whales are the only species of large whales that have been observed seriously injured and killed in midwater trawl gear, although these instances are rare. Since 2009, there has also been only two observed minke whale incidentally taken in midwater trawl gear; this incidence was observed in 2009 and 2013 (NEFSC 2015; Waring, et al. 2014; 2015). Based on this information, midwater trawl gear is not expected to pose a significant serious injury or mortality risk to any large whale species.

[1] The most recent LOF was issued August 25, 2014; 79 FR 50589.

[2] PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

Purse Seine (GOM Atlantic herring fishery)

Since 2008, three humpback whales and one fin/sei whale have been documented as interacting with purse seines, specifically those operating in the GOM targeting Atlantic herring (NEFSC 2015). All interactions; however, resulted in the animals being released from the nets unharmed (NEFSC 2015; Waring, et al. 2015). Based on this information, although interactions are possible with large whales, purse seines are not expected to pose a serious injury or mortality risk to these species. This conclusion is further supported by the fact that the LOF has identified the Gulf of Maine Atlantic herring purse seine fishery as a Category III fishery, that is, a fishery that causes a remote to no likelihood of causing serious injury or mortality to marine mammals (Table 43).

6.4.3.1.2 Small Cetaceans and Pinnipeds

Midwater Trawl Gear

Midwater trawl fisheries (Northeast or Mid-Atlantic) are considered Category II fisheries under the LOF. Small cetacean and pinniped species are known to be seriously injured or killed by this gear type, and in fact, based on observer data, bycatch of small cetaceans and pinnipeds have been attributed to the Atlantic herring fishery (NEFSC 2015; Waring, et al. 2014; 2015). Table 43 provides a list of small cetacean and pinniped species observed seriously injured and/or killed by midwater trawl Category II fisheries from 2007-2012 (Waring, et al. 2014; 2015).

Table 44 - Cetacean and pinniped species observed seriously injured and/or killed by Category II midwater fisheries in the Affected Environment of the Atlantic herring fishery, 2007-2012

Category II	
Fishery/Gear Type	**Species Observed Injured/Killed**
Mid-Atlantic Midwater Trawl (Including Pair Trawl)	Risso's dolphin
	White-sided dolphin (*)
	Short-beaked common dolphin
	Long and short-finned pilot whales
	Gray seal
	Harbor seal
Northeast Midwater Trawl (Including Pair Trawl)	White-sided dolphin
	Short-beaked common dolphin
	Long and short-finned pilot whales (*)
	Gray seal
	Harbor seal
* Species driving the fisheries classification. *Sources*: Waring et al. (2014; 2015); August 25, 2014, List of Fisheries (79 FR 50589).	

In 2006, based on observed midwater trawl interactions with long-finned pilot whales, short - finned pilot whales, common dolphins, and white sided dolphins, the Atlantic Trawl Gear Take Reduction Team (ATGTRT) was convened to address the incidental mortality and serious injury of these species incidental to bottom and midwater trawl fisheries operating in both the Northeast and Mid-Atlantic regions. Because none of the marine mammal stocks of concern to the ATGTRT are classified as a "strategic stock," nor do they currently interact with a Category I fishery, it was determined at the time that development of a take reduction plan was not necessary.

In lieu of a take reduction plan, the ATGTRT agreed to develop an Atlantic Trawl Gear Take Reduction Strategy (ATGTRS). The ATGTRS identifies informational and research tasks, as well as education and outreach needs the ATGTRT believes are necessary, to provide the basis for decreasing mortalities and serious injuries of marine mammals to insignificant levels approaching zero mortality and serious injury rates. The ATGTRS also identifies several potential voluntary measures that can be adopted by certain trawl fishing sectors to potentially reduce the incidental capture of marine mammals (e.g., reducing the numbers of turns made by the fishing vessel and tow times while fishing at night; increasing radio communications between vessels about the presence and/or incidental capture of a marine mammal). For additional details on the ATGTRS, see: http://www.greateratlantic.fisheries.noaa.gov/Protected/mmp/atgtrp/

Purse Seine (GOM Atlantic Herring Fishery)

There have been no observed small cetacean interactions with purse seines operating in the GOM. As a result, this gear type is not expected to pose an interaction risk with small cetacean species. However, purse seines, specifically those operating in the GOM targeting Atlantic herring, are known to interact with pinniped species (i.e., gray and harbor seals; NEFSC 2015; Waring, et al. 2014; Waring, et al. 2015). However, most observed interactions to date have resulted in the release of the animals unharmed (Table 45); only two unknown seal species have been observed serious injured and killed in the GOM Atlantic herring purse seine fishery (NEFSC 2015; Waring, et al. 2014; 2015). As a result, although interactions are possible with seals, purse seines are not expected to pose a significant serious injury or mortality risk to these species. This conclusion is further supported by the fact that the LOF has identified the Gulf of Maine Atlantic herring purse seine fishery as a Category III fishery, that is, a fishery that causes a remote to no likelihood of causing serious injury or mortality to marine mammals (Table 43).

Table 45 - Observed gray and harbor seal interactions with the GOM Atlantic herring purse seine fishery, 2005-2014

Seal Species	Number of Observed Interactions	Released Alive
Unknown	13	11-Yes/ 2-No
Harbor Seal	10	Yes
Gray Seal	101	Yes

6.4.3.2 Sea Turtles

Midwater Trawl

NEFOP and ASM observer data from 1989-2014 have recorded five leatherback sea turtle interactions with midwater trawl gear; the primary species landed during these interactions was tuna (NEFSC 2015). Based on the best available information, although interactions with this gear type are possible, the risk of a sea turtle interacting with midwater trawl gear targeting Atlantic herring is expected to be low. Further, with no observed sea turtle interactions attributed to the Atlantic herring midwater trawl fishery since 1989, midwater trawls targeting Atlantic herring are not expected to pose a significant serious injury or mortality risk to any sea turtle species.

Purse Seine (GOM Atlantic Herring Fishery)

NEFOP and ASM observer data from 1989-2014 have recorded no sea turtle interactions with purse seine gear where the primary species landed during these interactions was Atlantic herring (NEFSC 2015). However, purse seine interactions with sea turtles have been observed in other fisheries targeting other fish species in the Mid-Atlantic. Based on the best available information, although interactions with this gear type are possible, the risk of a sea turtle interacting with purse seine gear targeting Atlantic herring in the GOM is expected to be low. Further, with no observed sea turtle interactions attributed to the Atlantic herring GOM purse seine fishery since 1989, purse seines targeting Atlantic herring are not expected to pose a significant serious injury or mortality risk to these sea turtle species.

6.4.3.3 Atlantic Sturgeon

Midwater Trawl

To date, there have been no observed/documented interactions with Atlantic sturgeon and midwater trawl gear (NEFSC 2015). As a result, this gear type is not expected to pose an interaction risk to the species.

Purse Seine (GOM Atlantic herring fishery)

NEFOP and ASM observer data from 1989-2014 have recorded two Atlantic sturgeon interactions with purse seine gear targeting Atlantic herring in the GOM (NEFSC 2015). These interactions were recorded in 2004 and 2005, prior to the listing of Atlantic sturgeon under the ESA. While capture of sturgeon in this gear type is possible, interactions have been extremely rare (only two observed over the last 25 years) and therefore, the risk of an interaction is likely low.

6.5 FISHERY-RELATED BUSINESSES AND COMMUNITIES

The U.S. Atlantic herring fishery occurs over the Mid-Atlantic shelf region from Cape Hatteras to Maine, including an active fishery in the inshore Gulf of Maine and seasonally on Georges Bank. The Atlantic herring resource is managed as one stock complex, but this stock is thought to be comprised of inshore and offshore components that segregate during spawning. In recognition of the spatial structure of the herring resource, the Atlantic herring Annual Catch Limit (ACL) is divided into sub-ACLs and assigned to four herring management areas. Area 1 is the Gulf of Maine (GOM) divided into an inshore (Area 1A) and offshore section (Area 1B); Area 2 is located in the coastal waters between MA and NC (generally referred to as southern New England/Mid-Atlantic), and Area 3 is on Georges Bank (GB) (Figure 1, p. 3).

The Atlantic herring fishery is generally prosecuted south of New England in Area 2 during the winter (January-April), and oftentimes as part of the directed mackerel fishery. There is overlap between the herring and mackerel fisheries in Area 2 and in Area 3 during the winter months, although catches in Area 3 tend to be relatively low. The herring summer fishery (May-August) is generally prosecuted throughout the GOM in Areas 1A, 1B and in Area 3 (GB) as fish are available. Restrictions in Area 1A have pushed the fishery in the inshore GOM to later months (late summer). The midwater trawl (single and paired) fleet is restricted from fishing in Area 1A in the months of January through September because of the Area 1A sub-ACL split (0% January-May) and the purse seine-fixed gear only area (all of Area 1A) that is effective June-September. A sub-ACL split for Area 1B (0% January – April, 100% May – December) is effective for all vessels during the 2014 and 2015 fishing years.

Fall and winter fishing (September-December) tends to be more variable and dependent on fish availability; the Area 1A sub-ACL is always fully utilized, and the inshore Gulf of Maine fishery usually closes sometime around November. As the 1A and 1B quotas are taken, larger vessels become increasingly dependent on offshore fishing opportunities (Georges Bank, Area 3) when fish may be available.

Atlantic herring is also caught in state waters and in the New Brunswick weir fishery. Section 4.2.1 contains more information about those fisheries.

6.5.1 Atlantic Herring Catch

The Atlantic herring stockwide ACL and management area sub-ACLs are tracked/ monitored based on the ***total catch – landings and discards***, which is provided and required by herring permitted vessels through the vessel monitoring system (VMS) catch reports and vessel trip reports (VTRs) as well as through Federal/state dealer data. Atlantic herring harvesters are required to report discards in addition to landed catch through these independent reporting methods.

NMFS' catch estimation methods for the Atlantic herring fishery are described in detail in both Framework Adjustment 2 and Framework Adjustment 3 to the Atlantic Herring FMP (Section 3.6.1 of Framework 3, NEFMC 2014b).

Table 46 summarizes recent Atlantic herring catch estimates by year and management area from 2004-2014. The following bullets describe how these estimates were derived:

- 2004-2006 Atlantic herring catch estimates are provided from quota management implemented by NMFS through the Atlantic Herring FMP and are based on interactive voice

reporting (IVR) data from the call-in system used to monitor TACs. Reported herring discards are included in the totals.

- 2007-2009 Atlantic herring catch estimates are based on IVR data supplemented with dealer data. Reported herring discards are included in the totals.
- 2010-2014 Atlantic herring catch estimates are based on a comprehensive methodology developed by NMFS in response to Amendment 4 provisions and the need to better monitor sub-ACLs. Catch estimates are based on landings data obtained from dealer reports (Federal and State), supplemented with VTRs (Federal and State of Maine) with the addition of discard data from extrapolated observer data.

Catch of Atlantic herring by State-only permitted vessels (fishing in State waters) is tracked by the States and ASMFC. Recent information regarding state waters Atlantic herring catch is summarized in Section 4.2.1 (p. 15).

Table 46 - Atlantic herring catch by year and management area, 2004-2014

Year	Area	sub-ACL (mt)	Catch (mt)	% Utilized
2004	1A	60,000	60,095	100%
2004	1B	10,000	9,044	90%
2004	2	50,000	12,992	26%
2004	3	60,000	11,074	18%
2005	1A	60,000	61,102	102%
2005	1B	10,000	7,873	79%
2005	2	30,000	14,203	47%
2005	3	50,000	12,938	26%
2006	1A	60,000	59,989	100%
2006	1B	10,000	13,010	130%
2006	2	30,000	21,270	71%
2006	3	50,000	4,445	9%
2007	1A	50,000	49,992	100%
2007	1B	10,000	7,323	73%
2007	2	30,000	17,268	58%
2007	3	55,000	11,236	20%
2008	1A	43,650	42,257	97%
2008	1B	9,700	8,671	89%
2008	2	30,000	20,881	70%
2008	3	60,000	11,431	19%
2009	1A	43,650	44,088	101%
2009	1B	9,700	1,799	19%
2009	2	30,000	28,032	93%
2009	3	60,000	30,024	50%
2010	1A	26,546	28,424	107%
2010	1B	4,362	6,001	138%
2010	2	22,146	20,831	94%
2010	3	38,146	17,596	46%
2011	1A	29,251	30,676	105%
2011	1B	4,362	3,530	81%
2011	2	22,146	15,001	68%
2011	3	38,146	37,038	97%
2012	1A	27,668	24,302	88%
2012	1B	2,723	4,307	158%
2012	2	22,146	22,482	102%
2012	3	38,146	39,471	103%
2013	1A	29,775	29,820	100%
2013	1B	4,600	2,458	53%
2013	2	30,000	27,569	92%
2013	3	42,000	37,833	90%
2014	1A	33,031	32,898	100%
2014	1B	2,878	4,399	153%
2014	2	28,764	19,626	68%
2014	3	39,415	36,323	92%

Source: NMFS.
Note: Shaded rows indicate overages.

Table 47 summarizes total Atlantic herring catch as a percentage of the total available catch in each year from 2003-2014 based on NMFS catch estimation methods. Atlantic herring catch has been somewhat consistent over the time period (and in previous years), averaging about 91,925 mt from 2003-2014, with the highest catch of the time series observed in 2009 (103,943 mt) and lowest in 2010 (72,852 mt). However, the quota allocated to the fishery (stockwide ACL/OY) has decreased 50% over the twelve-year period. Consequently, and without increasing fishing effort, the Atlantic herring fishery has become more fully utilized in recent years, and the fishery used 100% of the total Atlantic herring ACL for the first time in 2012. The 2013-2015 Atlantic herring fishery specifications increased the stockwide Atlantic herring ACL by more than 15,000 mt from the 2010-2012 specifications; an additional 5,000 mt was caught under the higher quota in 2013 and 2014, and overall, the fishery used about 90% of the stockwide Atlantic herring ACL.

Table 47 - Total annual Atlantic herring catch, 2003-2014

Year	Total Herring Catch (mt)	Total Quota Allocated (mt)	% Caught
2003	101,607	180,000	57%
2004	93,205	180,000	52%
2005	96,116	150,000	64%
2006	98,714	150,000	66%
2007	85,819	145,000	59%
2008	83,240	143,350	58%
2009	103,943	143,350	73%
2010	72,852	91,200	80%
2011	86,245	93,905	92%
2012	90,561	90,683	100%
2013	95,764	106,375	90%
2014	93,247	104,088	90%
Source: NMFS.			

Table 48 provides updated/adjusted Atlantic herring sub-ACLs and the total ACL for the 2015 fishing year relative to catch year to date (YTD). As of December 27, 76.5% of the total ACL had been caught, and the Area 1A sub-ACL had the highest utilization rate, 96.1%.

Table 48 - 2015 Atlantic herring sub-ACLs (adjusted) and catch YTD (mt)

Area	2015 Catch (mt)	2015 sub-ACL* (mt)	% sub-ACL Caught
1A	29,395	30,580	96.1%
1B	2,889	4,922	58.7%
2	14,408	32,100	44.9%
3	33,256	44,910	74.1%
Total	**79,948**	**104,566**	**76.5%**
Source: NMFS Quota Monitoring Report through December 27, 2015. *Adjustments to initial allocations include overage deductions/carryovers from 2013 and deductions for the 2015 research set-asides.			

6.5.2 Monthly Atlantic Herring Quota Utilization

The temporal and spatial variability of the Atlantic herring fishery may be understood by examining the quota utilization in each management area on a monthly basis over the course of the fishing year. In general, the fishery concentrates in Area 2 during the first few months of the year, then effort shifts towards Area 1A through the summer and fall, as well as into Area 3 during the fall and early winter. Area 1B is used throughout the year as fish and markets are available. A more detailed description is in the 2013-2015 Atlantic herring fishery specifications (Section 3.5.1.2.3).

6.5.3 Atlantic Herring Permit Categories

Limited-access Atlantic herring vessel permit categories:

Category A – limited access in all management areas;

Category B – limited access in Areas 2 and 3 only;

Category C – limited access in all management areas, with a 25 mt (55,000 lb) Atlantic herring catch limit per trip and one landing per calendar day.

Open-access Atlantic herring vessel permit categories:

Category D – open access in all management areas, with a 3 mt (6,600 lb) Atlantic herring catch limit per trip and one landing per calendar day;

Category E – open access in Areas 2 and 3 only, with a 9 mt (20,000 lb) Atlantic herring catch limit per trip and landing per calendar day.

The Category E Atlantic herring permit was established through Amendment 5 and implemented in March 2014. Vessels that have not been issued a limited access herring permit, but that have been issued a limited access mackerel permit, are eligible for this permit.

6.5.4 Atlantic Herring Vessels

This section provides information regarding the vessels participating in the Atlantic herring fishery from 2008-present. Nominal revenues for “herring trips” are presented. Here, a herring trip is defined liberally as any trip in which at least one pound of Atlantic herring is retained.

Active Vessels in the Atlantic Herring Fishery

Since 2008, the number of vessels with either a limited access or an open access Atlantic herring permit has decreased annually (Table 49 and Table 50). This includes a decrease in the limited access directed fishery vessels (Categories A and B), which comprise the majority of the herring fishery, with 43 permitted in 2014. In 2014, 44% of the limited access vessels were active (defined broadly as landing at least one pound of Atlantic herring during the fishing year). Many of the Category A, B, and C vessels are also active in the Atlantic mackerel fishery (managed by the MAFMC). Although there have been far fewer active limited access versus open access vessels, the limited access vessels account for about 97% of annual Atlantic herring landings and revenues.

For the open access vessels, just 3-5% of the Category D permits have been active since 2009 (Table 49 and Table 50). The Category E permit was implemented during permit year 2013 (May-April). In 2014, there were just over 50 E permits issued, mostly to vessels with a D permit as well. About 11% of the E permits were active that year.

Table 49 - Fishing vessels with federal Atlantic herring permits, 2008-2011

Permit Category	2008	2009	2010	2011
A	44 (64%)	44 (66%)	43 (63%)	42 (64%)
B, C	5 (40%)	4 (75%)	4 (75%)	4 (50%)
C	53 (13%)	51 (25%)	51 (33%)	45 (20%)
Total Limited Access	**102 (34%)**	**99 (45%)**	**98 (48%)**	**91 (52%)**
D	2,390 (3%)	2,373 (3%)	2,231 (5%)	2,038 (4%)

Sources: NMFS Permit database (*http://www.nero.noaa.gov/permits/permit.html*) and VTR database.

Note: In parentheses are the percent active vessels, defined as having landed at least one pound of Atlantic herring. This includes all pair trawl vessels, whose partner vessel landed the catch. Data as of August 2015.

Table 50 - Fishing vessels with federal Atlantic herring permits, 2012-2014

Permit Category		2012	2013	2014
Limited Access	**A**	38 (61%)	40 (63%)	39 (67%)
	B, C	4 (50%)	4 (75%)	4 (50%)
	C	46 (24%)	44 (34%)	42 (21%)
	Total	**88 (41%)**	**88 (42%)**	**85 (44%)**
Open Access	**D**	2,026 (4%)	1,909 (4%)	1,788 (3%)
	D,E	n/a	n/a	53 (11%)
	E	n/a	n/a	1*
	Total	**2,026 (4%)**	**1,909 (4%)**	**1,842 (3%)**

Source: NMFS Permit database (*http://www.nero.noaa.gov/permits/permit.html*) and VTR database.

Note: In parentheses are the percent active vessels, defined as having landed at least one pound of Atlantic herring. This includes all pair trawl vessels, whose partner vessel landed the catch. Permit and landings data are as of August 2015 and do not include 2015 landings.

n/a = The Category E permits could first be issued at the end of 2013, but could not become active until 2014.

*Data confidentiality restrictions preclude reporting the percent active.

Fishing Gear

Atlantic herring vessels primarily use purse seines, single midwater trawls or midwater pair trawls for fishing gear, with the midwater pair trawl fleet harvesting the majority of landings since 2008 (Table 51 and Table 52). Some herring vessels use multiple gear types during the fishing year. Single and pair trawl vessels generally fish in all areas (October-December in Area 1A), though Areas 1A and 1B account for less of their overall landings in recent years. The purse

seine fleet fishes primarily in Area 1A and to a lesser extent, Areas 1B and Area 2, though in recent years, purse seines have not been active in Area 2. The single midwater trawl has been most active in Area 3. Small mesh bottom trawl vessels represented 5% of herring landings since 2008; other gear types (e.g., pots, traps, shrimp trawls, hand lines) comprise less than 0.5% of the fishery.

Table 51 - Atlantic herring landings by fishing gear type and area, 2008-2011

Gear Type	Area 1A (mt)	Area 1B (mt)	Area 2 (mt)	Area 3 (mt)	Total
Bottom Otter Trawl	463 (0.3%)	1 (0%)	14,288 (16%)	117 (0.1%)	**14,869 (4%)**
Single Midwater Trawl	6,340 (5%)	3,246 (17%)	4,886 (5%)	12,830 (14%)	**27,302 (8%)**
Midwater Pair Trawl	56,769 (43%)	12,612 (64%)	68,336 (76%)	78,518 (86%)	**216,235 (65%)**
Purse Seine	69,074 (52%)	3,696 (19%)	2,221 (2%)	0 (0%)	**74,991 (22%)**
Other	817 (0.6%)	0 (0%)	17 (0%)	1 (0%)	**834 (0.2%)**
Total	**133,463 (100%)**	**19,555 (100%)**	**89,748 (100%)**	**91,466 (100%)**	**334,231 (100%)**

Source: VTR database. September 2012.

Note: Data include all vessels that landed one pound or more of Atlantic herring.

Table 52 - Atlantic herring landings by fishing gear type and area, 2012-2014

Gear Type	Area 1A (mt)	Area 1B (mt)	Area 2 (mt)	Area 3 (mt)	Total
Bottom Otter Trawl	534 (1%)	16,967 (64%)	0 (0%)	267 (0%)	**17,768 (7%)**
Single and Pair Midwater Trawl	14,677 (18%)	9,068 (34%)	44,746 (100%)	110,227 (100%)	**178,718 (67%)**
Purse Seine	68,409 (82%)	310 (1%)	0 (0%)	0 (0%)	**68,719 (26%)**
Other	3 (0%)	0 (0%)	3 (0%)	0 (0%)	**6 (0%)**
Total	**83,623 (100%)**	**26,345 (100%)**	**44,749 (100%)**	**110,494 (100%)**	**265,211 (100%)**

Source: VTR database. August 2015.

Note: Data include all vessels that landed one pound or more of Atlantic herring. Single and pair midwater trawl data are combined due to data confidentiality restrictions.

Revenue

Table 53 provides percentage of total revenue from Atlantic herring by the total revenue for each permit category from 2008-2011 for trips landing Atlantic herring, showing the contribution of Atlantic herring revenues to those trips. Category A vessels catching Atlantic herring in Areas 1A, 1B, and 3 are catching herring almost exclusively (e.g., Category A vessels in Area 1A derived 98% of revenue from herring when landing herring). However, when these vessels catch herring in Area 2, a substantial portion of revenues (nearly 40%) are attributable to other species. Category C and D vessels have derived relatively small amounts of revenue from herring trips. The remainder of the revenue for these vessels is derived from other species (e.g., whiting).

Table 53 - Percent of total revenue from Atlantic herring by total revenue for each permit category and management area for trips landing Atlantic herring, 2008-2011

	Category A	Category B/C	Category C	Category D
Area 1A	99.9%		55.1%	32.8%
Area 1B	99.7%			
Area 2	61.6%	94.8%	6.7%	2.5%
Area 3	96.8%			1.2%
Total	**86.4%**	**94.8%**	**30.3%**	**11.2%**

Table 54 updates Table 53 for 2012-2014, showing the importance of each management area to vessels of the different permit categories. Category A vessels caught Atlantic herring almost exclusively in all areas, more so than in 2008-2011 (Table 53). Area 2 continues to be important for Category B and C vessels. The open access permit vessels (Category D and E) still derive relatively little revenue from Atlantic herring (14% overall).

Table 54 - Importance of Atlantic herring for each permit category and management area, 2012-2014

	Category A	Category B or C	Category D or E
Area 1A	98%	42%	26%
Area 1B	85%		minimal*
Area 2	85%	77%	9%
Area 3	92%		minimal*
Total	92%	69%	14%

Note: “Importance” measured as the percentage of total revenue derived from Atlantic herring for trips that retained herring.

* There was a very small amount of herring revenue for the D/E vessels in these areas.

6.5.5 Atlantic Herring Dealers

The number of Atlantic herring dealers has remained fairly constant since 2012 at just over 280. Table 55 summarizes all issued Atlantic herring permits by state and permit type for the past few years. Dealer permits can be issued and cancelled throughout the year, so at any given time, the number of active dealer permits could fluctuate from the totals reported. Most of the Atlantic herring dealers are based in Maine, Rhode Island, New York, and New Jersey.

Table 55 - Atlantic herring dealer permits issued, 2012-2015

	2012	2013	2014	2015
United States				
ME	76	83	84	85
NH	8	7	7	8
MA	57	61	60	62
RI	35	32	27	26
CT	2	2	3	3
VT	1	1	1	1
NY	52	50	50	48
NJ	26	26	26	28 (1)*
PA	2	2	2	2
DE	1		1	1
MD	3	3	3	2
VA	7	7	8	8
NC	9	8	8	8
GA	1	1		
Canada				
NB	1	1	1	1
NS	1	3	3	3
Total				
	282	**287**	**284**	**286(1)**

Source: GARFO permit database as of 7/31/2015.

Notes: 2015 permit counts are preliminary due to ongoing issuance. Individual entities may possess more than one permit type, i.e. total permits issued not equal to total number of dealers.

* One at-sea dealer permit has been issued in 2015.

6.5.6 Atlantic Herring Prices, Use as Bait, and Substitute Goods

Between 2008-2014, Atlantic herring catch ranged from 72,852-103,943 mt (with discards representing a very small fraction, see Table 47 and Table 16 (p. 23)) while nominal prices generally ranged from about $160-350 per mt (Figure 16 and Figure 17). Overall, Atlantic herring prices have been increasing over time with a peak in 2013. Atlantic herring caught in the Northeast U.S. is eaten by consumers worldwide and used as lobster bait. There are likely to be good substitutes for both uses; therefore, prices are likely insensitive to quantity changes.

In general, prices will decrease when quantity supplied increases, and prices will increase when quantity supplied decreases. The extent to which prices are responsive to changes in quantities supplied (and therefore by changes in ACLs and sub-ACLs) depends on the availability of good substitutes. If good substitutes are available, then prices will not be sensitive to changes in quantity supplied. However, if good substitutes are not available, then prices will be quite sensitive to changes in quantity supplied.

Limited amounts of Atlantic herring are consumed as food domestically. In the world market, there is likely one substitute: European herring. U.S. production of Atlantic herring is quite small relative to the worldwide production. Since total U.S. landings of Atlantic herring have been near 100,000 mt annually, while total worldwide landings of Atlantic herring are near 2,000,000 mt. Therefore, U.S. producers of herring as human food are likely to be price takers on the world market. This means that moderate changes in the quantity of herring produced for food are unlikely to have an effect on price of herring.

In the bait market, Atlantic menhaden, managed by the Atlantic States Marine Fisheries Commission, is one substitute for Atlantic herring. Use of menhaden for bait has increased in importance relative to fish meal and oil. Between 2001 and 2012, the percent of total menhaden landings that were used for bait rose from 13% to a high of 28% in 2012 (63,540 mt). In 2013, bait harvest composed approximately 22% of the total menhaden harvest. Menhaden landings for bait have recently dipped due to reductions in allowable catch; landings in 2013 were 35,043 mt, 34% below the average landings during 2010-2012 (52,900 mt) (ASMFC 2015). During 2008-2011, *ex-vessel* menhaden prices ranged from $139-$169 per mt. This is about 33-50% lower than *ex-vessel* herring prices. If the quantity of Atlantic herring supplied into the bait market declines dramatically, more menhaden may be used as bait, moderating the increases in herring prices.

Menhaden is primarily used to produce fish meal and oil. However, the Atlantic Herring FMP prohibits use of herring for fish meal, so herring is not a substitute in the production of those goods.

Atlantic herring is used as bait for many fisheries, such as lobster, tuna, and various recreational fisheries. A more detailed description of the bait sector of the industry is in Amendments 1 and 5 to the Herring FMP. According to NMFS dealer data, 77% of the Atlantic herring landed from 2012-2014 was sold as bait; most of the rest was used for human consumption. Ports in Maine (61%) and Massachusetts (36%) landed 97% of all herring used for bait.

Figure 16 - Average nominal price per metric ton of Atlantic herring, 2008-2012

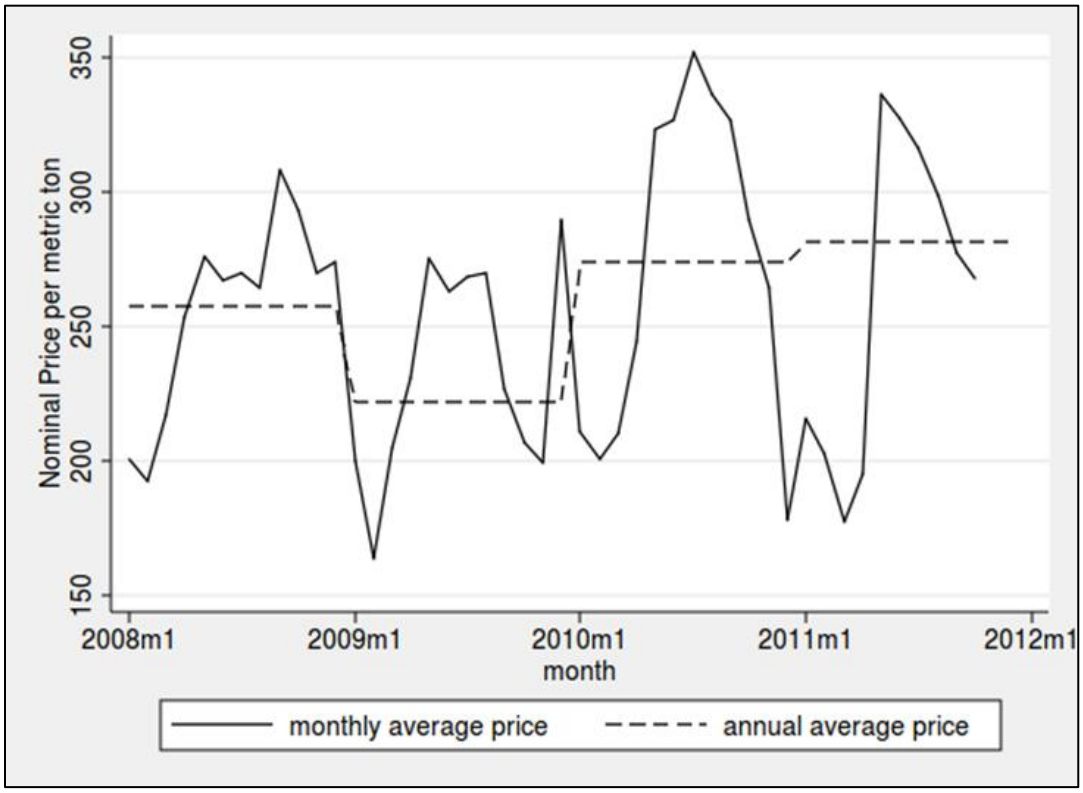
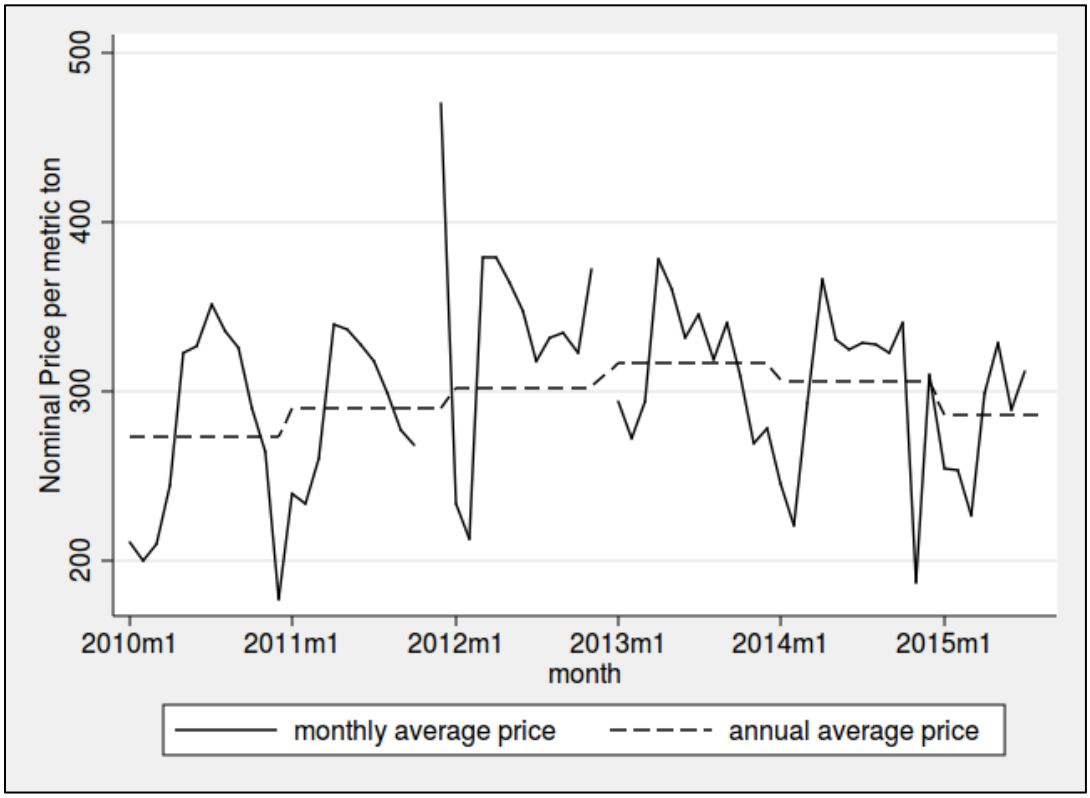


Figure 17 - Average nominal price per metric ton of Atlantic herring, 2010-2015



The lobster industry, particularly in Maine, is dependent on herring as a bait source, though it depends on price and availability. A 2008 survey of 6,832 lobster license holders in Maine revealed that 58% of respondents answered “very much” to the question “Could the supply or price of herring for bait impact your decisions on how to fish?” (MEDMR 2008). For lobstermen surveyed from Maine, New Hampshire and Massachusetts who harvest in Lobster Conservation Management Area A (inshore Gulf of Maine), herring is the predominant bait source (Table 56).

Table 56 - Bait use in the inshore Gulf of Maine lobster fishery

	Maine							NH	MA
	Zone A	**Zone B**	**Zone C**	**Zone D**	**Zone E**	**Zone F**	**Zone G**		
Herring	90%	86%	73%	73%	84%	37%	75%	60%	76%
Pogies	3%	2%	0%	15%	14%	39%	11%	4%	13%
Redfish	1%	8%	12%	4%	1%	19%	8%	0%	0%
Racks	1%	2%	1%	2%	0%	1%	1%	26%	6%
Alewives	1%	1%	0%	1%	0%	0%	0%	0%	0%
Other	4%	2%	13%	5%	0%	4%	4%	9%	4%
Source: Dayton et al. (2014).									

Data from New Hampshire port sampling reveals that New Hampshire vessels may be less dependent on herring as a bait source than the aforementioned survey indicates. Table 57 presents the use of herring as bait in NH from 2005 to 2011 (due to funding shortages, these data are no longer collected). Atlantic herring is a small percentage of the bait used by these vessels, ranging between 1.8% in 2010 and 4.6% in 2005. In terms of herring per trap just in Lobster Management Area (LMA) 1, the most used was in 2005 and the least in 2010. This correlates with overall high and low points in the percent of herring bait used. Historically, Atlantic herring is used for bait by smaller inshore vessels more than larger offshore vessels, because it is typically less expensive; in addition, alternative bait options like skates tend to be preferred for longer soaks in offshore waters. Note that the offshore LMA Area 3 vessels are not included in the herring per trap calculation because, at present, there is only one vessel in this category, which tends to utilize redfish and skates as primary bait sources. This is because redfish and skates do not degrade as rapidly as herring in deeper colder water. Furthermore, the LMA 3 vessel is not included to avoid skewing the data, however marginally, due to the diversity in bait types and the sheer volume of bait that is utilized throughout a fishing trip.

Table 57 - Bait use in the lobster fishery in New Hampshire

Year	Herring Bait (lbs)	Other Bait (lbs)	Total Bait (lbs)	% Herring of all Bait	# Types of Bait	Herring Per Trap LMA 1* (lbs)
2005	8,200	169,725	177,925	4.6%	11	0.33
2006	9,700	293,125	302,825	3.2%	13	0.20
2007	8,300	226,350	234,650	3.5%	10	0.18
2008	7,658	247,000	254,658	3.0%	12	0.16
2009	8,825	189,690	198,515	4.4%	11	0.25
2010	3,350	181,728	185,078	1.8%	11	0.14
2011	6,100	249,900	256,000	2.4%	9	0.21
Source: NH Fish & Game Department.						

6.5.7 Atlantic Herring Fishing Communities

In the 1996 amendments to the Magnuson Stevens Act, Congress added National Standards directly related to social and economic factors for consideration by Councils and NMFS. National Standard 8 (NS8) states that:

> *Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.*

NS 8 requires the consideration of impacts on fishing communities. Section 316 of MSA defines a fishing community as:

> *"A community which is substantially dependent on or substantially engaged in the harvesting or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community."*

To gain a better perspective on the nature of the Atlantic herring fishery and the character of the affected human environment, a broader interpretation of fishing community has been applied to include almost all communities with a substantial involvement in or dependence on the Atlantic herring fishery. In terms of National Standard 8 (NS 8), some of the communities identified in this section may not fit the strict interpretation of the criteria for substantial dependence on fishing. The fishing communities that meet the legal definition (as promulgated through NS 8) are likely to be considered a subset of the broader group of communities of interest that are engaged in the herring fishery and identified in this document.

Because Atlantic herring is widely used as bait for the lobster fishery, especially in Maine, it is not practical to identify every community with substantial involvement in the lobster fishery (and consequently some level of dependence on the herring fishery) for assessment in this document. Instead, some of the communities of interest were selected, in part, because of their involvement in or dependence on the lobster fishery; assessment of the impacts of the Amendment 1 measures

on these communities should provide enough context to understand the potential impacts on any community with substantial involvement in the lobster fishery. Parallels can be drawn between the communities that are identified in this section and other similar communities engaged in the lobster fishery.

NS 8 requires the Council to consider the importance of fishery resources to affected communities and provide those communities with continuing access to fishery resources, but it does not allow the Council to compromise the conservation objectives of the management measures. "Sustained participation" is interpreted as continued access to the fishery within the constraints of the condition of the resource.

Communities of Interest

The following five criteria were used in Amendments 1 and 5 to the Herring FMP to define *Communities of Interest* for the Atlantic herring fishery, which must meet at least one criterion:

1. Atlantic herring landings of at least 10M pounds (4,536 mt) per year from 1997-2008, or anticipated landings above this level based on interviews and documented fishery-related developments.
2. Infrastructure dependent in part or whole on Atlantic herring.
3. Dependence on herring as lobster and/or tuna bait.
4. Geographic isolation in combination with some level of dependence on the Atlantic herring fishery.
5. Utilization of Atlantic herring for value-added production.

Based on the above criteria, there are 11 *Communities of Interest* for the Atlantic herring fishery, identified below and further evaluated in Amendment 5 to the Atlantic Herring FMP (Section 4.5.3). Community profiles of each are available from the NEFSC Social Sciences Branch website (Clay et al. 2007). Since Amendment 1, this list has changed slightly with changes in harvesting and processing sectors.

1. Portland, Maine
2. Rockland, Maine
3. Stonington/Deer Isle, Maine
4. Vinalhaven, Maine
5. Lubec/Eastport, Maine
6. Sebasco Estates, Maine
7. NH Seacoast (Newington, Portsmouth, Hampton/Seabrook)
8. Gloucester, Massachusetts
9. New Bedford, Massachusetts
10. Southern Rhode Island (Point Judith, Newport, North Kingstown)
11. Cape May, New Jersey

Home Ports

Of the Atlantic herring *Communities of Interest*, Gloucester and New Bedford, Southern RI, and Cape May are homeports with largest concentrations of vessels that have Atlantic Herring limited access directed fishery permits, Categories A and B (Table 58). Mid-Coast ME, Portland and Seacoast NH also are home to a few of these permit holders. Beyond the communities of interest, a few Category A and B permit holders have homeports in Bath, Cundys Harbor, Hampden, and Matinicus ME; Boston and Woods Hole MA; and Wanchese NC. For the most part, these vessels use a community of interest as a landing port. The distribution of important homeports for Atlantic Herring vessels is largely unchanged between 2011 and 2015 (Table 58), particularly for the limited access vessels.

Table 58 - Distribution of herring permit holders which have an Atlantic herring community of interest as a homeport, 2011 and 2015

Homeport		Atlantic Herring Permit Category					
		Limited Access (A, B, C)		Open Access (D, E)		Total	
		2011	2015	2011	2015	2011	2015
ME	Portland	3	3	129	30	132	33
	Rockland	1	1	2	2	3	3
	Stonington/Deer Isle	1	0	0	2	1	2
	Vinalhaven	0	0	2	2	2	2
	Lubec/Eastport	0	0	2	1	2	2
	Sebasco Estates	0	0	3	1	3	2
	Maine, other	11	7	196	146	207	153
NH	Seacoast	6	5	96	93	102	98
MA	Gloucester	7	8	174	120	181	128
	New Bedford	9	8	201	178	210	186
	Massachusetts, other	9	8	377	324	386	332
RI		15	14	117	104	132	128
NJ	Cape May	12	13	93	83	105	96
	New Jersey, other	0	0	200	177	200	177
Other		12	12	494	388	506	400

Source: NMFS permit database. (*http://www.nero.noaa.gov/permits/permit.html*). 2011 data accessed September 2012. 2015 data accessed July 2015.

Landing Ports

From 2008-2011, Atlantic herring harvested from Areas 1A and 1B are landed in fishing communities in Maine, New Hampshire, and Massachusetts, whereas herring from Areas 2 and 3 are landed in a wider range of ports (Table 59). Communities in Rhode Island and New Jersey fish in Area 2 for herring almost exclusively. Portland, Rockland, Gloucester, and New Bedford are ports with the most herring landings in recent years. Within New Jersey, Cape May is the most active landing port.

Table 59 - Landing port distribution of Atlantic herring landings by fishing areas, 2008-2011

Landing Port		Area 1A (mt)	Area 1B (mt)	Area 2 (mt)	Area 3 (mt)
Maine	Portland	23%	22%	1%	23%
	Rockland	26%	15%	1%	10%
	Stonington/Deer Isle	8%	12%	0.5%	0%
	Vinalhaven	2%	5%	0%	2%
	Lubec/Eastport	0%	0%	0%	0%
	Sebasco Estates	0%	0%	0%	0%
	Maine, other	6%	0.3%	0.8%	4%
New Hampshire	Seacoast	3%	0.9%	0.4%	1%
Massachusetts	Gloucester	23%	42%	17%	45%
	New Bedford	8%	2%	45%	16%
	Massachusetts, other	1%	0.1%	4%	0%
Rhode Island	Southern	0%	0%	17%	0.1%
New Jersey	Cape May	0%	0%	13%	0%
	New Jersey, other	0%	0%	0%	0%
Other States		0%	0%	0.1%	0%
Total		**133,463 (100%)**	**19,555 (100%)**	**89,748 (100%)**	**91,466 (100%)**
Source: NMFS VTR database. September 2012.					

7.0 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

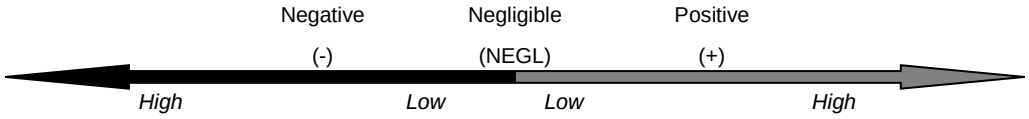
In this section, the impacts of the proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps are evaluated and discussed relative to each of the valued ecosystem components (VECs) described in the Affected Environment (Section 6.0, p. 40). The impacts of the no action alternative and non-preferred alternatives considered by the Council are also addressed in this section.

In general, the descriptive and analytic components of this document are constructed in a consistent manner. The Affected Environment for the 2016-2018 Atlantic herring fishery specifications updates the biological and management history related to each VEC since the implementation of Amendment 1 to the Atlantic Herring FMP (in 2006) through Amendment 5 (finalized by the Council in 2013). The Affected Environment is designed to enhance understanding of the baseline conditions and recent trends to fully understand the anticipated environmental impacts of the management measures under consideration in this management action. The impacts of the proposed 2016-2018 fishery specifications and RH/S catch caps are assessed in the following sub-sections using a similar structure to that found in the Affected Environment.

To enhance clarity and maintain consistency, the terms described in Table 60 are used to summarize the impacts of each alternative/option on the VECs in this document. In some instances (although less common), impacts on a VEC may be characterized as neutral, particularly if there may be both positive and negative impacts resulting from a management measure. If impacts are determined to be neutral, the reasons for making such a determination are in the discussion.

Table 60 - Terms used to summarize impacts on VECs

Impact Definition			
	Direction		
VEC	**Positive (+)**	**Negative (-)**	**Negligible**
Atlantic Herring; Non-Target Species; Protected Resources	Actions that increase stock/population size	Actions that decrease stock/population size	Actions that have little or no positive or negative impacts to stocks/populations
Physical Environment/ Habitat/EFH	Actions that improve the quality or reduce disturbance of habitat	Actions that degrade the quality or increase disturbance of habitat	Actions that have no positive or negative impact on habitat quality
Fishery-Related Businesses and Communities (Human Environment)	Actions that increase revenue and social well-being of fishermen and/or associated businesses	Actions that decrease revenue and social well-being of fishermen and/or associated businesses	Actions that have no positive or negative impact on revenue and social well-being of fishermen and/or associated businesses
Impact Qualifiers:			
Low (L, as in low positive or low negative)	To a lesser degree		
High (H; as in high positive or high negative)	To a substantial degree (not significant unless indicated as such)		
Likely	Some degree of uncertainty associated with the impact		



7.1 IMPACTS ON ATLANTIC HERRING

The Atlantic herring fishery is administered in accordance with the Atlantic Herring FMP, as modified by applicable amendments and framework adjustments. The Atlantic Herring FMP was developed by the Council and implemented by NMFS in 2000. The Atlantic herring fishery specification-setting process is the primary management tool used to manage the U.S. catch of Atlantic herring to ensure that overfishing does not occur. The specifications process was modified in Amendment 1 (from annual to every three years) and in Amendment 4 (for consistency with the ACL/AM provisions in the reauthorized MSA). Overall, fishing mortality on Atlantic herring is managed through the specification of the stockwide ACL (reduced from the overfishing limit and acceptable biological catch to address scientific uncertainty and management uncertainty) and sub-ACLs that are intended to minimize risk to individual stock components while maximizing opportunities for the fishery to achieve OY.

Updated information about the Atlantic herring resource is in Section 6.1 (p. 40). Based on the best available science (Atlantic herring operational assessment, Deroba 2015), the Atlantic herring resource continues to remain well above its biomass target (rebuilt), and fishing mortality remains well below the F_{MSY} threshold (not overfishing). A retrospective pattern re-emerged when updating the stock assessment model from the 2012 benchmark assessment; the retrospective pattern suggests that Atlantic herring SSB is likely overestimated and F is likely to be underestimated in the terminal year of the assessment. The retrospective adjustments made by the assessment review panel resulted in approximately a 40% decrease in the terminal year (2014) SSB estimate and a 60% increase in the 2014 F estimate. Even with the retrospective adjustments, the Atlantic herring stock complex remains above the biomass target and below the fishing mortality threshold (Table 28, Figure 2, p. 41).

The NEFMC SSC reviewed the 2015 Atlantic herring operational assessment results and recommended the proposed 2016-2018 Atlantic herring OFL and ABC specifications, which form the basis of the action alternatives considered by the Council in this document (the 2015 Atlantic herring operational assessment report and the May 20, 2015 SSC Meeting Report should be referenced for more information). The impacts of the proposed 2016-2018 Atlantic herring fishery specifications and alternatives for 2016-2018 RH/S catch caps on the Atlantic herring resource are discussed in the following subsections.

7.1.1 Impacts of Alternatives for 2016-2018 Atlantic Herring Fishery Specifications on Atlantic Herring

Each of the alternatives considered by the Council for the 2016-2018 fishery specifications includes an annual specification for OFL, ABC, a stockwide Atlantic Herring ACL (OY), DAH, DAP, USAP, BT, management area sub-ACLs (and seasons), RSA, and FGSA for 2016-2018. The OFL is the amount of annual Atlantic herring catch that would likely result in overfishing of the Atlantic herring resource; the ABC is the annual catch level recommended by the SSC to reduce the risk of overfishing while accounting for scientific uncertainty; the stockwide ACL/OY is the maximum annual amount of Atlantic herring that the U.S. fishery can harvest, buffered for management uncertainty (in this case, Atlantic herring that may be caught in Canadian fisheries). AMs further ensure that the stockwide ACL is not exceeded in the U.S. fishery. Therefore, to evaluate the potential impacts of the 2016-2018 fishery specifications on the Atlantic herring resource, the maximum potential removals under the stockwide Atlantic herring ACL/OY specification can be compared to the OFL to compare the risk of overfishing under each alternative.

To facilitate the evaluation of the impacts of the alternatives on the Atlantic herring resource, Table 61 lists the potential annual removals of Atlantic herring that can be expected under each alternative, assuming that the stockwide Atlantic herring ACL is fully utilized. Table 61 also summarizes the accountability measures (AMs) that apply to the U.S. Atlantic herring fishery and provides some summary information about recent catch in the U.S. and Canadian fisheries that affect the Atlantic herring resource.

On average, total annual removals of Atlantic herring (from both the U.S. and NB weir fisheries) have been well below the maximum removals for the U.S. fishery (the stockwide ACL) that would be allowed under any of the alternatives under consideration for 2016-2018. Alternative 2 would allow for the highest annual removals of Atlantic herring from the U.S. fishery – 108,000 mt. According to Table 47 (p. 89), annual U.S. Atlantic herring catch has been well below 108,000 mt for at least the last ten years, even during years when the total allowable catch was much higher (180,000 mt). Total Atlantic herring removals (U.S. and Canadian fishery combined) in 2014 were 90% of the 108,000 mt stockwide ACL proposed in Alternative 2, and the five-year average total herring removals are about 86% of the Alternative 2 stockwide ACL (Table 61). In other words, if Atlantic herring catch in the U.S. fishery during 2016-2018 is similar to 2014 catch (around 95,000 mt), there would be a considerable additional buffer to account for a substantial increase in the NB weir catch before total removals would reach the overfishing limit. This should increase confidence that none of the alternatives under consideration are likely to result in catch levels above the stockwide Atlantic herring ACL. This also provides greater assurance that the risk of overfishing will continue to be minimized in the event that the NB weir fishery lands an unusually large amount of Atlantic herring in any of the next three years.

Table 61 - Potential removals of Atlantic herring (mt) under alternatives for 2016-2018 Specifications

Specifications	No Action Alternative (2015 Specifications)	Alternative 2	Alternative 3 *Preferred Alternative*
OFL	2016 – 114,000 2017 – 114,000 2018 – 114,000	2016 – 138,000 2017 – 117,000 2018 – 111,000	2016 – 138,000 2017 – 117,000 2018 – 111,000
ABC	**114,000**	**111,000**	**111,000**
Mgmt. Uncertainty	*6,200*	*3,000*	*6,200*
Stockwide ACL/OY	**107,800**	**108,000**	**104,800**
Stockwide ACL with NB weir option	**N/A** **107,800**	**N/A** **108,000**	**105,800**
Accountability Measures	• Directed fishery in management area closes when 92% of the sub-ACL is projected to be reached. • Directed fishery in all management areas close when 95% of the stockwide ACL is projected to be reached. • Overage paybacks for management area sub-ACLs and stockwide ACLs (one-year lag). • Underage carryovers up to 10% for sub-ACLs (with one-year lag), cannot increase stockwide ACL.		
	U.S. Atl Herring Fishery	**NB Weir Fishery (Canada)**	**Total Herring Removals**
2014 Catch	95,037	2,149	**97,186**
Three-Year Avg.	93,787	3,028	**96,815**
Five-Year Avg.	88,092	4,751	**92,843**

Overall Biological Impacts

The biological impacts of the alternatives for the 2016-2018 Atlantic herring fishery specifications were assessed using three-year projections of SSB, fishing mortality, and probability of overfishing/overfished in each year. In the projections, fishing mortality is derived from the estimate of F_{MSY} in the Atlantic herring operational assessment, and the terminal year estimates of F and SSB from the operational assessment (2014, with the retrospective adjustment) are used. A simulation of 1,000 projections was then run to capture possible outcomes of SSB and F for 2016-2018. The results of the projections are in Table 62 (p. 108) and Table 63 (p. 109) and discussed below relative to each alternative under consideration for the 2016-2018 fishery specifications.

The SSC's recommendation for ABC for the 2016-2018 fishing years only differs from the 2013-2015 Atlantic herring ABC specification by 3,000 mt (2.6%). Because the ABC specifications are very similar, the three-year projections of Atlantic herring SSB and F in the following subsections demonstrate that there is no discernable difference between the impacts of Alternatives 1-3 on the Atlantic herring resource. Atlantic herring is considered rebuilt and well above the spawning stock biomass (SSB) target. The projections show that under each of the OFL/ABC specifications, Atlantic herring SSB and F resulting from fully utilizing ABC fall within the same range (based on the 80% confidence intervals). Because none of the alternatives are expected to change or jeopardize the biological status of the Atlantic herring resource (rebuilt, above SSB_{target}), and there would be mortality controls on the fishery, all three alternatives under consideration for the 2016-2018 fishery specifications are expected to continue to have a ***low positive impact*** on the Atlantic herring resource.

The differential impacts between the alternatives relate to the size of the buffer between OFL/ABC and the specification of the stockwide Atlantic herring ACL/OY, i.e., the maximum amount of total annual removals from the U.S. fishery under each of the alternatives. Alternatives that allow for higher annual removals from the U.S. fishery are considered to be less precautionary with respect to the risk of overfishing (exceeding the OFL). Because the risk of exceeding the ABC and/or OFL is very low under all three alternatives, and because the difference in ABC between the alternatives is minor, the differential impacts of the alternatives are expected to be **negligible**.

Because the Atlantic herring ABC specification proposed for 2016-2018 is only 2.6% lower than the 2013-2015 ABC specification, and because available biological/fishery information does not indicate a need to consider major changes to the distribution of allowable catch in the herring fishery (sub-ACLs) or other specifications (e.g., BT, RSA, FGSA), the alternatives that the Council considered for 2016-2018 maintain the status quo for many specifications. Thus, the impacts of specifications other than ABC and ACL are not expected to differ from what was considered in prior actions and are not discussed here.

7.1.1.1 Impacts of Alternative 1 (No Action)

No Action. The annual specification of Atlantic herring OFL and ABC would remain 114,000 mt for 2016-2018. This ABC specification is higher than the SSC's recommended specification of 111,000 mt. Because Alternative 1 specifies OFL and ABC at the same level in all three years, there would be no buffer between OFL and ABC to account for scientific uncertainty. This does not appear to be consistent with the best available science.

Table 62 summarizes the biological impacts of Alternative 1 on the Atlantic herring resource with respect to fishing mortality and projected SSB for 2016-2018. Under Alternative 1, median Atlantic herring SSB is projected to decline 24% by 2018 to 421,000 mt, which would still be well above the biomass target of 311,145 mt (i.e., the stock would still be considered rebuilt). The projections indicate a 2% chance that SSB could fall below the biomass threshold. Median fishing mortality would increase close to F_{MSY} levels over the three years, and there would be a 54% chance that fishing mortality would exceed F_{MSY} in 2018 (i.e., that overfishing would occur). Over the three-year simulation, expected Atlantic herring SSB and F under Alternative 1 are within the same range as Alternatives 2 and 3 (based on the 80% confidence intervals, see Table 63 for the SSB/F projection under Alternatives 2 and 3). SSB would decline, but remain

above its biomass target. Because the overall status of Atlantic herring (rebuilt, B > SSB) is not expected to be jeopardized, and there would be mortality controls in the fishery, Alternative 1 is expected to have a ***low positive impact*** on the Atlantic herring resource.

Relative to Alternatives 2 and 3, the impacts of Alternative 1 on the Atlantic herring resource are expected to be *more negative*. Alternative 1 does not provide a scientific uncertainty buffer between OFL and ABC and allows annual catch to exceed the SSC recommendation for 2016-2018, and because there is a 54% probability that overfishing would occur in Year 3 (2018), this alternative is less conservative/precautionary than Alternatives 2 and 3. It is also not based on the best available science (i.e., SSC advice).

Table 62 - Three-Year F/SSB projection under Alternative 1 (No Action)

	No Action ABC (114,000mt)		
	2016	**2017**	**2018**
Median F	0.19	0.24	0.26
80%CI	0.13-0.30	0.15-0.37	0.15-0.44
Catch mt	**114,000**	**114,000**	**114,000**
Median SSB mt	555,000	454,000	421,000
80%CI	341,000-940,000	279,000-756,000	232,000-732,000
Prob SSB<(SSB_{MSY}/2)	**0.00**	**0.00**	**0.02**
Prob F>F_{MSY}	**0.27**	**0.47**	**0.54**
Note: Projections assume that Atlantic herring catch equals the ABC in each of the three years.			

7.1.1.2 Impacts of Alternative 2 (Non-Preferred)

Under Alternative 2 (as well as Alternative 3), the annual specification of Atlantic herring ABC for 2016-2018 would be 111,000 mt, based on the SSC recommendations, and only differs from the 2013-2015 ABC by 3,000 mt (2.6%). Table 63 summarizes the biological impacts of Alternatives 2 and 3 on the Atlantic herring resource with respect to fishing mortality and projected SSB for 2016-2018. Under the ABC specification in Alternatives 2 and 3, median Atlantic herring SSB is projected to decline 23% by 2018 to 427,000 mt, which would still be well above the biomass target of 311,145 mt (i.e., the stock would still be considered rebuilt). By Year 3 (2018), median fishing mortality would increase close to F_{MSY} levels, but not as high as under Alternative 1, and there would be a 50% chance that fishing mortality would exceed F_{MSY} in 2018 (i.e., that overfishing would occur).

Over the three-year simulation, expected Atlantic herring SSB and F under Alternative 2 are within the same range Alternative 1, provided that ABC is not exceeded (based on the 80% confidence intervals, see Table 62 for the projection under Alternative 1). SSB declines, but the stock remains above its biomass target. Because the overall status of Atlantic herring (rebuilt, B > SSB) is not expected to be jeopardized, and there would be mortality controls in the fishery, Alternative 2 is expected to have a ***low positive*** impact on the Atlantic herring resource.

Relative to Alternative 1, Alternative 2 is considered to be more precautionary, and thus expected to have *more positive* impacts, because it has a lower risk of overfishing (exceeding the

OFL) and provides a scientific uncertainty buffer between the OFL and ABC in Years 1 and 2. This is consistent with the application of the interim ABC control rule for Atlantic herring in the 2013-2015 fishery specifications and the SSC advice regarding the 2016-2018 ABC. This buffer may afford more protection to the 2011 year class of Atlantic herring that is just starting to recruit into the mobile gear fishery (see Atlantic herring operational assessment report for more information).

Alternatives 2 and 3 differ from each other in terms of the management uncertainty buffer size between the stockwide ACL/U.S. OY and the ABC, which reduces the probability of overfishing. The stockwide ACL is the maximum amount of catch that the U.S. Atlantic herring fishery could take in a year. A lower stockwide ACL specification is considered to be more precautionary, because it provides a greater buffer to account for management uncertainty (NB weir fishery catch) and reduces the likelihood of exceeding the OFL. The suite of AMs in the Atlantic herring fishery further prevent the stockwide ACL from being exceeded. In the case of the U.S. Atlantic herring fishery, the stockwide ACL has only been reached/exceeded once in the last ten years (Table 47, p. 89).

Table 61 lists the potential annual removals of Atlantic herring that can be expected under each alternative, assuming that the stockwide Atlantic herring ACL/OY is fully utilized. Alternative 2 would allow for the highest annual removals of Atlantic herring from the U.S. fishery with a stockwide ACL specification of 108,000 mt. This is very slightly higher than the total removals allowed under Alternative 1 (stockwide ACL/OY 107,800 mt). However, the risk of overfishing is higher under Alternative 1, and the ABC specification in Alternative 1 is inconsistent with the best available science. Under Alternative 3, the stockwide Atlantic herring ACL/OY would be 105,800 mt with the NB weir payback option and 104,800 mt without the NB weir payback option. When compared to Alternative 3, the risk of exceeding the OFL is slightly higher under Alternative 2, particularly in Year 3. Alternative 2 is expected to be more precautionary than Alternative 1 and less precautionary than Alternative 3. While the overall impact of Alternative 2 on the Atlantic herring resource is expected to be ***low positive***, Alternative 2 is expected to have *more positive* impacts on the Atlantic herring resource than Alternative 1, and *less positive* impacts than Alternative 3.

Table 63 - Three-year F/SSB projection under Alternatives 2 and 3

	Constant Catch with Probability $F>F_{MSY}$ = 0.50 in 2018		
	2016	**2017**	**2018**
Median F	0.19	0.23	0.25
80% CI	0.13-0.29	0.15-0.36	0.15-0.42
Catch mt	**111,000**	**111,000**	**111,000**
80% CI	-	-	-
Median SSB mt	557,000	458,000	427,000
80% CI	343,000-942,000	283,000-760,000	237,000-738,000
Prob $SSB<(SSB_{MSY}/2)$	**0.00**	**0.00**	**0.02**
Prob $F>F_{MSY}$	**0.23**	**0.43**	**0.50**
Note: Projections assume that Atlantic herring catch equals the ABC specification in all the three years.			

7.1.1.3 Impacts of Alternative 3 (*Preferred Alternative*)

Under Alternative 3 (as well as Alternative 2), the specification of Atlantic herring ABC for 2016-2018 would be 111,000 mt, based on the SSC recommendations. The three-year SSB and F projection under Alternative 3 is in Table 63. Over the three-year projection, expected Atlantic herring SSB and F under Alternative 3 are within the same range as Alternatives 1 and 2, provided that ABC is not exceeded (based on the 80% confidence intervals, see Table 62 for the projection under Alternative 1). Atlantic herring SSB declines, but the stock remains above its biomass target of 311,145 mt. Because the overall status of Atlantic herring (rebuilt, B > SSB) is not expected to be jeopardized, and there would be mortality controls in the fishery, Alternative 3 is expected to have a ***low positive*** impact on the Atlantic herring resource.

Relative to Alternative 1, Alternative 3 is considered more precautionary, and thus expected to have *more positive* impacts, because it has a lower risk of overfishing (exceeding the OFL) and provides a scientific uncertainty buffer between the OFL and ABC in Years 1 and 2. This is consistent with the application of the interim ABC control rule for Atlantic herring in the 2013-2015 fishery specifications and the advice from the SSC regarding the 2016-2018 ABC. This buffer may afford more protection to the 2011 year class of Atlantic herring that is just starting to recruit into the mobile gear fishery (see Atlantic herring operational assessment report for more information).

Alternatives 2 and 3 differ from each other in terms of the management uncertainty buffer size between the stockwide ACL/U.S. OY and the ABC, which reduces the risk of overfishing in any one year. The stockwide ACL is the maximum amount of annual catch that the U.S. Atlantic herring fishery could take. A lower stockwide ACL specification is considered to be more precautionary, because it provides a greater buffer to account for management uncertainty (NB weir fishery catch) and reduces the probability of exceeding the OFL. A number of AMs in the Atlantic herring fishery further prevent the stockwide ACL from being exceeded. In the case of the U.S. Atlantic herring fishery, the stockwide ACL has only been reached/exceeded once in the last ten years (Table 47, p. 89).

Table 61 lists the potential annual removals of Atlantic herring that can be expected under each alternative, assuming that the stockwide Atlantic herring ACL/OY is fully utilized by the U.S. fishery. Alternative 2 would allow for the highest annual removals of Atlantic herring from the U.S. fishery with a stockwide ACL specification of 108,000 mt. This is slightly higher than the total removals allowed under Alternative 1 (stockwide ACL/OY 107,800 mt). However, the risk of overfishing is higher under Alternative 1, and the ABC specification in Alternative 1 is inconsistent with the best available science. Under Alternative 3, the stockwide Atlantic herring ACL/OY would be 105,800 mt with the NB weir payback option and 104,800 mt without the NB weir payback option. When compared to Alternative 2, the risk of exceeding the OFL is lower under Alternative 3, particularly in Year 3.

While the overall impact of Alternative 3 on the Atlantic herring resource is expected to be ***low positive***, Alternative 3 is expected to have *more positive* impacts on the Atlantic herring resource than Alternatives 1 and 3.

7.1.2 Impacts of 2016-2018 RH/S Catch Caps on Atlantic Herring

The alternatives under consideration for specifying the 2016-2018 RH/S catch caps are summarized in Table 26 (p. 37). The following subsections discuss the potential impacts of these alternatives on the Atlantic herring resource.

Overall Biological Impacts

Overall, the alternatives for the 2016-2018 RH/S catch caps are not expected to substantially impact the Atlantic herring resource, because they are not expected to affect the amount of Atlantic herring available for harvest in any given fishing year, which is specified through the Atlantic herring OFL, ABC, and the stockwide ACL/OY (see Section 7.1.1 for a discussion of the impacts of these specifications on the Atlantic herring resource). The RH/S catch cap alternatives (by gear and area) are intended to provide an opportunity for the vessels participating in the directed Atlantic herring fishery to fully utilize the total stockwide ACL for Atlantic herring (U.S. OY), if they can continue to avoid RH/S.

The continued collaborative effort between Atlantic herring fishermen, SMAST, and MADMF (Section 6.2.3.4, p. 66) is expected to increase the potential for RH/S avoidance and better ensure that the fleet can fully utilize the available annual herring yield under all of the alternatives. High levels of cooperation and participation by industry members in the avoidance program continues to be documented. The overall behavior of the vessels within the program's avoidance areas also provides evidence of cooperation, and the appearance of distinct spatial and temporal bycatch patterns within the target areas suggests vessels can avoid large catches of alosines. The RH/S catch caps specified for 2016-2018 may result in synergy between regulatory and voluntary bycatch mitigation efforts. The avoidance systems could provide fishermen with a tool that will help them stay below alosine catch limits, enabling them to fully utilize the available Atlantic herring OY. Assuming the fleet can continue to target Atlantic herring and avoid RH/S, the impacts of all of the RH/S catch cap alternatives under consideration for 2016-2018 on the Atlantic herring resource are expected to be ***negligible***.

However, depending on which RH/S catch cap alternative is selected by the Council, it is possible that one or more of the RH/S catch caps may result in the closure of a RH/S Catch Cap Area(s) sometime during the 2016-2018 fishing years. This can be expected for the alternatives that base the catch caps on the median value of a recent time series of RH/S catch estimates (the median value suggests that if the directed fishery operates the same way as it did in the reference time frame, RH/S catch will be above the median level 50% of the time). The spatial distribution of (1) the proposed RH/S catch caps, (2) the Atlantic herring resource and available ACL, and (3) fishing effort in the directed Atlantic herring fishery will influence whether Atlantic herring catch may be reduced under any of the RH/S catch cap alternatives.

In general, if Atlantic herring catch is less than expected (based on the stockwide ACL), there could be a positive impact on the Atlantic herring resource. The potential to reduce Atlantic herring catch due to reaching a RH/S catch cap can be evaluated by considering the total removals of RH/S that would be allowed under each RH/S catch cap alternative. Presumably, alternatives that allow for more removals of RH/S would have a lower likelihood of closing the directed Atlantic herring fishery (and consequently reducing Atlantic herring catch), and alternatives that allow for fewer removals of RH/S would have a higher likelihood of closing the directed Atlantic herring fishery and reducing Atlantic herring catch.

1.1.2.1 Impacts of RH/S Alternative 1 (No Action)

No Action. Alternative 1 would maintain the 2014/2015 RH/S catch caps for the 2016-2018 fishing years. Under Alternative 1, the 2016-2018 RH/S catch caps would be based on the median value of estimated RH/S catch from 2008-2012 (Table 23, p. 34). Implementation of the 2014/2015 RH/S catch caps became effective very late in 2014, so 2015 is the first fishing year that the directed Atlantic herring fishery operated under RH/S catch caps.

The RH/S catch cap alternatives (by gear and area) are intended to provide an opportunity for vessels participating in the directed Atlantic herring fishery to fully utilize the total stockwide ACL for Atlantic herring (U.S. OY), if the fleet can continue to avoid RH/S. If so, the impacts of Alternative 1 on the Atlantic herring resource are expected to be ***negligible***.

Table 64 (p. 119) summarizes the total potential removals of RH/S in the directed Atlantic herring fishery (trips landing more than 6,600 pounds of Atlantic herring) under the RH/S catch caps proposed in each alternative, assuming that 100% of the caps are caught. Of the alternatives under consideration, Alternative 3 with the Weighted Mean (***Preferred Alternative***) would allow for the highest RH/S removals, followed by Alternative 1 (no action alternative), then Alternative 2 with the Weighted Mean, and Alternative 2 with the Median. Alternative 3 with the Median would allow for the lowest amount of total annual RH/S removals. Therefore, while the impacts of all of the RH/S catch cap alternatives on the Atlantic herring resource are expected to be ***negligible***, there is a greater chance of closing the directed Atlantic herring fishery and reducing Atlantic herring removals in one or more areas under Alternative 1 only when compared to Alternative 3 Weighted Mean. In terms of potential impacts on the Atlantic herring resource, therefore, RH/S Alternative 1 is likely to be *more positive* than Alternative 3 Weighted Mean and *less positive* than all of the other alternatives under consideration.

1.1.2.2 Impacts of RH/S Alternative 2 (Non-Preferred)

Under Alternative 2, the 2016-2018 RH/S catch caps would be based on the Herring PDT's recent updates/revisions to the 2008-2012 RH/S catch estimates from Framework 3 (Appendix I). The same five-year time series that was used in Framework 3 (2008-2012 with updated/revised data) would determine the RH/S catch caps under Alternative 2, with options to select either the median or weighted mean from the time series (Table 24, p. 35).

Option 1: Median. Option 1 would allow for up to 190.9 mt of RH/S to be taken by midwater trawl vessels and 19.6 mt of RH/S to be taken by small mesh bottom trawl vessels fishing in the southern New England/Mid-Atlantic area. Relative to Alternative 1 (no action), Option 1 would decrease the amount of RH/S that could be taken by midwater trawl vessels by 14% and would significantly decrease (78%) the amount of RH/S that could be taken by SNE/MA SMBT vessels. Overall, the amount of RH/S that could be taken by the directed Atlantic herring fishery would decrease by 32.4% from 2015 levels under Option 1. Option 1 includes the lowest RH/S catch cap for the southern New England/Mid-Atlantic SMBT fleet. Relative Alternative 1, there is a higher likelihood that Option 1 could reduce Atlantic herring catch by closing the directed fishery in one or more catch cap/AM areas.

Option 2: Weighted Mean. Option 2 would allow for up to 241.3 mt of RH/S to be taken by midwater trawl vessels and 28.2 mt of RH/S to be taken by small mesh bottom trawl vessels fishing in the southern New England/Mid-Atlantic area. Relative to Alternative 1 (no action), Option 1 would increase the amount of RH/S that could be taken by midwater trawl vessels by

8.4% and would decrease the amount of RH/S that could be taken by SNE/MA SMBT vessels by 68.3%. Overall, the amount of RH/S that could be taken by the directed Atlantic herring fishery would decrease by 13.5% from 2015 levels under Option 2. Relative to the Alternative 1, there is a higher likelihood (although less than Option 1) that Option 2 could reduce Atlantic herring catch by closing the directed fishery in one or more catch cap/AM areas.

Impacts on Atlantic Herring

Overall, the impacts of RH/S Alternative 2 on Atlantic herring are expected to be similar to those under Alternative 1 (no action) and are discussed in the previous subsection. Any RH/S catch caps that are specified for 2016-2018 are not expected to substantially impact the Atlantic herring resource, because they are not expected to affect the amount of Atlantic herring available for harvest in any given fishing year, which is specified through the OFL, ABC, and the stockwide ACL (see Section 7.1.1 for a discussion of the impacts of these specifications on the Atlantic herring resource). The RH/S catch cap alternatives (by gear and area) are intended to provide an opportunity for vessels participating in the directed Atlantic herring fishery to fully utilize the total stockwide ACL for Atlantic herring (U.S. OY), if the fleet can continue to avoid RH/S. If so, the impacts of Alternative 2 (Options A and B) on the Atlantic herring resource are expected to be ***negligible***.

Table 64 (p. 119) summarizes the total potential removals of RH/S in the directed Atlantic herring fishery (trips landing more than 6,600 pounds of Atlantic herring) under the RH/S catch caps proposed in each alternative, assuming that 100% of the caps are caught. Of the alternatives under consideration, Alternative 3 Weighted Mean would allow for the highest RH/S removals, followed by Alternative 1 (no action), Alternative 2 Weighted Mean, and Alternative 2 Median. Alternative 3 Median would allow for the lowest amount of total RH/S removals. Therefore, while the impacts of Alternative 2 on the Atlantic herring resource are expected to be *negligible*, there is a greater chance of closing the directed Atlantic herring fishery in one or more areas under Alternative 2 when compared to Alternative 1 (no action) and Alternative 3 Weighted Mean. In terms of potential impacts on the Atlantic herring resource, therefore, RH/S Alternative 2 is likely to be *more positive* than RH/S Alternative 1 and RH/S Alternative 3 Weighted Mean and *less positive* than RH/S Alternative 3 Median. RH/S Alternative 2 Median could have a *more positive* impact than Alternative 2 Weighted Mean (due to reduced Atlantic herring catch) if the fleet cannot continue to avoid RH/S and fully utilize Atlantic herring OY.

1.1.2.3 Impacts of RH/S Alternative 3 (*Preferred*)

Under Alternative 3, the 2016-2018 RH/S catch caps would be specified based on RH/S catch estimates from 2008-2014, using the Herring PDT's recently revised/updated data (Appendix I). Alternative 3 would incorporate RH/S catch estimates from the most recent two years, extending the time series to seven years, with options to select either the median or weighted mean values (Table 25, p. 36). Alternative 3, Option 2 is the ***Preferred Alternative*** for the 2016-2018 RH/S catch caps.

Option 1: Median. Option 1 would allow for up to 124.7 mt of RH/S to be taken by midwater trawl vessels and 24 mt of RH/S to be taken by small mesh bottom trawl vessels fishing in the southern New England/Mid-Atlantic area. Relative to Alternative 1 (no action), Option 1 would decrease the amount of RH/S that could be taken by midwater trawl and SNE/MA SMBT by 44% and 73%, respectively. With respect to RH/S removals, Option 1 is the most conservative 2016-2018 RH/S catch cap option under consideration. Overall, the total amount of RH/S that

could be taken by the directed Atlantic herring fishery would decrease by 52.2% from 2015 levels under Option 1. Relative to other alternatives under consideration, this Option 1 has the highest potential to reduce Atlantic herring catch by closing the directed fishery in one or more catch cap/AM areas.

Option 2: Weighted Mean (*Preferred Alternative*). Option 2would allow for up to 238.7 mt of RH/S to be taken by midwater trawl vessels and 122.3 mt of RH/S to be taken by small mesh bottom trawl vessels fishing in the southern New England/Mid-Atlantic area. This is the only option that includes an increase in the RH/S catch cap for southern New England/Mid-Atlantic SMBT vessels. Relative to Alternative 1 (no action), Option 2 would increase the amount of RH/S that could be taken by midwater trawl and SNE/MA SMBT vessels by 7.3% and 37.6%, respectively. Overall, the total amount of RH/S that could be taken by the directed Atlantic herring fishery would increase by 15.9% from 2015 levels under Option 2. Relative to other alternatives under consideration, Option 2 has the lowest potential to reduce Atlantic herring catch by closing the directed fishery in one or more catch cap/AM areas.

Impacts on Atlantic Herring

Overall, the impacts of RH/S Alternative 3 on Atlantic herring are expected to be similar to those under Alternative 1 (no action) and Alternative 2, and are discussed in the previous subsections. Any RH/S catch caps that are specified for 2016-2018 are not expected to substantially impact the Atlantic herring resource, because they are not expected to affect the amount of Atlantic herring available for harvest in any given fishing year, which is specified through the OFL, ABC, and the stockwide ACL (see Section 7.1.1 for a discussion of the impacts of these specifications on the Atlantic herring resource). The proposed RH/S catch caps (by gear and area) are intended to provide an opportunity for vessels participating in the directed Atlantic herring fishery to fully utilize the total stockwide ACL for Atlantic herring (U.S. OY) if the fleet can continue to avoid RH/S. If the fleet continues to avoid RH/S and is able to fully utilize the Atlantic herring OY, the impacts of Alternative 3 (Options 1 and 2) on the Atlantic herring resource are expected to be ***negligible***.

Table 64 (p. 119) summarizes the total potential removals of RH/S in the directed Atlantic herring fishery (trips landing more than 6,600 pounds of Atlantic herring) under the RH/S catch caps proposed in each alternative, assuming that 100% of the caps are caught. Of the alternatives under consideration, Alternative 3 with the weighted mean would allow for the highest RH/S removals, followed by Alternative 1 (no action), Alternative 2 with the weighted mean, and Alternative 2 with the median. Alternative 3 with the median would allow for the lowest amount of total RH/S removals. Therefore, while the impacts of Alternative 3 on the Atlantic herring resource are expected to be *negligible*, the Alternative 3 options differ in terms of their potential to reduce Atlantic herring catch through closure of the directed fishery in one or more areas. Alternative 3 Median has the greatest likelihood of reducing Atlantic herring catch, and Alternative 3 Weighted Mean has the lowest likelihood of reducing Atlantic herring catch. In terms of potential impact on the Atlantic herring resource, therefore, RH/S Alternative 3 Median is likely to be the *most positive* alternative under consideration, and RH/S Alternative 3 Weighted Mean is likely to be the *least positive*.

7.2 IMPACTS ON NON-TARGET SPECIES

The primary non-target species in the directed Atlantic herring fishery are groundfish (particularly haddock) and the river herring/shad (RH/S) species. Spiny dogfish, squid, butterfish, Atlantic mackerel are also common non-target species in the directed Atlantic herring fishery (mackerel and some other non-target species catch is often landed and sold). Comprehensive information about the catch of these species in the Atlantic herring fishery is in Section 5.2 of the FEIS for Amendment 5 and Sections 3.2 (River Herring/Shad) and 3.3 (Other Non-Target Species) of Framework 3 to the Atlantic Herring FMP. Updated and summary information about non-target species is in Section 6.2 (p. 46) of this document. River herring and shad are non-target species of particular concern, and catch of RH/S in the directed Atlantic herring fishery is managed through gear and area-specific catch caps, which are proposed to be set for 2016-2018 in this management action.

The ASMFC completed the river herring benchmark stock assessment and peer review in 2012, examining 52 stocks of alewife and blueback herring with available data in U.S. waters. The stock assessment technical team examined indices from fishery-dependent (directed river herring landings and bycatch estimates in ocean fisheries) and fishery-independent (young-of-year indices, adult net and electrofishing indices, coastal waters trawl surveys, and run count indices) datasets. From this information, the statuses of 23 stocks were determined to be *depleted* relative to historic levels, and one stock was increasing. Statuses of the remaining 28 stocks could not be determined, citing times-series of available data being too short. The term "*depleted*" was used, rather than "*overfished* and "*overfishing.*" It was determined that many factors (i.e., directed fishing, incidental fishing/bycatch, habitat loss, predation, and climate change) contribute to the decline of river herring populations, and the stock assessment did not determine estimates of river herring abundance and fishing mortality due to lack of adequate data. For many of these reasons, the stock assessment team suggested reducing the full range of impacts on river herring populations.

The following subsections discuss the impacts on non-target species of the alternatives for the proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps, with particular focus on impacts to the RH/S stocks.

7.2.1 Impacts of Alternatives for 2016-2018 Atlantic Herring Fishery Specifications on Non-Target Species

General Impacts

Interactions between the Atlantic herring fishery and non-target species are managed through provisions to help minimize catch and bycatch mortality to the extent practicable (National Standard 9) as well as other required and discretionary provisions of the MSA. Available data indicate that the majority of catch by Atlantic herring vessels on directed trips is Atlantic herring, with low percentages of bycatch.

Each of the alternatives for the 2016-2018 Atlantic herring fishery specifications include an annual specification for OFL, ABC, a stockwide Atlantic herring ACL (OY), DAH, DAP, USAP, BT, management area sub-ACLs (and seasons), RSA, and FGSA for 2016-2018. Under all of the alternatives for the 2016-2018 Atlantic herring fishery specifications, the following applies:

- Haddock catch by midwater trawl vessels in the Atlantic herring fishery will continue to be managed through a catch cap established in 2006 though Framework 43 to the Multispecies (Groundfish) Fishery Management Plan (FMP) and modified in 2011 through Framework 46. Currently, the herring midwater trawl fleet (including both single and paired midwater trawl vessels) is subject to a stock-specific cap on haddock catch that is equal to 1% of the GB haddock ABC and 1% of the GOM haddock ABC (see Section 6.2.1, p. 46 for more information about the catch of haddock by midwater trawl vessels in the Atlantic herring fishery).
- River herring and shad (RH/S) are non-target species of particular concern that may be caught/landed incidentally by vessels in the directed Atlantic herring fishery. The catch of RH/S in the directed Atlantic herring fishery will continue to be managed by area-based and gear-based catch caps. The alternatives under consideration for 2016-2018 RH/S catch cap levels are described in Section 4.3 (p. 34) and analyzed throughout Section 7.0.

In addition, regardless of which alternative is selected for the 2016-2018 Atlantic herring fishery specifications, the directed catch of non-target species and other sources of mortality will continue to be managed through their respective FMPs (Northeast Multispecies FMP and ASMFC Interstate Management Plans for River Herring and Shad) as well as other conservation/restoration efforts.

It is difficult to quantify specific positive or negative impacts on non-target species that may result from the proposed OFL/ABC levels for 2016-2018. In general, alternatives that allow for higher Atlantic herring catch may increase interactions with non-target species, but the impacts, whether positive or negative, will depend on changes in patterns in the Atlantic herring fishery (timing/effort) as well as the distribution/abundance of non-target species. Variability associated with these factors prevents specific predictions regarding impacts. However, in the two action alternatives under consideration (Alternative 2 and Alternative 3), the Atlantic herring ABC specification proposed for 2016-2018 is only 2.6% lower than the 2013-2015 ABC specification (Alternative 1). When the stockwide Atlantic herring ACL is distributed across the four management areas, the resulting sub-ACLs change by less than 1,000 mt in most cases (Table 7). Overall, because interactions with the primary non-target species in the Atlantic herring fishery (haddock and RH/S) will continue to be managed through catch caps, the impacts of all three alternatives on non-target species are expected to be ***negligible***. Because the differences in Atlantic herring catch between the alternatives are expected to be minor, differential impacts between the alternatives are expected to be ***negligible***.

Because the Atlantic herring ABC specification proposed for 2016-2018 is only 2.6% lower than the 2013-2015 ABC specification, and because available biological/fishery information does not indicate a need to consider major changes to the distribution of allowable catch in the herring fishery (sub-ACLs) or other specifications (e.g., BT, RSA, FGSA), the alternatives that the Council considered for 2016-2018 maintain the status quo for many specifications. Thus, the impacts of specifications other than ABC and ACL are not expected to differ from what was considered in prior actions and are not further discussed here.

7.2.1.1 Impacts of Alternative 1 (No Action)

No Action. The annual specification of Atlantic herring OFL and ABC would remain 114,000 mt in 2016-2018. This ABC specification is higher than the SSC's recommended specification of

111,000 mt. Because the seasonal/spatial distribution of Atlantic herring catch and fishing effort would not change from 2013-2015 levels, and due to the continuing management of non-target species catch in the Atlantic herring fishery and ongoing efforts to avoid/minimize bycatch, Alternative 1 is not expected to affect the biological status of any non-target species. Alternative 1 is therefore expected to have ***negligible*** impacts on non-target species.

7.2.1.2 Impacts of Alternative 2 (Non-Preferred)

Under Alternative 2 (as well as Alternative 3), the annual specification of Atlantic herring ABC for 2016-2018 would be 111,000 mt, based on the SSC recommendations. This is only 2.6% lower than the 2013-2015 Atlantic herring ABC specification (Alternative 1). When the stockwide Atlantic herring ACL is distributed across the four management areas under Alternative 2, there is very little change in the management area sub-ACLs when compared to Alternative 1 or Alternative 3 (Table 7). Because the change in the seasonal/spatial distribution of Atlantic herring catch and fishing effort under Alternative 2 is expected to be minor, and due to the continuing management of non-target species catch in the Atlantic herring fishery and ongoing efforts to avoid/minimize bycatch, Alternative 2 is not expected to affect the biological status of any non-target species. The impacts of Alternative 2 on non-target species are expected to be ***negligible***.

7.2.1.3 Impacts of Alternative 3 (*Preferred Alternative*)

Under Alternative 3 (as well as Alternative 2), the annual specification of Atlantic herring ABC for 2016-2018 would be 111,000 mt, based on the SSC recommendations. This is only 2.6% lower than the 2013-2015 Atlantic herring ABC specification (Alternative 1). When the stockwide Atlantic herring ACL is distributed across the four management areas under Alternative 3, the change in management area sub-ACLs is less than 1,000 mt in most cases, when compared to Alternative 1 or Alternative 2 (Table 7). Because the change in the seasonal/spatial distribution of Atlantic herring catch and fishing effort under Alternative 3 is expected to be minor, and due to the continuing management of non-target species catch in the Atlantic herring fishery and ongoing efforts to avoid/minimize bycatch, Alternative 3 is not expected to affect the biological status of any non-target species. The impacts of Alternative 3 on non-target species are expected to be ***negligible***.

7.2.2 Impacts of 2016-2018 RH/S Catch Caps on Non-Target Species

The alternatives under consideration for specifying the 2016-2018 RH/S catch caps are summarized in Table 26 (p. 37). The following subsections discuss the potential impacts of these alternatives on non-target species. Because the catch caps are focused exclusively on river herring and shad (RH/S), the impacts of the alternatives on other non-target species are expected to be negligible. Particular consideration is given here to the potential impacts of the catch cap alternatives for 2016-2018 on river herring and shad (RH/S).

While stock and fishery data are not robust enough at this time to determine a biologically-based RH/S catch cap and/or the potential impacts of such a catch cap on the RH/S stocks, setting a cap on the catch of these species in the directed Atlantic herring fishery is a proactive action intended to manage and minimize catch to the extent practicable, while allowing the Atlantic herring fishery to continue to operate and fully utilize OY during 2016-2018, if RH/S can be avoided. The catch of RH/S in the directed Atlantic herring fishery would likely be less under any of the alternatives when compared to not specifying catch caps in the fishery, because catch would be

capped, and there would be a regulatory incentive for the fleet to avoid RH/S. Generally, lower catches should result in positive impacts on RH/S.

Moreover, continuing to specify RH/S catch caps may generate more information, which can provide the Council with the ability to link RH/S catch in the Atlantic herring fishery to RH/S stock status and fishing mortality in the future. It could allow for future RH/S catch caps in the directed Atlantic herring fishery to be set such that more specific impacts on the RH/S stocks can be quantified. Due to the depleted status of many of the RH/S stocks, and concerns about the impact of RH/S catch/bycatch and associated mortality in the Atlantic herring fishery, there is likely to be a biological benefit to continuing to specify RH/S catch caps for the directed Atlantic herring fishery. The impacts of all of the RH/S catch cap alternatives on non-target species, particularly RH/S, are therefore expected to be ***low positive***.

There are, however, differences between the alternatives under consideration and their potential impacts on RH/S stocks. Specific biological impacts will be influenced by changes in directed Atlantic herring fleet behavior and shifts in the distribution/aggregation of RH/S stocks/sub-stocks resulting from changes in fishing activity, environmental factors, climate change, restoration efforts, and other factors. Comparing the total removals of RH/S that may be allowed under each catch cap alternative for 2016-2018 provides a basis for understanding the differences between the alternatives and their potential impacts on RH/S. Alternatives that would allow for lower annual RH/S removals in the directed Atlantic herring fishery are assumed to have a *more positive* impact on RH/S; alternatives that would allow for higher annual RH/S removals in the directed Atlantic herring fishery are assumed to have a *less positive* impact on RH/S.

Table 64 summarizes the calculation of total potential removals of RH/S in the directed Atlantic herring fishery (trips landing more than 6,600 pounds of Atlantic herring) under each RH/S catch caps alternative, assuming that 100% of the caps are caught. For each alternative, values represent estimates of catch in prior years using different approaches (Appendix I). Alternative 3 (seven-year time series) with the weighted mean would allow for the highest RH/S removals, followed by Alternative 1 (no action), Alternative 2 with the weighted mean, and Alternative 2 with the median. Alternative 3 with the median would allow for the lowest amount of total RH/S removals.

Table 64 - Potential removals of RH/S (mt) under each RH/S catch cap alternative

	Alt 1 (No Act)	Alt 2		Alt 3	
		(Median)	(Wgt Mean)	(Median)	(Wgt Mean)
Midwater Trawl GOM	85.5	98.1	98.3	11.3	76.7
Midwater Trawl Cape Cod	13.3	8.9	27.6	29.5	32.4
Midwater Trawl SNE/MA	123.7	83.9	115.4	83.9	129.6
Total Midwater Trawl	222.5	190.9	241.3	124.7	238.7
Small Mesh Bottom Trawl SNE/MA	88.9	19.6	28.2	24.0	122.3
Total RH/S Removals	**311.4**	**210.5**	**269.5**	**148.7**	**361**

Note: Estimated RH/S removals assume that 100% of the caps are taken on trips landing more than 6,600 pounds of Atlantic herring during the fishing year. Values represent estimates of catch in prior years, using different approaches (Appendix I).

7.2.2.1 Impacts of RH/S Alternative 1 (No Action)

No Action. Alternative 1 would maintain the 2014/2015 RH/S catch caps implemented in Framework 3 for the 2016-2018 fishing years. Under Alternative 1, the 2016-2018 RH/S catch caps would be based on the median value of estimated RH/S catch from 2008-2012 from Framework 3 (Table 23, p. 34). Framework 3 became effective very late in the 2014 fishing year, so 2015 was the first fishing year that the directed Atlantic herring fishery was operating under RH/S catch caps.

If 100% of the RH/S caps are taken in the directed Atlantic herring fishery (trips landing more than 6,600 pounds) during the fishing year, then Alternative 1 (no action) would allow for more total RH/S removals than Alternative 2 (Median and Weighted Mean) and Alternative 3 Median, but less total RH/S removals than Alternative 3 Weighted Mean (Table 64).

As discussed above, due to the depleted status of many of the RH/S stocks, and concerns about the impact of RH/S catch/bycatch and associated mortality in the Atlantic herring fishery, there is likely to be a biological benefit to continuing to specify RH/S catch caps for the directed Atlantic herring fishery. The impacts of Alternative 1 on non-target species, particularly RH/S, are therefore expected to be ***low positive***. The impacts of Alternative 1 on non-target species are expected to be *less positive* than Alternative 2 (Median and Weighted Mean), *less positive* than Alternative 3 Median, and *more positive* than Alternative 3 Weighted Mean.

7.2.2.2 Impacts of RH/S Alternative 2 (Non-Preferred)

Under Alternative 2, the 2016-2018 RH/S catch caps would be based on the Herring PDT's recent updates/revisions to the 2008-2012 RH/S catch estimates from Framework 3. The same five-year time series that was used in Framework 3 (2008-2012 with updated/revised data) would determine the RH/S catch caps under Alternative 2, with options to select either the median or weighted mean from the time series (Table 24, p. 35; Appendix I).

Option 1: Median. Option 1 would allow for up to 190.9 mt of RH/S to be taken by midwater trawl vessels and 19.6 mt of RH/S to be taken by small mesh bottom trawl vessels fishing in the southern New England/Mid-Atlantic area. Relative to Alternative 1 (2015 RH/S catch caps), Option 1 would decrease the amount of RH/S that could be taken by midwater trawl vessels by 14% and would significantly decrease (78%) the amount of RH/S that could be taken by SNE/MA SMBT vessels. Overall, the amount of RH/S that could be taken by the directed Atlantic herring fishery would decrease by 32.4% from 2015 levels under Option 1. Option 1 includes the lowest RH/S catch cap for the southern New England/Mid-Atlantic SMBT fleet.

Option 2: Weighted Mean. Option 2 would allow for up to 241.3 mt of RH/S to be taken by midwater trawl vessels and 28.2 mt of RH/S to be taken by small mesh bottom trawl vessels fishing in the southern New England/Mid-Atlantic area. Relative to the Alternative 1 (2015 RH/S catch caps), Option 2 would increase the amount of RH/S that could be taken by midwater trawl vessels by 8.4% and would decrease the amount of RH/S that could be taken by SNE/MA SMBT vessels by 68.3%. Overall, the amount of RH/S that could be taken by the directed Atlantic herring fishery would decrease by 13.5% from 2015 levels under Option 2.

Impacts on Non-Target Species (RH/S)

Of the RH/S catch cap alternatives under consideration for 2016-2018, Alternative 3 Weighted Mean would allow for the highest annual RH/S removals, followed by Alternative 1 (no action), Alternative 2 Weighted Mean, and Alternative 2 Median (Table 64, p. 119). Alternative 3 Median would allow for the lowest amount of total RH/S removals and is the most conservative option under consideration with respect to removals. If 100% of the RH/S caps are taken in the directed Atlantic herring fishery (trips landing more than 6,600 pounds) during the fishing year, then Alternative 2 (Median and Weighted Mean) is more conservative with respect to total RH/S removals than Alternative 1 (no action) and Alternative 3 Weighted Mean (***Preferred Alternative***), and it is less conservative than Alternative 3 Median. Alternative 2 Median is more conservative than Alternative 2 Weighted Mean.

As discussed above, due to the depleted status of many of the RH/S stocks and concerns about the impact of RH/S catch/bycatch and associated mortality in the Atlantic herring fishery, there is likely to be a biological benefit to continuing to specify RH/S catch caps for the directed Atlantic herring fishery. The impacts of all of the RH/S catch cap alternatives on non-target species, particularly RH/S, are therefore expected to be ***low positive***. When compared to the other RH/S catch cap alternatives in terms of potential RH/S removals, the impacts of Alternative 2 Median on non-target species are expected to be *less positive* than Alternative 3 Median and *more positive* than the other alternatives under consideration. The impacts of Alternative 2 Weighted Mean on non-target species are expected to be *less positive* than Alternative 2 Median and Alternative 3 Median and *more positive* than Alternative 1 and Alternative 3 Weighted Mean.

7.2.2.3 Impacts of RH/S Alternative 3 (*Preferred*)

Under Alternative 3, the 2016-2018 RH/S catch caps would be specified based on RH/S catch estimates from 2008-2014, using the Herring PDT's recently revised/updated data (Appendix I). Alternative 3 would incorporate RH/S catch estimates from the most recent two years, extending the time series to seven years, with options to select either the median or weighted mean values (Table 25, p. 36). Alternative 3, Option 2 is the ***Preferred Alternative*** for the 2016-2018 RH/S catch caps.

Option 1: Median. Option 1 would allow for up to 124.7 mt of RH/S to be taken by midwater trawl vessels and 24 mt of RH/S to be taken by small mesh bottom trawl vessels fishing in the southern New England/Mid-Atlantic area. Relative to Alternative 1 (2015 RH/S catch caps), Option 1 would decrease the amount of RH/S that could be taken by midwater trawl and SNE/MA SMBT vessels by 44% and 73%, respectively.

With respect to RH/S removals, this is the most conservative alternative/option under consideration for the 2016-2018 RH/S catch caps. Overall, the total amount of RH/S that could be taken by the directed Atlantic herring fishery would decrease by 52.2% from 2015 levels under Option 1. While Option 1 would allow for midwater trawl removals of RH/S to increase in the Cape Cod Area, overall removals of RH/S allowed by midwater trawl vessels under Option 1 are the lowest of the alternatives under consideration. Option also proposes a substantial reduction in the RH/S catch cap for SNE/MA SMBT vessels.

Option 2: Weighted Mean (*Preferred Alternative*). Option 2 would allow for up to 238.7 mt of RH/S to be taken by midwater trawl vessels and 122.3 mt of RH/S to be taken by small mesh bottom trawl vessels fishing in the southern New England/Mid-Atlantic area. This is the only option that includes an increase in the RH/S catch cap for SNE/MA SMBT vessels. Relative to Alternative 1 (2015 RH/S catch caps), Option 2 would increase the amount of RH/S that could be taken by midwater trawl and SNE/MA SMBT by 7.3% and 37.6%, respectively. Overall, the total amount of RH/S that could be taken by the directed Atlantic herring fishery would increase by 15.9% from 2015 levels under Option 2. This increase reflects use of the seven-year time series and weighted mean approach to estimating past RH/S catch, the approach to estimating past catch that the Herring PDT recommended as the most technically sound (Appendix 1).

Impacts on Non-Target Species (RH/S)

Of the RH/S catch cap alternatives under consideration for 2016-2018, Alternative 3 Weighted Mean would allow for the highest RH/S removals, followed by Alternative 1 (no action), Alternative 2 Weighted Mean, Alternative 2 Median, and Alternative 3 Median (Table 64, p. 119). If 100% of the RH/S caps are taken in the directed Atlantic herring fishery (trips landing more than 6,600 pounds) during the fishing year, then Alternative 3 Median is the most conservative option under consideration with respect to total RH/S removals, and Alternative 3 Weighted Mean (***Preferred Alternative***) is the least conservative (Table 64, p. 119). Alternative 3 Weighted Mean would allow total RH/S removals to increase about 16% from the potential removals allowed under the 2015 RH/S catch caps (Alternative 1).

As discussed above, due to the depleted status of many of the RH/S stocks and concerns about the impact of RH/S catch/bycatch and associated mortality in the Atlantic herring fishery, there is likely to be a biological benefit to continuing to specify RH/S catch caps for the directed Atlantic herring fishery. The impacts of all of the RH/S catch cap alternatives on non-target species, particularly RH/S, are therefore expected to be ***low positive***. When compared to the other RH/S catch cap alternatives in terms of potential RH/S removals, the impacts of Alternative 3 Median on non-target species are expected to be *more positive* than any other alternatives under consideration. The impacts of Alternative 3 Weighted Mean (***Preferred Alternative***) on non-target species are expected to be *less positive* than any other alternative under consideration. This increase reflects use of the seven-year time series and weighted mean approach to estimating past RH/S catch, the approach to estimating past catch that the Herring PDT recommended as the most technically sound (Appendix 1).

7.3 IMPACTS ON PHYSICAL ENVIRONMENT AND ESSENTIAL FISH HABITAT

The physical environment and Essential Fish Habitat (EFH) are described in Section 6.3 (p. 67). An assessment of the potential effects of the directed Atlantic herring commercial fishery on EFH for Atlantic herring and other federally-managed species in the Northeast region of the U.S. was conducted as part of an EIS that evaluated impacts of the Atlantic herring fishery on EFH (NMFS 2005). This analysis was included in Appendix VI, Volume II of the FEIS for Amendment 1 to the Atlantic Herring FMP. It found that midwater trawls and purse seines do occasionally contact the seafloor and may adversely impact the benthic habitat of a number of federally-managed species, including EFH for Atlantic herring eggs. However, after reviewing all the available information, the conclusion was reached that if the quality of EFH is reduced as a result of this contact, the impacts are minimal and/or temporary and, pursuant to MSA, do not need to be minimized, i.e., that there was no need to take specific action at that time to minimize the adverse effects of the herring fishery on benthic EFH. This conclusion also applied to pelagic EFH for Atlantic herring larvae, juveniles, and adults, and to pelagic EFH for any other federally-managed species in the region. Additional information is in the FEIS for Amendment 1 to the Atlantic Herring FMP, updated in the FEIS for Amendment 5 to the Atlantic Herring FMP.

The impacts of each of alternative under consideration in the 2016-2018 Atlantic herring fishery specifications on the Physical Environment and EFH are discussed in the following subsections. Overall, given the minimal and temporary nature of adverse effects on EFH in the Atlantic herring fishery, the alternatives under consideration are expected to have a ***negligible*** impact on the physical environment and EFH.

7.3.1 Impacts of Alternatives for 2016-2018 Atlantic Herring Fishery Specifications on the Physical Environment and EFH

Each of the alternatives considered for the 2016-2018 fishery specifications includes an annual specification for OFL, ABC, a stockwide Atlantic Herring ACL (OY), DAH, DAP, USAP, BT, management area sub-ACLs (and seasons), RSA, and FGSA for 2016-2018 are in Table 7.

Because the Atlantic herring ABC specification proposed for 2016-2018 is only 2.6% lower than the 2013-2015 ABC specification, and because available biological/fishery information does not indicate a need to consider major changes to the distribution of allowable catch in the herring fishery or other specifications, the alternatives that the Council considered for 2016-2018 maintain the status quo for many specifications. Given the minimal and temporary nature of adverse effects on EFH in the Atlantic herring fishery, these specifications are expected to have a ***negligible*** impact on the physical environment and EFH.

7.3.2 Impacts of 2016-2018 RH/S Catch Caps on the Physical Environment and EFH

The alternatives under consideration for specifying the 2016-2018 RH/S catch caps are summarized in (Table 26, p. 37). Given the minimal and temporary nature of adverse effects on EFH in the Atlantic herring fishery (NEFMC 2012), there is no measureable difference between any of the alternatives/options considered by the Council in these specifications. Thus, the preferred alternative and the non-preferred action alternative would not have any adverse effects on EFH as compared to the no action alternative. The impacts of the 2016-2018 RH/S catch cap specifications are therefore expected to be ***negligible***.

7.4 IMPACTS ON PROTECTED RESOURCES

The protected resources that are evaluated with respect to this management action are described in Section 6.4 (p. 73). The ESA and MMPA requirements addressed in Section 6.4 further explain the protected species/resources and have been well-documented in the major gear types currently used in the Atlantic herring fishery.

The following subsections discuss the impacts of the alternatives for the 2016-2018 Atlantic herring fishery specifications and RH/S catch caps on protected resources.

7.4.1 Impacts of Alternatives for 2016-2018 Atlantic Herring Fishery Specifications on Protected Resources

Each of the alternatives considered by the Council for the 2016-2018 Atlantic herring fishery specifications includes an annual specification for OFL, ABC, a stockwide Atlantic Herring ACL (OY), DAH, DAP, USAP, BT, management area sub-ACLs (and seasons), RSA, and FGSA for 2016-2018. Because the Atlantic herring ABC specification proposed for 2016-2018 is only 2.6% lower than the 2013-2015 ABC specification, and because available biological/fishery information does not indicate a need to consider major changes to the distribution of allowable catch in the herring fishery or other specifications, the alternatives that the Council considered for 2016-2018 maintain the status quo for many specifications.

7.4.1.1 Impacts of Alternative 1 (No Action)

No Action. The 2015 Atlantic herring fishery specifications would be maintained for the 2016-2018 fishing years. Aside from the OFL, the specifications identified in 2015 were also in place during the 2013 and 2014 fishing years.

Non-ESA Listed Species Impacts

Non-ESA listed species, which consist of species of cetaceans and pinnipeds (marine mammals), are known to interact with the Atlantic herring fishery (Section 3.4.3). Impacts of Alternative 1 on non-ESA listed species are somewhat uncertain, as quantitative analysis has not been performed. However, to the extent possible, available information on marine mammal interactions with commercial fisheries has been considered, including the Atlantic herring fishery (NEFSC 2015; Waring, et al. 2014; 2015) (Section 6.4.3). Aside from harbor porpoise and several stocks of bottlenose dolphin, there has been no indication that takes of non-ESA listed species of marine mammals in commercial fisheries over the last 5 or more years has gone above and beyond levels which would result in the inability of each species population to sustain itself. Specifically, aside from harbor porpoise and several stocks of bottlenose dolphin, potential biological removal (PBR) has not been exceeded for any of the non-ESA listed marine mammal species identified in Section 3.4.3 (Waring, et al. 2014; 2015).[3]

Although the available information on non-ESA listed marine mammal interactions with commercial fishing gear is a collective representation, and does not address the effects of the Atlantic Herring FMP specifically, the information does demonstrate that, to date, operation of

[3] Take reduction plans have been implemented for harbor porpoise (Harbor Porpoise Take Reduction Plan, effective January 1, 1999 (63 FR 71041)) and bottlenose dolphins (Bottlenose Dolphin Take Reduction Plan, effective April 26, 2006 (71 FR 24776)) to reduce bycatch in the fisheries affecting these species. These plans are still in place and are continuing to assist in decreasing bycatch levels for these species

the Atlantic Herring FMP, or any other fishery, has not resulted in a collective level of take that threatens the continued existence of non-ESA listed marine mammal populations. Based on this information, and the fact that voluntary measures exist that reduce serious injury and mortality to marine mammal species incidentally caught in trawl fisheries (see the Atlantic Trawl Gear Take Reduction Team), it is expected that Alternative 1, which will maintain status quo conditions, will result in levels of take that will not affect the continued existence of non- ESA listed species of marine mammals. For these reasons, Alternative 1 is expected to have ***low negative to negligible*** impacts on non- ESA listed species of marine mammals.

ESA Listed Species Impacts

As in Section 6.4.3, ESA listed species interactions with the Atlantic herring fishery are rare to non-existent. As Alternative 1 will maintain current operating conditions, changes in fishing effort or behavior above and beyond that which has been characteristic of the fishery over the last 3 or more years is not expected. As interactions with ESA listed species over this time frame were rare to non-existent, the Alternative 1 is expected to introduce any new risks (e.g., changes in gear or effort) to ESA listed species that have not already been considered by NMFS and deemed "not likely to adversely affect" these species (NMFS 2012a; b; 2013; 2014a; b). In fact, NMFS recently concluded that the Atlantic Herring FMP will not adversely affect or jeopardize the continued existence of any ESA listed species (NMFS 2014a; b). As a result, the effects of Alternative 1 on ESA listed species are expected to be ***negligible***.

7.4.1.2 Impacts of Alternative 2 (Non-Preferred)

Under Alternative 2 (as well as Alternative 3), the annual specification of Atlantic herring ABC for 2016-2018 would be 111,000 mt, based on the SSC recommendations. This is only 2.6% lower than the 2013-2015 Atlantic herring ABC specification (Alternative 1). When the stockwide Atlantic herring ACL is distributed across the four management areas under Alternative 2, there is very little change in the management area sub-ACLs when compared to Alternative 1 or Alternative 3 (Table 7). Because the change in the seasonal/spatial distribution of Atlantic herring catch and fishing effort under Alternative 2 is expected to be minor, the impacts on ESA and non-ESA listed species are not expected to change from those described for the no action alternative (see previous subsection). Based on this, the effects to ESA (***negligible***) and non-ESA (***low negative to negligible***) listed species are expected to be the same as those described for the no action alternative in the previous subsection (Section 7.1.1.1).

7.4.1.3 Impacts of Alternative 3 (*Preferred Alternative*)

Under Alternative 3 (as well as Alternative 2), the annual specification of Atlantic herring ABC for 2016-2018 would be 111,000 mt, based on the SSC recommendations. This is only 2.6% lower than the 2013-2015 Atlantic herring ABC specification (Alternative 1). When the stockwide Atlantic herring ACL is distributed across the four management areas under Alternative 3, the change in management area sub-ACLs is less than 1,000 mt in most cases, when compared to Alternative 1 or Alternative 2 (Table 7). Because the change in the seasonal/spatial distribution of Atlantic herring catch and fishing effort under Alternative 3 is expected to be minor, the impacts on ESA and non-ESA listed species are not expected to change from those described for the no action alternative (see previous subsection). Based on this, the effects to ESA (***negligible***) and non-ESA (***low negative to negligible***) listed species are

expected to be the same as those described for the no action alternative in the previous subsection (Section 7.1.1.1).

7.4.2 Impacts of 2016-2018 RH/S Catch Caps on Protected Resources

The alternatives under consideration for specifying the 2016-2018 RH/S catch caps are summarized in Table 26 (p. 37). The following subsections discuss the potential impacts of these alternatives/options on protected resources.

Overall, the alternatives under consideration for the 2016-2018 RH/S catch caps are not expected to substantially change fishing effort or behavior in the Atlantic herring fishery such that effects to protected species differ significantly from those that have been considered in the section above (Section 7.4.1, Impacts of 2016-2018 Atlantic Herring Fishery Specifications). However, depending on which RH/S catch cap alternative is selected by the Council, it is possible that one or more of the RH/S catch caps may result in the closure of a RH/S Catch Cap Area(s) sometime during the 2016-2018 fishing years. The potential for interaction with protected resources therefore, may increase or decrease depending on when and how directed herring fishing effort changes as a result of the particular catch caps. Presumably, RH/S catch cap alternatives that allow for more removals of RH/S would have a lower likelihood of closing the directed Atlantic herring fishery (and consequently reducing Atlantic herring fishing effort) and therefore, interactions risks with protected species would likely remain similar to those described in Section 7.4.1 (impacts under the specifications); however, alternatives that allow for fewer removals of RH/S would have a higher likelihood of closing the directed Atlantic herring fishery and reducing Atlantic herring fishing effort (e.g., amount and time gear is present in water), thereby precluding the directed fishery in one or more management areas. Under the latter scenario, interaction risks with protected species would likely decrease and therefore afford more positive impacts to protected species than if RH/S catch caps are higher. Specifically, as the area fished and the duration of time that gear is in the water significantly influences the risk of protected species interaction with fishing gear, any decrease in Atlantic herring fishery effort as a result of a lower RH/S cap would likely equate to a reduction in time that gear would be present in the water and therefore, reduce interaction risk to protected species in the affected area.

Using the rationale described in the previous paragraph, the following subsections will address the impacts of the RH/S catch cap alternatives on protected species.

1.1.2.4 Impacts of RH/S Alternative 1 (No Action)

No Action. Alternative 1 would maintain the 2014/2015 RH/S catch caps implemented in Framework 3 for the 2016-2018 fishing years. Under Alternative 1, the 2016-2018 RH/S catch caps would be based on the median value of estimated RH/S catch from 2008-2012 from Framework 3 (Table 23, p. 34). As the no action alternative would maintain the RH/S catch caps that have been in place for last two years, overall changes in fishing behavior and effort are not expected to go above and beyond current operating conditions. As a result, effects to protected resources are expected to similar to those described in Section 7.4.1.1 (ESA listed species: ***negligible***; non-ESA listed species: ***low negative to negligible***).

Table 64 (p. 119) summarizes the total potential removals of RH/S in the directed Atlantic herring fishery (trips landing more than 6,600 pounds of Atlantic herring) under the RH/S catch caps proposed in each alternative, assuming that 100% of the caps are caught. Of the alternatives under consideration, Alternative 3 (Weighted Mean) would allow for the highest RH/S removals,

followed by Alternative 1 (no action alternative), then Alternative 2 (Weighted Mean), and Alternative 2 (Median). Alternative 3 (Median) would allow for the lowest amount of total annual RH/S removals. As a result, with the exception of Alternative 3 (weighted mean), Alternative 1 has a lower likelihood of closing the directed Atlantic herring fishery (and consequently reducing Atlantic herring fishing effort) than all other proposed alternatives. Based on this information and the rationale in the previous subsection, relative to potential impacts on protected resources, RH/S Alternative 1 is likely to be *more positive* than Alternative 3 (Weighted Mean) and *less positive* than all of the other alternatives under consideration.

1.1.2.5 Impacts of RH/S Alternative 2 (Non-Preferred)

Under RH/S Alternative 2, the 2016-2018 RH/S catch caps would be based on the Herring PDT's updates/revisions to the 2008-2012 RH/S catch estimates from Framework 3 (Appendix I). The same five-year time series that was utilized in Framework 3 (2008-2012 with updated/revised data) would be used to determine the RH/S catch caps under Alternative 2, with options to select either the median or weighted mean from the time series (Table 24, p. 35). As in Table 64, total RH/S removals for Alternative 2 are 210.5 mt (median) or 269.5 mt (weighted mean).

Under Alternative 2, both the median or weighted mean options are less than the No Action RH/S total caps. As in Section 1.1.2.4, effects of Alternative 1 to protected resources are expected to similar to those described in Section 7.4.1.1 (ESA listed species: negligible; non-ESA listed species: low negative to negligible). As the total RH/S catch cap under both options of Alternative 2 are lower than Alternative 1, effects to protected species would be no worse than those under Alternative 1; however, as described in Section 7.4.2, with a lower total catch cap, there is higher likelihood of closing the directed Atlantic herring fishery and reducing Atlantic herring fishing effort; this equates to a reduce potential for protected species interactions (Section 7.4.2). With total catch caps under Alternative 2 being reduced from current operating conditions (similar to Alternative 1 conditions), there is the possibility for overall effort to decrease in the Atlantic herring fishery under either option of Alternative 2 and therefore, the potential for reduced interaction risks with protected species. However, one must still consider the potential, even under Alternative 2, that the catch cap limits will not be attained. Under these circumstances, impacts to protected species would be similar to Alternative 1 (Section 1.1.2.4). Based on this information, effects to protected resources from Alternative 2 (Option 1 or 2) are expected to range between ***low positive to low negative***.

Table 64 (p. 119) summarizes the total potential removals of RH/S in the directed Atlantic herring fishery (trips landing more than 6,600 pounds of Atlantic herring) under the RH/S catch caps proposed in each alternative, assuming that 100% of the caps are caught. Of the alternatives under consideration, Alternative 3 (Weighted Mean) would allow for the highest RH/S removals, followed by Alternative 1 (no action), Alternative 2 (Weighted Mean), and Alternative 2 (Median). Alternative 3 (Median) would allow for the lowest amount of total RH/S removals. As a result, Alternative 2 has a lower likelihood of closing the directed Atlantic herring fishery (and consequently reducing Atlantic herring fishing effort) than Alternative 3 (Median); however, relative to Alternative 1 (no action) and 3 (weighted mean), Alternative 2 (weighted or median) has a higher potential of closing the directed Atlantic herring fishery (and consequently reducing Atlantic herring fishing effort). Based on this information and the rationale in Section 7.4.2, in terms of potential impacts on protected resources, Alternative 2 is likely to be *more positive* than

Alternative 1 (no action) or Alternative 3 (Weighted Mean) and *less positive* than Alternative 3 (median).

1.1.2.6 Impacts of RH/S Alternative 3 (*Preferred Alternative*)

Under RH/S Alternative 3, the 2016-2018 RH/S catch caps would be specified based on RH/S catch estimates from 2008-2014, using the Herring PDT's revised/updated data (Appendix I). Alternative 3 would incorporate RH/S catch estimates from the most recent two years as well, extending the time series to seven years, with options to select either the median or weighted mean values (Table 25, p. 36). Alternative 3, Option 2 is the ***Preferred Alternative*** for the 2016-2018 RH/S catch caps at this time.

Option 1: Median. Under Option 1, the total RH/S catch cap is less than the No Action RH/S total cap (Alternative 1). As the total RH/S catch cap under Option 1 is lower than Alternative 1, there is higher likelihood of closing the directed Atlantic herring fishery and reducing Atlantic herring fishing effort; this equates to a reduce potential for protected species interactions (Section 4.4.2). With the total catch cap under Option 1 being significantly reduced from current operating conditions (similar to Alternative 1 conditions; 162.7 mt difference), there is a strong possibility for overall effort to decrease in the Atlantic herring fishery under Option 1. As a result, interactions risks to protected resources are likely to decrease under Option 1; however, should catch cap limits not be attained under Option 1, impacts to protected species would be similar to Alternative 1 (Section 1.1.2.4). Based on this information, effects to protected resources from Option 1 are expected to range between ***low positive to low negative***.

Table 64 (p. 119) summarizes the total potential removals of RH/S in the directed Atlantic herring fishery (trips landing more than 6,600 pounds of Atlantic herring) under the RH/S catch caps proposed in each alternative, assuming that 100% of the caps are caught. Of the alternatives under consideration, Alternative 3 (Weighted Mean) would allow for the highest RH/S removals, followed by Alternative 1 (no action), Alternative 2 (Weighted Mean), and Alternative 2 (Median). Alternative 3 (Median) would allow for the lowest amount of total RH/S removals. As a result, Alternative 3 (mean; Option 1) has a higher likelihood of closing the directed Atlantic herring fishery (and consequently reducing Atlantic herring fishing effort) than all other proposed Alternatives. Based on this information and the rationale in Section 7.4.2, in terms of potential impacts on protected resources, Alternative 3 (mean; Option 1) is likely to be *more positive* than all other alternatives under consideration.

Option 2: Weighted Mean (*Preferred Alternative*). Under Option 2, the total RH/S catch cap is technically greater than all other proposed alternatives; however, to provide some context to what this catch limit equates to in terms of fishing effort, relative to the No Action RH/S total catch cap, the difference between the two is not so great effort or fishing behavior under Option 2 is expected to change significantly from operating conditions under the no action alternative (i.e., there is a 49.6 mt difference between the total RH/S removals between Alternative 1 and Alternative 3 (weighted mean). As a result, effects of Option 2 to protected resources are expected to similar to those described in Section 1.1.2.4 (ESA listed species: ***negligible***; non-ESA listed species: ***low negative to negligible***).

Table 64 (p. 119) summarizes the total potential removals of RH/S in the directed Atlantic herring fishery (trips landing more than 6,600 pounds of Atlantic herring) under the RH/S catch caps proposed in each alternative, assuming that 100% of the caps are caught. Of the alternatives under consideration, Alternative 3 (Weighted Mean) would allow for the highest RH/S removals,

followed by Alternative 1 (no action), Alternative 2 (Weighted Mean), and Alternative 2 (Median). Alternative 3 (Median) would allow for the lowest amount of total RH/S removals. As a result, Alternative 3 (weighted mean; Option 2) has a lower likelihood of closing the directed Atlantic herring fishery (and consequently reducing Atlantic herring fishing effort) than all other proposed Alternatives. Based on this information and the rationale in Section 7.4.2, in terms of potential impacts on protected resources, Alternative 3 (mean weighted; Option 2) is likely to be *more negative* than all other alternatives under consideration.

7.5 IMPACTS ON FISHERY-RELATED BUSINESSES AND COMMUNITIES

The analysis of impacts on fishery-related businesses and communities characterizes the magnitude and extent of the economic and social impacts likely to result from the alternatives considered for the 2016-2018 Atlantic herring fishery specifications as compared to the no action alternatives. National Standard 8 requires the Council to consider the importance of fishery resources to affected communities and provide those communities with continuing access to fishery resources, but it does not allow the Council to compromise the conservation objectives of the management measures. Thus, continued overall access to fishery resources is a consideration, but not a guarantee that fishermen will be able to use a particular gear type, harvest a particular species of fish, fish in a particular area, or fish during a certain time of the year.

A fundamental difficulty exists in forecasting economic and social change relative to fishery management alternatives when communities or other societal groups are constantly evolving in response to numerous external factors, such as market conditions, technology, alternate uses of waterfront, and tourism. Certainly, management regulations influence the direction and magnitude of economic and social change, but attribution is difficult with the tools and data available. While this analysis focuses generally on the economic and social impacts of the proposed fishing regulations, external factors may also influence change, both positive and negative, in the affected communities. In many cases, these factors contribute to a community's vulnerability and ability to adapt to new or different fishing regulations.

When examining potential economic and social impacts of management measures, it is important to consider impacts on the following: the fishing fleet (vessels grouped by fishery, primary gear type, and/or size); vessel owners and employees (captains and crew); herring dealers and processors; final users of herring; community cooperatives; fishing industry associations; cultural components of the community; and fishing families. While some management measures may have a short-term negative impact on some communities, this should be weighed against potential long-term benefits to all communities which can be derived from a sustainable herring fishery.

The social impact factors outlined on the following page can be used to describe the Atlantic herring fishery, its sociocultural and community context and its participants. These factors or variables are considered relative to the management alternatives and used as a basis for comparison between alternatives. Use of these kinds of factors in social impact assessment is based on NMFS guidance (NMFS 2007) and other texts (e.g., Burdge 1998). Longitudinal data describing these social factors region-wide and in comparable terms is limited. While this analysis does not quantify the impacts of the management alternatives relative to the social

impact factors, qualitative discussion of the potential changes to the factors characterizes the likely direction and magnitude of the impacts. The factors fit into five categories:

1. *Size and Demographic Characteristics* of the fishery-related workforce residing in the area; these determine demographic, income, and employment effects in relation to the workforce as a whole, by community and region.

2. The *Attitudes, Beliefs, and Values* of fishermen, fishery-related workers, other stakeholders and their communities; these are central to understanding the behavior of fishermen on the fishing grounds and in their communities.

3. The effects of the proposed action on *Social Structure and Organization*; that is, changes in the fishery's ability to provide necessary social support and services to families and communities.

4. The *Non-Economic Social Aspects* of the proposed action; these include lifestyle, health, and safety issues, and the non-consumptive and recreational uses of living marine resources and their habitats.

5. The *Historical Dependence on and Participation in* the fishery by fishermen and communities, reflected in the structure of fishing practices, income distribution, and rights (NMFS 2007).

In general, the economic effects of regulations can be categorized into regulations that change costs (including transactions costs such as search, information, bargaining, and enforcement costs) or change revenues (by changing market prices or by changing the quantities supplied). These economic effects may be felt by the directly regulated entities. They may also be felt by related industries. For the herring fishery, this might include, for example, participants in the lobster fishery, zoos, and purchasers of herring for food.

7.5.1 Impacts of Alternatives for 2016-2018 Atlantic Herring Fishery Specifications on Fishery-Related Businesses and Communities

General Impacts

Each of the alternatives includes an annual specification for OFL, ABC, a stockwide Atlantic herring ACL (OY), DAH, DAP, USAP, BT, management area sub-ACLs (and seasons), RSA, and FGSA for 2016-2018. Because the Atlantic herring ABC specification proposed for 2016-2018 (recommended by the SSC, Section 4.1.1) only differs from the 2013-2015 ABC specification by 3,000 mt (2.6% lower), and because available biological/fishery information does not indicate a need to consider major changes to the distribution of allowable catch or other specifications, the alternatives for 2016-2018 maintain the status quo (2013-2015) for many of the fishery specifications (e.g., sub-ACLs, BT, RSA, FGSA),. The alternatives differ primarily through the specification of management uncertainty and the overall (stockwide) Atlantic herring ACL. Thus, the impacts of specifications other than ABC and ACL are not expected to differ from what was considered in prior actions and are not discussed here.

Overall, the impacts to fishery-related businesses and communities of all the alternatives are expected to be ***low positive***, and there are only minor differences between the alternatives. Stability in specifications provides a sense of certainty about regulations and the future of the Atlantic herring fishery, which is a substantial benefit to business and household planning. Over the long-term, harvesting within OFL, ABC, and ACL constraints should provide for a

sustainable herring fishery, which has positive economic and social impacts. For the OFL, ABC, and ACL specification alternatives (Section 4.1), the SSC determined that Alternatives 2 and 3 are biologically acceptable (NEFMC 2015). When considering the importance of fishery resources to fishing communities, National Standard 8 specifies that, "All other things being equal, where two alternatives achieve similar conservation goals, the alternative that provides the greater potential for sustained participation of such [fishing] communities and minimizes the adverse economic impacts on such communities would be the preferred alternative (NMFS 2009)."

This analysis assumes that the directed Atlantic herring fishery will not get shut down by the RH/S catch caps (Section 4.3), the negative consequences of which are described in Section 7.5.2.

7.5.1.1 Impacts of Alternative 1 (No Action)

No Action. The herring fishery specifications from 2015 would remain constant for 2016-2018 fishing years. The specification of Atlantic herring ABC would remain at 114,000 mt, which is above the SSC recommendation for 2016-2018 (111,000 mt).

With no change in the ABC, Alternative 1 would likely result in a degree of constancy and predictability for fishing industry operations and a steady supply to the market (in addition to the stability provided by a three-year specifications process). Maintaining the status quo ABC would likely result in negligible social and economic impacts in the short term. Total revenue for the fishery is not expected to change, unless price should change. At a typical nominal price of $300/mt, the total revenue would be about $32.3M, should all of the ACL be landed. The *Size and Demographic Characteristics* of the fishery-related workforce would likely be unchanged, as would the *Historical Dependence on and Participation in* the fishery. However, since the ABC is slightly higher than the level recommended by the SSC to be biologically acceptable (e.g., there is a 54% probability that overfishing would occur in Year 3 (2018)), Alternative 1 may lead to overfishing in Year 3, which could have negative impacts if it necessitates a reduction in future Atlantic herring catch. There may also be a negative impact on the *Attitudes, Beliefs, and Values* of stakeholders towards management should overfishing actually occur. Overall, because of the relatively low probability of overfishing associated with Alternative 1, the impacts of Alternative 1 on fishery-related businesses and communities are expected be ***low positive***.

7.5.1.2 Impacts of Alternative 2 (Non-Preferred)

Alternative 2 would specify Atlantic herring ABC at the level recommended by the SSC (111,000 mt) and would maintain a status quo approach to specifying the management uncertainty buffer for 2016-2018 (value is 3,000 mt lower). All other fishery specifications (e.g., border transfer) would be unchanged.

Relative to Alternative 1, Alternative 2 provides essentially the same fishing opportunities for participants in the Atlantic herring fishery in all three years (the stockwide Atlantic herring ACL would be 200 mt greater under Alternative 2 and slightly more than Alternative 3 (3,200 mt greater without the NB weir payback provision). Because ready substitutes for Atlantic herring exist, prices are not likely to change dramatically when the quantity supplied of herring changes, so an increase in supply relative to Alternative 1 is likely to correspond to an increase in revenue (Section 6.5.5). Total revenue for the fishery is expected to increase slightly relative to No

Action, unless price should change. At a typical nominal price of $300/mt, the total revenue would be about $32.4M (a $0.1M increase), should all of the ACL be landed. If a minor increase in quantity supplied is realized, employment opportunities would either be stable or slightly increase, resulting in negligible to low positive impacts to the *Size and Demographic Characteristics* of the fishery-related workforce relative to Alternative 1. The *Historical Dependence on and Participation* in the fishery would either be sustained or increased. Like Alternative 1, Alternative 2 maintains a constant ABC over the specifications period (2016-2018), providing consistency for fishing industry operations, stability for the industry and a steady supply to the market (in addition to the stability provided by a three-year specifications process).

Overall, the impacts of Alternative 2 on fishing businesses and communities are likely ***low positive***. Relative to Alternative 1, the impacts of Alternative 2 on fishing businesses and communities are expected to be *more positive*, and relative to Alternative 3, the impacts are expected to be *less positive*.

7.5.1.3 Impacts of Alternative 3 (*Preferred Alternative*)

Alternative 3 would specify Atlantic herring ABC at the level recommended by the SSC (111,000 mt) and would maintain the status quo value for the management uncertainty buffer for 2016-2018. All other specifications (e.g., border transfer) would be unchanged.

Relative to Alternatives 1 and 2, Alternative 3 would provide slightly less fishing opportunity in 2016-2018 for participants in the herring fishery (the stockwide Atlantic herring ACL would be lower by 3,000 and 3,200 mt, respectively, without the NB weir payback provision). Because ready substitutes for Atlantic herring exist, prices are not likely to change dramatically when the quantity supplied of herring changes, so a decrease in supply relative to Alternative 1 is likely to correspond to a decrease in revenue (Section 6.5.5). Total revenue for the fishery is expected to decrease slightly relative to No Action, unless price should change. At a typical nominal price of $300/mt, the total revenue would be about $31.4M (a $0.9M decrease), should all of the ACL be landed. If a decrease in quantity supplied is realized, employment opportunities would likely decrease, resulting in low negative impacts to the *Size and Demographic Characteristics* of the fishery-related workforce relative to Alternatives 1 and 2. The *Historical Dependence on and Participation in* the fishery would either be sustained or decreased. Like Alternatives 1 and 2, Alternative 3 maintains a constant ABC over the specifications period, providing consistency for fishing industry operations, stability for the industry and a steady supply to the market (in addition to the stability provided by a three-year specifications process).

Alternative 3 contains an option that up to 1,000 mt of catch could be added to the Area 1A sub-ACL should NMFS determine that less than 4,000 mt has been caught by the New Brunswick weir fishery by either October 1 or 15. Relative to Alternative 1 and Alternative 2, this option would generally have *positive* impacts on the fishery-related businesses (82% purse seines in 2012-2014, Table 52) and communities (primarily Portland, Rockland, Gloucester; Table 59) that rely on fishing in Area 1A. The Council selected October 1 as the preferred date. The October 1 deadline is expected to have *low positive* impacts on fishing businesses and communities relative to October 15, as it more likely to precede any sub-ACL closure, thus better avoiding fishery disruption.

Overall, the impacts of Alternative 3 on fishing businesses and communities are expected to be ***low positive.*** Relative to Alternatives 1 and 2, the impacts of Alternative 3 on fishing businesses

and communities are expected to be *more negative*, because the stockwide Atlantic herring ACL available to the fishery would be lower. However, there are no discernable differences between the impacts of Alternatives 1 and 2 relative to Alternative 3, because the stockwide ACLs are almost the same in Alternatives 1 and 2.

7.5.2 Impacts of 2016-2018 RH/S Catch Caps on Fishery-Related Businesses and Communities

The 2016-2018 RH/S catch cap alternatives (Table 26, p. 37) would apply to midwater trawl vessels in the Gulf of Maine and Cape Cod Catch Cap Areas, and to both midwater trawl and small mesh bottom trawl vessels in the southern New England/Mid-Atlantic Catch Cap Area (see RH/S Catch Cap Areas shaded on Figure 1, p. 3) on all trips landing more than 6,600 pounds of Atlantic herring. No RH/S catch cap would be adopted for the GB Catch Cap Area. Since only limited access herring vessels (permit categories A/B/C) are allowed to land more than 6,600 pounds of Atlantic herring, these are the vessels that these alternatives would directly impact. The trips landing more than 6,600 pounds of Atlantic herring accounted for 96% or more of annual Atlantic herring landings between 2008 and 2012. While the catch caps directly impact the active limited-access herring vessels, they may indirectly impact users of herring (e.g. lobstermen who use herring as bait). Framework 3 details the impacts of establishing a catch cap program, which has only been in place for 2015, so analysis of the impact of the alternatives in this section are somewhat hampered by scant data on the performance of the caps to date.

General Discussion of Positive Impacts: RH/S catch caps are unlikely to have substantial negative impacts on fishery-related businesses and communities, as long as the caps do not constrain Atlantic herring harvest. RH/S catch caps incentivize participants in the directed herring fishery to find innovative, low-cost solutions to avoid river herring and shad. Communication networks developed for river herring avoidance might be used for other reasons, for example, safety-related circumstances that arise suddenly or other fisheries or fishing-related problems. Having a RH/S catch cap in inshore areas may incentivize fishing offshore which may reduce gear conflicts. To the extent that the caps successfully lead to increases in RH/S abundance, establishing caps would increase the sense of well-being of those whose businesses rely on herring as forage, and RH/S stocks could eventually be of less concern. It would likely lead to improved coordination with the MAFMC, resulting in greater trust in management among the industry, a positive impact on the formation of *Attitudes* and *Beliefs.* To the extent that the caps successfully limit catch of RH/S, the herring catch may be cleaner, requiring less culling. This may improve fishery operations.

General Discussion of Negative Impacts: RH/S catch caps could result in some negative impacts on fishery-related businesses and communities as well. If the RH/S catch cap is reached for a gear type in the directed fishery in a particular area(s), the resultant closure of the directed fishery could reduce fishing profits in the herring fishery. This could lead to lower employment and a decrease in the *Size and Demographic Characteristics* of the fishery-related workforce. Fishermen could hold negative *Attitudes* and *Beliefs* towards management if herring fishing is closed part-way through the year. Interruption in the supply of herring could raise the cost of bait for the lobster fishery and other users, thereby potentially affecting the *Size and Demographic Characteristics* of the lobster industry. Additional reporting burdens could produce negative *Attitudes* about management. Closing the fishery to certain gear types in certain areas may cause resentment or conflict between fishing groups, a negative social impact in the form of changes to *Social Structures and Organizations*. Closing the fishery inshore may incentivize smaller vessels

to fish offshore, which may lead to unsafe fishing conditions, a negative impact on the *Non-Economic Social Aspects* of the action.

7.5.2.1 Impacts of RH/S Alternative 1 (No Action)

No Action. The 2016-2018 RH/S catch caps would be based on the median value of estimated RH/S catch from 2008-2012 from Framework 3 (Table 23, p. 34).

Based on the performance of the fishery under the first year of the RH/S catch caps so far (2015 not yet complete), the impacts of Alternative 1 on fishery-related businesses and communities are likely to be ***negligible***. The status quo would be maintained, and the caps have not yet shut down the directed Atlantic herring fishery (see Table 35 in Section 6.2.3.3 (p. 63) for information about RH/S catch under the 2015 catch caps YTD). Most of the RH/S interactions have been in the Cape Cod and Southern New England areas (no catch to date in the GOM midwater trawl fishery). Although more than half of the SNE bottom trawl fishery RH/S catch cap has been caught, that fishery is most active in the early months of the year, so it is unlikely that this fishery will be constrained during the 2015 fishing year.

7.5.2.2 Impacts of RH/S Alternative 2 (Non-Preferred)

Under RH/S Alternative 2, the 2016-2018 RH/S catch caps would be based on the recent Herring PDT's updates/revisions to the 2008-2012 RH/S catch estimates from Framework 3. The same five-year time series that was utilized in Framework 3 (2008-2012 with updated/revised data) would be utilized to determine the RH/S catch caps under Alternative 2, with options to select either the median or weighted mean from the time series (Table 24, p. 35).

If the Alternative 2 caps constrain the directed Atlantic herring fishery, there would be negative impacts on fishery-related businesses and communities. For the Gulf of Maine midwater trawl fishery, the Alternative 2 caps are higher than Alternatives 1 and 3, but none are likely to be constraining based on 2015 performance to date. The cap with the greatest potential to be constraining under Alternative 2 is the cap for the SNE/MA bottom trawl fishery, as the cap (19.6 or 28.2 mt) is much lower than catch to date in 2015 (Section 6.2.3.3, p. 63). Using more accurate RH/S catch data for the basis of management would have positive impacts on the *Attitudes and Beliefs* of stakeholders on their perceptions of management. Overall, the impacts of Alternative 2 would be ***negligible*** relative to the no action alternative, except for the SNE/MA bottom trawl fleet, which would likely experience *negative* impacts.

Option 1: Median. Option 1 uses the median values of the 2008-2012 revised data. The impacts of Option 1 on fishery-related businesses and communities would be *more negative* relative to Option 2. The caps would be more constraining of the directed Atlantic herring fishery. Option 1 would allow more river herring to remain in the ecosystem, a positive impact to users of the river herring resource.

Option 2: Weighted Mean. Option 2 uses the weighted mean values of the 2008-2012 revised data. The impacts of Option 2 on fishery-related businesses and communities would be *more positive* relative to Option 1. The caps would be less constraining of the directed Atlantic herring fishery. Option 2 would allow less river herring to remain in the ecosystem, a negative impact to users of the river herring resource.

7.5.2.3 Impacts of RH/S Alternative 3 (*Preferred*)

Under RH/S Alternative 3, the 2016-2018 RH/S catch caps would be specified based on RH/S catch estimates from 2008-2014, using the Herring PDT's revised/updated data (Appendix I). Alternative 3 would incorporate RH/S catch estimates from the most recent two years as well, extending the time series to seven years, with options to select either the median or weighted mean values (Table 25, p. 36). Alternative 3, Option 2 is the ***Preferred Alternative*** for the 2016-2018 RH/S catch caps.

The impacts of Alternative 3 on fishery-related businesses and communities are likely to be ***negligible*** relative to Alternative 1. Using improved data for the basis of management would have positive impacts on the *Attitudes and Beliefs* of stakeholders on their perceptions of management. Alternative 3 would lower the catch caps for some gear types and areas, but increase them for others, relative to Alternatives 1 and 2.

If the Alternative 3 caps constrain the directed Atlantic herring fishery, there would be negative impacts on fishery-related businesses and communities. For the Gulf of Maine midwater trawl fishery, the Alternative 3 caps are lower than Alternatives 1 and 2, but none are likely to be constraining based on 2015 performance to date (Section 6.2.3.3, p. 63). The catch cap with the greatest potential to be constraining under Alternative 3 is the median cap for the SNE/MA bottom trawl fishery, as the cap (24.0 mt) is much lower than catch to date in 2015 (46.9 mt). Using more accurate RH/S catch data for the basis of management would have positive impacts on the *Attitudes and Beliefs* of stakeholders on their perceptions of management. Overall, the impacts of Alternative 3 are expected to be ***negligible***, except potentially for the SNE/MA bottom trawl fleet (should the median value be selected), which would likely have *negative* impacts.

Option 1: Median. Option 1 uses the median values of the 2008-2014 data. The impacts of Option 1 on fishery-related businesses and communities would be *more negative* relative to Option 2. The catch caps would be more constraining of the directed Atlantic herring fishery (particularly for the SNE/MA bottom trawl fleet). Option 1 would allow more river herring to remain in the ecosystem, a positive impact to users of the river herring resource.

Option 2: Weighted Mean (*Preferred Alternative*). Option 2 uses the weighted mean values of the 2008-2014 data. The impacts of Option 2 on fishery-related businesses and communities would be *more positive* relative to Option 1. The catch caps would be less constraining of the directed Atlantic herring fishery. Option 2 would allow less river herring to remain in the ecosystem, a positive impact to users of the river herring resource.

7.6 CUMULATIVE EFFECTS

A cumulative effects assessment (CEA) is a required part of an EIS or EA according to the Council on Environmental Quality (CEQ) (40 CFR part 1508.7) and NOAA's agency policy and procedures for NEPA, found in NOAA Administrative Order 216-6. The purpose of the CEA is to integrate into the impact analyses the combined effects of many actions over time that would be missed if each action were evaluated separately. CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective. Rather, the intent is to focus on those effects that are truly meaningful. This section serves to examine the potential direct and indirect effects of the alternatives under consideration together with past, present, and reasonably foreseeable future actions that affect the environment related

to the Atlantic herring fishery. The predictions of potential synergistic effects from multiple actions, past, present and/or future are generally be qualitative in nature, because of the limitations of determining effects over the large geographic areas under consideration.

The regulatory atmosphere within which Federal fishery management operates requires that management actions be taken in a manner that will optimize the conditions of resources, habitat, and human communities. Consistent with NEPA, the MSA requires that management actions be taken only after consideration of impacts to the biological, physical, economic, and social dimensions of the human environment. Given this, and because fishery management actions must strive to create and maintain sustainable resources, impacts on all valued ecosystem components VECs (except short-term impacts to human communities) from past, present and reasonably foreseeable future actions, when combined with baseline conditions, have generally been positive and are expected to continue in that manner for the foreseeable future. This is not to say that some aspects of the various VECs are not experiencing negative impacts, but rather, that when taken as a whole and compared to the level of unsustainable effort that existed prior to and just after the fishery came under management control, the overall long-term trend is positive.

7.6.1 Valued Ecosystem Components

Consistent with CEA guidelines, cumulative effects can be more easily identified by analyzing the impacts of the Proposed Action on VECs. The affected environment is described in this document based on VECs that were identified for consideration relative to the proposed specifications. VECs represent the resources, areas, and human communities that may be affected by a Proposed Action or alternatives and by other actions that have occurred or will occur outside the Proposed Action. VECs are generally the “place” where the impacts of management actions are exhibited. An analysis of impacts is performed on each VEC to assess whether the direct/indirect effects of an alternative adds to or subtracts from the effects that are already affecting the VEC from actions outside of the Proposed Action (i.e., cumulative effects).

The Affected Environment is described (Section 6.0) based on VECs that were identified in Framework 4 (NEFMC 2014c):

1. Atlantic Herring (Section 6.1);
2. Non-Target Species (Section 6.2);
3. Physical Environment and Essential Fish Habitat (EFH; Section 6.3);
4. Protected Resources (Section 6.4); and
5. Fishery-Related Businesses and Communities (Section 6.5).

Changes to the Atlantic Herring FMP have the potential to directly affect the Atlantic herring resource. Similarly, management actions that would alter the distribution and magnitude of fishing effort for herring could directly or indirectly affect non-target species and other fisheries, which, for the 2016-2018 Atlantic herring specifications, have been identified primarily as river herring and shad. The physical environment and EFH VEC focuses on habitat types vulnerable to activities related to direct fishing on herring. The protected resources VEC focuses on those protected species with a history of encounters with the Atlantic herring fishery. The fishery-related businesses and communities VEC could be affected directly or indirectly through a variety of complex economic and social relationships associated with either the managed species (Atlantic herring) or any of the other VECs.

The descriptive and analytic components of this document are constructed in a consistent manner. The Affected Environment for the 2016-2018 Atlantic herring specifications updates the history of each VEC since the implementation of Amendment 1 to the Herring FMP (in 2006) through Framework 3 (November 2014) and consequently addresses the impacts of past actions. The Affected Environment enhances understanding of the historical, current, and near-future conditions (baselines and trends) to fully understand the anticipated environmental impacts of the management alternatives and independent measures under consideration in this management action. The direct/indirect and cumulative impacts of these alternatives and measures are then assessed using a similar structure to that found in the Affected Environment.

The cumulative effects assessment will identify and characterize the impact on the VECs by the alternatives proposed in this document when analyzed in the context of other past, present, and reasonably foreseeable future actions. To enhance clarity and maintain consistency, the terms described in Table 60 (p. 103) are used to summarize impacts on each VEC. In some instances (although less common), impacts on a VEC may be characterized as neutral, particularly if there may be both positive and negative impacts resulting from a management measure. If impacts are determined to be neutral, the reasons for making such a determination are in the discussion.

7.6.2 Spatial and Temporal Boundaries

The geographic area that encompasses the physical, biological and human community impacts considered in the cumulative effects analysis are described in Section 6.0 (Affected Environment). The geographic range for impacts to fish species is the range of each fish species in the western Atlantic Ocean. The physical environment, including habitat and EFH, is bounded by the range of the Atlantic herring fishery, from the Gulf of Maine through the Mid-Atlantic Bight, and includes adjacent upland areas (from which non-fishing impacts may originate). For protected species, the geographic range is the total range of Atlantic herring. The geographic range for fishery-related businesses and communities is defined in the Affected Environment as well.

Overall, while the effects of the historical herring fishery are important and are considered in the analysis, the temporal scope of past and present actions for Atlantic herring, non-target species and other fisheries, the physical environment and EFH, protected species, fishery-related businesses and communities is focused principally on actions that have occurred since 1996, when the MSA was amended with new fisheries management and EFH requirements. The temporal scope for marine mammals begins in the mid-1990s, when NMFS was required to generate stock assessments for marine mammals that inhabit waters of the U.S. EEZ that create the baseline against which current stock assessments are evaluated. For turtle species, the temporal scope begins in the 1970s, when populations were noticed to be in decline. The temporal scope for Atlantic herring is focused more on the time since the Council's original Herring FMP was implemented at the beginning of the 2001 fishing year. The Atlantic Herring FMP serves as the primary management action for the Atlantic herring fishery and has helped to shape the current condition of the resource.

While the Atlantic herring fishery specifications are assessed only for the 2016-2018 fishing years, the temporal scope of impacts of measures proposed in this specifications document generally extends into the future for all VECs. A five-year period was chosen, because of the dynamic nature of resource management and lack of specific information on projects that may occur in the future, which make it difficult to predict impacts beyond this time frame with any

certainty. This is also the rebuilding time frame for the Atlantic herring resource, as defined in the Atlantic Herring FMP, should the resource become overfished and subject to a rebuilding program in the future.

7.6.3 Analysis of Total Cumulative Effects

A cumulative effects assessment ideally makes effect determinations based on the culmination of the following: (1) impacts from past, present and reasonably foreseeable future actions; (2) the baseline condition for resources and human communities (note – the baseline condition consists of the present condition of the VECs plus the combined effects of past, present and reasonably foreseeable future actions); and (3) impacts of the Proposed Action and alternatives.

A description of past, present and reasonably foreseeable future actions is in Section 7.6.4. The baseline conditions of the resources and human community are in Section 7.6.5 (note that beyond the stock managed under this FMP and protected species, quantitative metrics for the baseline conditions are not available). A brief summary of the potential impacts of the alternatives is in Section 7.6.6. The culmination of all these factors is considered when making the cumulative effects assessment.

7.6.4 Past, Present, and Reasonably Foreseeable Future Actions

Table 65 (p. 151) summarizes the combined effects of past, present and reasonably foreseeable future actions that affect the VECs, other than the alternatives considered in this document. Most of the actions affecting the VECs come from fishery-related activities (e.g., Federal fishery management actions). As expected, these activities have fairly straightforward effects on environmental conditions, and were, are, or will be taken, in large part, to improve those conditions. The reason for this is the statutory basis for Federal fisheries management – the MSFCMA. That legislation was enacted to promote long-term positive impacts on the environment in the context of fisheries activities. The MSFCMA stipulates that management comply with a set of National Standards that collectively serve to optimize the conditions of the human environment. Under this regulatory regime, the cumulative impacts of past, present, and future Federal fishery management actions on the VECs should be expected to result in positive long-term outcomes. Nevertheless, these actions are often associated with offsetting impacts. For example, constraining fishing effort frequently results in negative short-term socio-economic impacts for fishery participants. However, these impacts are usually necessary to bring about the long-term sustainability of a given resource and as such should, in the long-term, promote positive effects on human communities, especially those that are economically dependent upon the managed resource.

Non-fishing activities are also considered when determining the combined effects from past, present and reasonably foreseeable future actions. Activities that have meaningful effects on the VECs include the introduction of chemical pollutants, sewage, changes in water temperature, salinity, dissolved oxygen, and suspended sediment into the marine environment. These activities pose a risk to the all of the identified VECs in the long term. Human induced non-fishing activities that affect the VECs are those that tend to be concentrated in near-shore areas, including: agriculture, port maintenance, beach nourishment, coastal development, marine transportation, marine mining, dredging and the disposal of dredged material. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality and, as such, may indirectly constrain the sustainability of the managed resources, non-

target species, and protected resources. Decreased habitat suitability would tend to reduce the tolerance of these VECs to the impacts of fishing effort. Mitigation of this outcome through regulations that would reduce fishing effort could negatively impact human communities.

7.6.4.1 Atlantic Herring Resource

Past and Present Actions: Atlantic herring management measures were implemented in two related, but separate FMPs in 1999 – one by the Federal government (NEFMC 1999, amended in 2006) and one by the states (ASMFC 1999, amended in 2006). The current status of the Atlantic herring is in Section 6.1.1. The offshore stock component has recovered from its collapse in the early 1970s and, overall, the coastal Atlantic herring resource is not overfished, and overfishing is not occurring. There is more concern for the inshore stock component, since it receives more fishing pressure, but the most recent benchmark assessment (SAW 54, July 2012) indicates that the herring resource is in a "rebuilt" condition (above the biomass target) and that fishing mortality is well below the overfishing threshold.

In 2010, Amendment 4 to the Atlantic Herring FMP established ACLs by first defining terms to bring the FMP into compliance with the new requirements of the MSFCMA, setting an interim ABC control rule, eliminating JVP, IWP, TALFF and reserve specifications, establishing sub-ACLs, and modifying the specifications process to use these elements. Three Accountability Measures (AMs) were also established: an in-season AM that closes the directed herring fishery in a management area when 95% of the sub-ACL is projected to be reached, an AM for overage deductions, which subtracts the amount of an ACL or sub-ACL overage from subsequent ACLs/sub-ACLs, and an AM which closes the directed herring fishery if the haddock catch cap (Framework 43 and 46 to the Multispecies FMP) is reached.

In 2006, Framework 43 to the Northeast Multispecies FMP modified the restrictions for herring vessels, so that herring fishing could continue on Georges Bank, but prohibited certain herring vessels from discarding haddock and limited possession of other groundfish to small amounts. It also adopted a cap on the amount of haddock that could be caught by certain herring vessels. In 2011, Framework 46 changed these catch cap provisions, so that they would apply only to midwater trawl vessels with a herring permit, because these vessels caught nearly all of the haddock caught by the herring fishery. Catches of haddock by midwater trawl vessels fishing in Herring Management Areas 1A, 1B, and 3 that are documented by at-sea observers are now extrapolated to an estimate of the total catch of haddock. Individual estimates are then developed for each haddock stock (GOM and GB haddock). The cap is then applied based on the multispecies fishing year (May 1 through April 30), and is 1 percent of the Acceptable Biological Catch (ABC) of each stock. If the haddock catch estimate extrapolated from observer reports exceeds a stock-specific cap, midwater trawl vessels are limited to catching 2,000 pounds of Atlantic herring in a relevant area. If there is an overage of the cap, the cap for the following year is reduced by the amount of the overage. To monitor the cap, midwater trawl vessels fishing in Herring Management Areas 1A, 1B, and 3 are also required to report total kept catch by haddock stock area and gear used.

The Atlantic States Marine Fisheries Commission (ASMFC) manages the Atlantic herring fishery in State waters. The ASMFC adopted Amendment 2 in March of 2006, which revised management area boundaries, biological reference points, the specification process, research set-asides, internal waters processing operations, and measures to address fixed gear fisheries and

required fixed gear fishermen to report herring catches through the IVR program. Further discussion is in the 2013-2015 Atlantic Herring specifications.

The ASMFC also adopted an Addendum in 2010 which modified Amendment 1 and Amendment to the Interstate FMP for Atlantic Sea Herring by changing the specification setting process and associated definitions. Based on the difficulty of having two sets of acronyms, one for the NEFMC plan and one for the ASMFC plan, for one cooperatively managed species, the addendum was developed to establish an identical set of definitions and acronyms as those that the NEFMC is required to use under MSA. The addendum also established a new specification setting process that is more in line with the ASMFC Sea Herring Section's usual process for setting specifications, while taking into account the new process that was enacted by the NEFMC. To date, ASMFC management remains generally consistent with Federal management through the Herring FMP.

The ASMFC is currently developing Amendment 3 to the Interstate Fishery Management Plan for Atlantic Herring. ASMFC is considering adjustments to the default closing dates and boundaries of the three inshore spawning areas to better protect spawning sea herring. In addition, Amendment 3 considers industry needs by reconsidering the rollover provision for the fixed gear set-aside. To better inform management of fishing effort, Amendment 3 considers a requirement for vessel owners to declare their intended gear before the start of a season. Consistent with Framework 4 to the Atlantic Herring FMP (currently under review), the ASMFC amendment proposes a requirement that fish holds must be empty of fish prior to leaving the dock for a fishing trip. The ASMFC has delayed further development of this amendment, pending NMFS' decision regarding the approval of Framework 4.

Framework 2 to the Atlantic Herring FMP was implemented by NMFS concurrently with the 2013-2015 Atlantic herring fishery specifications on September 30, 2013. Framework 2 authorizes the sub-ACLs in all herring management areas to be split seasonally (by month) during the specifications process. It also authorizes annual carryover of unused sub-ACL (up to 10%) under specific conditions. Seasonal (monthly) splits of sub-ACLs in Areas 1A and 1B were in effect for the 2014 and 2015 fishing years, and carryover provisions apply as well. These provisions are proposed for the 2016-2018 Atlantic herring fishery specifications.

The 2013-2015 specifications included AMs for the herring fishery that will remain effective beyond the 2015 fishing year: the trigger for closing the directed herring fishery in a management area is reduced to 92% of the sub-ACL (not including RSAs). When 92% of a management area sub-ACL is projected to be reached, the directed herring fishery in that area closes, and all herring permit holders will be limited to 2,000 pounds of herring per trip in that area for the remainder of the fishing year. In addition, the new AMs establish a trigger for closing the directed herring fishery in all management areas. The trigger for closing the directed herring fishery in all management areas is when 95% of the stockwide ACL for herring is projected to be reached. Then, the directed herring fishery in all management areas will close, and all herring permit holders will be limited to 2,000 pounds of herring per trip for the remainder of the fishing year. These AMs were adopted to further prevent the stockwide Atlantic herring ACL and management area sub-ACLs from being exceeded during the fishing year, as well as improve the likelihood that the total ACL (OY) can be caught on a continuing basis while preventing overfishing.

Amendment 5 to the Atlantic Herring FMP was submitted to NMFS on March 25, 2013. The focus of Amendment 5 is to establish a comprehensive catch monitoring program for the Atlantic herring fishery, address river herring bycatch, establish criteria for midwater trawl vessel access to groundfish closed areas, and adjust other aspects of the fishery management program to keep the Herring FMP in compliance with the MSA. On July 18, 2013, Amendment 5 was partially approved by NMFS. The approved measures in Amendment 5, which became effective on March 17, 2014, include:

- Revisions to fishery management program provisions (permitting provisions, dealer and vessel reporting requirements, operational provisions for carrier vessels and transfers at-sea, requirements for vessel monitoring systems);
- Revisions to vessel requirements to improve at-sea sampling by observers;
- Management measures to minimize the discarding of catch before it has been sampled by observers;
- Establishment of River Herring Monitoring/Avoidance Areas; and
- Expansion of sea sampling requirements on midwater trawl vessels fishing in the year-round groundfish closed areas.

The impacts of Amendment 5 on the Atlantic herring resource are expected to be positive. Quickly following the completion of Amendment 5 in 2013, the Council developed Framework 3 to the Atlantic Herring FMP, which also expanded on the management measures in Amendment 5 and established catch caps for RH/S as well as related provisions to manage and minimize interactions with these species in the directed Atlantic herring fishery. The Framework 3 measures were implemented in late 2014 and are expected to have a low positive impact on the Atlantic herring resource.

Reasonably Foreseeable Future Actions: Framework 4 to the Atlantic Herring FMP builds on measures implemented in Amendment 5 to the Atlantic Herring FMP (effective March 17, 2014) and proposes management measures to further enhance catch monitoring and address net slippage on vessels participating in the Atlantic herring fishery. More specifically, the management measures proposed in Framework 4 would implement a third-party catch verification program for limited access herring vessels, a requirement that herring vessel fish holds be empty of fish before leaving the dock, and measures to further address net slippage in the herring fishery. Approval and implementation of Framework 4 are pending. To the extent that the Framework 4 measures enhance the Atlantic herring catch monitoring program and reduce bycatch to the extent practicable, the impacts of this action on the Atlantic herring resource are expected to be positive.

NMFS is currently leading the development of an omnibus amendment to establish provisions for industry-funded monitoring across all New England and Mid-Atlantic Council-managed FMPs (Amendment 7 to the Herring FMP). This amendment considers provisions for observer coverage in the Atlantic herring and mackerel fisheries, which were disapproved in Amendment 5 (herring) and Amendment 14 (mackerel). The target implementation date for the omnibus amendment is in 2016 fishing year. The long-term impacts of this action on the Atlantic herring resource are likely to be positive.

An Omnibus EFH Amendment is likely to be implemented in the foreseeable future (Amendment 3 to the Atlantic Herring FMP). This amendment could positively affect Atlantic herring via increased protection of benthic habitats used by the species from the adverse effects

of various regional fisheries. It may also modify the boundaries and access provisions (including those for midwater trawl gear) related to the year-round groundfish closed areas. NMFS implemented changes in the Harbor Porpoise Take Reduction Plan, which is intended to reduce harbor porpoise mortalities. This action would likely result in vessels facing additional restrictions, possibly resulting in positive impacts to herring and other species taken incidentally.

The Sea Turtle Strategy is a gear-based approach to addressing sea turtle bycatch. NMFS has revised the regulatory requirements for trawl fisheries to protect sea turtles. As described in the turtle Strategy Final EIS (77 FR 29905 May 21, 2012), NMFS allowed the use of new materials and modified existing approved TED designs to other trawl fisheries and also modified the geographic scope of the TED requirements. This measure is likely to be neutral for the herring resource as it will not affect herring directly.

Amendment 8 to the Atlantic Herring FMP was initiated by the Council in January 2015 to consider a range of alternatives to establish a long-term ABC CR for Atlantic herring, including alternatives that explicitly account for Atlantic herring's role in the ecosystem. At its June 2015 meeting, the Council approved the following goals and objectives for Amendment 8:

Goal 1. To account for the role of Atlantic herring within the ecosystem, including its role as forage;
Goal 2. To stabilize the fishery at a level designed to achieve OY;
Goal 3. To address localized depletion in inshore waters.

Objective: Develop and implement an ABC control rule that manages Atlantic herring within an ecosystem context and addresses the goals of Amendment 8.

Amendment 8 is currently under development by the Council, and implementation is expected prior to the next round of Atlantic herring fishery specifications. By taking into account the role of Atlantic herring in the ecosystem when developing an ABC control rule and long-term management approach, the impacts of Amendment 8 on the Atlantic herring resource are expected to be positive.

7.6.4.2 Non-Target Species

Past and Present Actions: Updated information about non-target species affected by the Atlantic herring fishery is in Section 6.2. River herring and shad (RH/S) are non-target species of particular concern in the Atlantic herring fishery. In addition to RH/S, haddock is another important non-target species encountered by midwater trawl herring vessels. The catch of haddock in the Atlantic herring fishery was addressed through Framework 43 and Framework 46 to the Northeast Multispecies FMP, as well as the Atlantic herring fishery specifications and Amendment 5 to the Atlantic Herring FMP.

The Northeast Multispecies FMP has a multitude of management measures, a full summary of which is in the most recent Framework to the FMP, Framework 55. Groundfish was considered as its own VEC in that framework, however groundfish is a portion of the non-target species VEC being considered herein, and as such, the summary of the effects of past, present, and reasonably foreseeable future actions that was used in that framework will be considered here. Past actions have created mixed effects to the regulated groundfish stocks, as the combined effects of past actions have decreased effort, improved habitat protection, and implemented rebuilding plans when necessary, but some stocks remain overfished. Present actions created a positive effect, as sustainable stocks were the purpose of the regulations, as is the case for

foreseeable future actions as well. Overall, the combined effects had a short-term negative, but long-term positive effect.

In 2006, Framework 43 to the Northeast Multispecies FMP was enacted, which modified the restrictions for herring vessels so that herring fishing could continue on Georges Bank, but prohibited certain herring vessels from discarding haddock and limited possession of other groundfish to small amounts. It also adopted a cap on the amount of haddock that could be caught by certain herring vessels. In 2011, Framework 46 changed these catch cap provisions so that they would apply only to midwater trawl vessels with a herring permit, because these vessels caught nearly all of the haddock caught by the herring fishery. Catches of haddock by midwater trawl vessels fishing in Herring Management Areas 1A, 1B, and 3 that are documented by at-sea observers are now extrapolated to an estimate of the total catch of haddock. Individual estimates are then developed for each haddock stock (GOM and GB haddock). The cap is then applied based on the multispecies fishing year (May 1 through April 30), and is 1% of the Acceptable Biological Catch (ABC) of each stock. If the haddock catch estimate extrapolated from observer reports exceeds a stock-specific cap, midwater trawl vessels are limited to catching 2,000 pounds of Atlantic herring in a relevant area. If there is an overage of the cap, the cap for the following year is reduced by the amount of the overage. To monitor the cap, midwater trawl vessels fishing in Herring Management Areas 1A, 1B, and 3 are also required to report total kept catch by haddock stock area and gear used.

The ASMFC FMP for Shad & River Herring, approved in 1985, was one of the very first FMPs developed by the ASMFC. Amendment 1 was adopted in 1998 and focuses on American shad regulations as well as and monitoring programs to improve data collection and stock assessment capabilities. Amendment 2 to the ASMFC Interstate FMP for Shad and River Herring was approved in 2009 and implemented a precautionary approach to river herring management. Amendment 2 requires states or jurisdictions to close all state fisheries by January 1, 2012, with exceptions for systems with a sustainable fishery. A sustainable fishery is defined as one that demonstrates that the river herring stock can support a commercial and/or recreational fishery without diminishing future stock reproduction and recruitment. Under Amendment 2, river herring from any state waters fishery may not be landed without an approved plan requesting State fishery proposals must contain ‘sustainability targets’ that are subject to Shad and River Herring Technical Committee (TC) review and Shad & River Herring Management Board (Board) approval. States with approved plans are required to submit annual updates of the achievement and maintenance of sustainability targets. The TC has reviewed proposals from Maine, New Hampshire, North Carolina and South Carolina and the Board approved all plans. The 2012 sustainability plan deadline was implemented to allow states with a lengthy legislative process adequate time to develop and implement proposals.

In 2010, the Board approved Amendment 3, which revises American shad regulatory and monitoring programs in place under Amendment 1. The amendment was developed in response to the 2007 American shad stock assessment, which found that most American shad stocks were at all-time lows and did not appear to be recovering. Amendment 3 is similar to the management program required for river herring. The amendment prohibits state waters commercial and recreational fisheries beginning January 1, 2013, unless a state or jurisdiction has a sustainable management reviewed by the TC and approved by the Board. The amendment defines a sustainable fishery as “a commercial and/or recreational fishery that will not diminish the potential future stock reproduction and recruitment.” Submitted plans must clearly demonstrate

that the state's or jurisdiction's American shad fisheries meet this new definition of sustainability through the development of sustainability targets which must be achieved and maintained. The amendment allows any river systems to maintain a catch and release recreational fishery. States and jurisdictions are also required to identify local significant threats to American shad critical habitat and develop a plan for mitigation and restoration.

Amendment 5 to the Atlantic Herring FMP was approved by Council in June 2012. After review and revision, the final submission for Amendment 5 was presented to NMFS on March 25, 2013, and measures approved in Amendment 5 just recently became effective (March 17, 2014). The focus of Amendment 5 is to establish a comprehensive catch monitoring program for the Atlantic herring fishery, address river herring bycatch, establish criteria for midwater trawl vessel access to groundfish closed areas, and adjust other aspects of the fishery management program to keep the Herring FMP in compliance with the MSA. The amendment also establishes a long-term strategy for river herring bycatch avoidance/minimization through industry-based avoidance and, presumably, a catch cap for river herring. The impacts of Amendment 5 on non-target species are expected to be positive.

Amendment 14 to the Mackerel Squid Butterfish (MSB) FMP was developed by the MAFMC concurrently to Amendment 5. Many of the actions contained in both amendments have been developed to compliment and/or replicate each other, to avoid conflicting overlaps of restrictions on vessels that participate in both the herring and mackerel fisheries. In some cases, however, the actions contained in both amendments present some conflict with each other. Actions included in Amendment 14 include: vessel reporting measures, dealer reporting measures, at-sea observation optimization measures, other sampling and monitoring measures such as port-side monitoring, at-sea observer coverage requirements, mortality caps on river herring, restrictions in areas of high river herring catch, mesh requirements, and the potential addition of river herring as a stock in the fishery. The ways in which these actions overlap can be seen in Table 196 of the Amendment 5 FEIS. The implementation of Amendment 14 also recently occurred (March 26, 2014) and is expected to have positive impacts on non-target species. The MAFMC also recently implemented a RH/S catch cap for the directed mackerel fishery through its specifications process. The 2014 RH/S catch cap for the Atlantic mackerel fishery is 236 mt. These measures are expected to have positive impacts on the RH/S resources.

Quickly following the completion of Amendment 5 in 2013, the Council developed Framework 3 to the Atlantic Herring FMP, which also expanded on the management measures in Amendment 5 and established catch caps for RH/S as well as related provisions to manage and minimize interactions with these species in the directed Atlantic herring fishery. The RH/S catch caps implemented in Framework 3 became effective in late 2014. The measures implemented in Framework 3 are expected to have a positive impact on the river herring and shad species, which are non-target species of particular concern in the Atlantic herring fishery.

The 2014/2015 RH/S catch caps for the midwater trawl fishery and bottom trawl Atlantic herring fisheries are summarized in Section 4.3.1. The catch caps are expected to reduce RH/S catch and limit RH/S catch by the Atlantic herring fishery when compared to the status quo. This should produce a positive impact to RH/S stocks in 2014 and 2015, but the extent is unknown because there are no absolute abundance estimates for RH/S stocks, and there is no way to link the RH/S catch cap amount (or RH/S catch under a cap) to RH/S stock status or fishing mortality at this time.

Reasonably Foreseeable Future Actions: Framework 4 to the Atlantic Herring FMP builds on measures implemented in Amendment 5 to the Atlantic Herring FMP (effective March 17, 2014) and proposes management measures to further enhance catch monitoring and address net slippage on vessels participating in the Atlantic herring fishery. There would be a third-party catch verification program for limited access herring vessels, a requirement that herring vessel fish holds be empty of fish before leaving the dock, and measures to further address net slippage in the herring fishery. Approval and implementation of Framework 4 are pending. To the extent that the Framework 4 measures enhance the Atlantic herring catch monitoring program and reduce bycatch to the extent practicable, the impacts of this action on non-target species are expected to be positive.

During the MSB specifications process (June 2015), the MAFMC recommended a catch cap for the directed mackerel fishery for the 2016 fishing year. There is opportunity for the two Councils to better align the catch caps in the overlapping southern New England/Mid-Atlantic area for the 2017 fishing year and beyond. The Council built flexibility into the RH/S catch cap process in Framework 3 to allow development of a joint herring/mackerel fishery RH/S catch cap for the southern New England/Mid-Atlantic area with the MAFMC.

A foreseeable future action that will likely affect non-target species is the development of observer coverage requirements for the limited access herring fishery (disapproved in Amendment 5), as well as the funding options that pertain to this measure. NMFS is currently leading the development of an omnibus amendment to establish provisions for industry-funded monitoring across all New England and Mid-Atlantic Council-managed FMPs (Amendment 7 to the Herring FMP). The omnibus industry-funded monitoring amendment will include provisions for observer coverage in the Atlantic herring and mackerel fisheries, which were disapproved in Amendment 5 (herring) and Amendment 14 (mackerel). The target implementation date for the omnibus amendment is during the 2016 fishing year.

In early August 2013, when NMFS published the ESA listing decision for river herring, NMFS indicated that it would partner with ASMFC to form a technical expert working group (TEWG). The TEWG is focused on developing a dynamic conservation plan to help restore river herring throughout their range from Canada to Florida, identifying and implementing important conservation efforts, and conducting research to fill in critical data gaps for these species. The TEWG has met to begin its work. NMFS plans to continue to coordinate with all of management partners including the MAFMC and the NEFMC to maximize resources and identify ways to complement ongoing efforts to promote river herring restoration.

Implementation of the Omnibus EFH Amendment may also result in additional habitat protections for which there is an indirect positive effect to bycatch/incidental catch species and other fisheries, as they would also receive protection. It may also modify the boundaries and access provisions (including those for midwater trawl gear) related to the year-round groundfish closed areas. As with Allocated Target Species, if revisions are made to the Harbor Porpoise Take Reduction Plan, vessels could face additional restrictions, possibly resulting in positive impacts to bycatch through effort reductions.

The Sea Turtle Strategy is a gear-based approach to addressing sea turtle bycatch. NMFS is currently considering proposing changes to the regulatory requirements for trawl fisheries to protect sea turtles. As described in a NOI to prepare an EIS (74 FR 88 May 8, 2009), NMFS is considering expanding the use of TEDs to other trawl fisheries and modifying the geographic

scope of the TED requirements. TED requirements would likely have a positive effect on bycatch and discards as they would likely exclude some of these species from capture in the cod-end.

7.6.4.3 Physical Environment and EFH

Past and Present Actions: The Atlantic herring EFH designation, which was developed as part of an EFH Omnibus Amendment prepared by Council for its entire managed species, is in Section 6.3. The EFH Omnibus Amendment was approved for Atlantic herring by the Secretary of Commerce on October 27, 1999. The final rule implementing the Atlantic Herring FMP to allow for the development of a sustainable Atlantic herring fishery was published on December 11, 2000 (65 FR 77450).

Because the gears used in the Atlantic herring fishery have only occasional bottom contact with the primary substrates used by herring for egg deposition, and because the noises produced by herring fishing operations only temporarily disperse schools of juvenile and adult herring, EFH impacts assessments for the fishery have concluded that it does not have an adverse effect on herring EFH. In addition, these assessments have concluded that the herring fishery does not have an adverse impact on EFH designated for non-herring species.

Various measures have been implemented in the Northeast Region to protect the EFH of Council-managed species. In particular, all bottom-tending mobile gear is prohibited from the level 3 Habitat Closed Areas (HCAs) established in 2004 under Amendment 13 to the Northeast Multispecies FMP and Amendment 10 to the Atlantic Sea Scallop FMP. In large part, these HCAs overlap with areas established in 1994 and 1998 to protect overfished stocks of cod, haddock and other groundfish species. As mobile bottom-tending gear is largely prohibited from the groundfish closures, they have incidental EFH protection benefits. Other measures to protect EFH include spatially-specific roller gear restrictions in the Multispecies and Monkfish fisheries.

Reasonably Foreseeable Future Actions: Reasonably foreseeable future actions that will likely affect habitat include the Omnibus EFH Amendment, currently under development. This action reviews and updates EFH designations, identifies Habitat Areas of Particular Concerns (HAPCs), reviews prey information for all managed species, reviews non-fishery impacts to EFH, and reviews the current science on fishing impacts to habitat. It will also include coordinated and integrated measures intended to minimize the adverse impact of Council-managed fishing on EFH. It may also modify the boundaries and access provisions (including those for midwater trawl gear) related to the year-round groundfish closed areas. The net effect of new EFH and HAPC designations and more targeted habitat management measures should be positive for the physical environment and EFH.

The Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic Ocean and Gulf of Mexico ("Strategy") is a gear-based approach to addressing sea turtle bycatch. NMFS is currently considering proposing changes to the regulatory requirements for trawl fisheries to protect sea turtles. As described in a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) for Sea Turtle Conservation and Recovery in Relation to the Atlantic Ocean and Gulf of Mexico Trawl Fisheries (74 FR 88 May 8, 2009), NMFS is considering expanding the use of TEDs in trawl fisheries and modifying the geographic scope of the TED requirements. Since TED requirements may decrease the catch retention of some target species, vessels may tow longer to offset this loss of catch, likely resulting in negative impacts to habitat and EFH.

7.6.4.4 Protected Resources

Past and Present Actions: A general description of protected species that may be affected by the proposed action is in Section 6.4 and in more detail in Amendment 5 to the Atlantic Herring FMP.

Large whales may be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources due to trophic effects resulting from a variety of activities including the operation of commercial fisheries. Ship strikes and fishing gear entanglement continue to be the most likely sources of human-related injury or mortality for right, humpback, fin and minke whales. Sei, blue, and sperm whales are also vulnerable, but fewer ship strikes or entanglements have been recorded. Mobile bottom trawls, as well as midwater trawl gear, appear to be less of a concern for the large whale species. Other marine mammals, however, such as harbor porpoise, dolphins and to a greater degree seals, are vulnerable to entanglement in net gear, including midwater trawl gear and purse seines.

In addition to these actions, NMFS has implemented specific regulatory actions to reduce injuries and mortalities from gear interactions. The ALWTRP, implemented in 1999 with subsequent rule modifications, restrictions, and extensions, includes time and area closures for trap/pot fisheries (e.g., lobster and black sea bass) and gillnet fisheries (e.g., anchored gillnet and shark gillnet fisheries); gear requirements, including a general prohibition on having line floating at the surface in these fisheries; a prohibition on storing inactive gear at sea; and restrictions on setting shark gillnets off the coasts of Georgia and Florida and drift gillnets in the Mid-Atlantic. This plan also contains non-regulatory aspects, including gear research, public outreach, scientific research, a network to inform mariners when right whales are in an area, and increasing efforts to disentangle whales caught in fishing gear. The intent of the ALWTRP is to positively affect large whales (North-Atlantic right, humpback, and fin) by reducing their injury and death in waters off the U.S. East Coast due to incidental entanglement in fishing gear.

Turtles have documented entanglements in shrimp trawls, pound nets, bottom trawls and sink gillnets. Shrimp trawls are required to use turtle excluder devices (TEDs). The sea turtle life history also leaves them susceptible to many other human impacts, including impacts on land, in the benthic environment, and in the pelagic environment. Anthropogenic factors that impact the success of nesting and hatching include: beach erosion, beach armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, and an increased presence of native species (e.g., raccoons, armadillos, and opossums) which raid and feed on turtle eggs. Entanglement(s) in debris or ingestion of marine debris are also seen as possible threats.

The final submission for Amendment 5 to the Atlantic Herring FMP was presented to NMFS on Dec 21, 2012 and approved by Council in June 2012. Measures that were approved in Amendment 5 became effective on March 17, 2014. The focus of Amendment 5 is to establish a comprehensive catch monitoring program for the limited access herring fishery, address river herring bycatch, establish criteria for midwater trawl vessel access to groundfish closed areas, and adjust other aspects of the fishery management program to keep the Herring FMP in compliance with the MSA.

Reasonably Foreseeable Future Actions: The likely impacts of the Omnibus EFH Amendment on protected resources cannot be determined at this time. The Harbor Porpoise Take Reduction Plan for the GOM and Mid-Atlantic coasts was originally implemented in 1998, and NMFS published a proposed rule in July 2009 indicating additional management restrictions for gillnetters. Future measures of this plan may be implemented if take reduction goals are not met, which could further reduce fishing effort, a positive effect on the population of this species.

The Sea Turtle Strategy is a gear-based approach to addressing sea turtle bycatch. Under the Strategy, NMFS has identified trawl gear as a priority for reducing sea turtle bycatch and is considering proposing changes to the TED requirements in the trawl fisheries. TED requirements are designed to have a positive effect on protected resources, specifically turtles by allowing for most turtles caught in trawl nets to escape. NMFS is working to develop and implement bycatch reduction measures in all trawl fisheries in the Atlantic and Gulf of Mexico when and where sea turtle takes have occurred or where gear, time, location, fishing method, and other similarities exist between a particular trawl fishery and sea turtle takes have occurred by trawls (72 FR 7382, February 15, 2007). On February 15, 2007, NMFS issued an advance notice of proposed rulemaking to announce that it is considering amendments to the regulatory requirements for TEDs (72 FR 7382). On May 8, 2009, NMFS issued a NOI to prepare an EIS (74 FR 88 May 8, 2009), and held public scoping meetings throughout the East coast.

7.6.4.5 Fishery-Related Businesses and Communities

Past and Present Actions: A general description of fishery-related businesses and communities that may be affected by the proposed action is in Section 6.5 and in more detail in Amendment 5 to the Herring FMP. Past and present actions described in Section 7.6.4.1 affecting the Atlantic herring resource have also affected fishery-related businesses and communities.

In 2010, the ASMFC adopted an Addendum which modified Amendment 1 and Amendment 2 to the Interstate FMP for Atlantic Sea Herring by changing the specification setting process and associated definitions. Based on the difficulty of having two sets of acronyms, one for the NEFMC plan and one for the ASMFC plan, for one cooperatively managed species the addendum was developed to establish an identical set of definitions and acronyms as those that the NEFMC is required to use under MSA. The addendum also established a new specification setting process that is more in line with the ASMFC Sea Herring Section's usual process for setting specifications while taking into account the new process that was enacted through Amendment 4 to the Atlantic Herring FMP.

Amendment 4 to the Atlantic Herring FMP (2010), primarily responded to the requirements of the MSA and NEPA. The amendment established ACLs by first defining terms to bring the FMP into compliance with the new requirements of the MSA, setting an interim ABC control rule, eliminating JVP, IWP, TALFF and reserve specifications, establishing sub-ACLs, and modifying the specifications process to utilize these elements. Three Accountability Measures (AMs) were also established in Amendment 4: an in-season AM that closes the directed herring fishery in a management area when there is a projection that 95% of the sub-ACL is reached, an AM for overage deductions, which subtracts the amount of an ACL or sub-ACL overage from subsequent ACLs/sub-ACLs, and another AM which established provisions for closing the directed herring fishery if the haddock catch cap (Framework 43 and 46 to the Multispecies FMP, see below) is reached.

In 2006, Framework 43 to the Northeast Multispecies FMP was enacted, which modified the restrictions for herring vessels so that herring fishing could continue on Georges Bank, but prohibited certain herring vessels from discarding haddock and limited possession of other groundfish to small amounts. It also adopted a cap on the amount of haddock that could be caught by certain herring vessels. In 2011, Framework 46 changed these catch cap provisions so that they would apply only to midwater trawl vessels with a herring permit, because these vessels caught nearly all of the haddock caught by the herring fishery. Catches of haddock by midwater trawl vessels fishing in Herring Management Areas 1A, 1B, and 3 that are documented by at-sea observers are now extrapolated to an estimate of the total catch of haddock. Individual estimates are then developed for each haddock stock (GOM and GB haddock). The cap is then applied based on the multispecies fishing year (May 1 through April 30), and is 1 percent of the Acceptable Biological Catch (ABC) of each stock. If the haddock catch estimate extrapolated from observer reports exceeds a stock-specific cap, midwater trawl vessels are limited to catching 2,000 pounds of Atlantic herring in a relevant area. If there is an overage of the cap, the cap for the following year is reduced by the amount of the overage. To monitor the cap, midwater trawl vessels fishing in Herring Management Areas 1A, 1B, and 3 are also required to report total kept catch by haddock stock area and gear used.

Framework 2 to the Atlantic Herring FMP was implemented by NMFS concurrently with the 2013-2015 Atlantic herring fishery specifications on September 30, 2013. Framework 2 authorizes the sub-ACLs in all herring management areas to be split seasonally (by month) during the specifications process. It also authorizes annual carryover of unused sub-ACL (up to 10%) under specific conditions. Seasonal (monthly) splits of sub-ACLs in Areas 1A and 1B are effective for the 2014 and 2015 fishing years, and carryover provisions apply as well. The 2013-2015 Atlantic herring fishery specifications are summarized in Table 5.

Additional AMs for the Atlantic herring fishery were implemented through the 2013-2015 specifications; the AMs will remain effective beyond the 2015 fishing year. Under the new AMs (effective September 30, 2013), the trigger for closing the directed herring fishery in a management area is reduced to 92% of the sub-ACL (not including RSAs). When 92% of a management area sub-ACL is projected to be reached, the directed herring fishery in that area will close, and all herring permit holders will be limited to 2,000 pounds of herring per trip in that area for the remainder of the fishing year. In addition, the new AMs establish a trigger for closing the directed herring fishery in all management areas. The trigger for closing the directed herring fishery in all management areas is 95% of the stockwide Atlantic herring ACL. When 95% of the stockwide ACL for herring is projected to be reached, the directed herring fishery in all management areas will close, and all herring permit holders would be limited to 2,000 pounds of herring per trip for the remainder of the fishing year. These AMs were adopted to further prevent the stockwide Atlantic herring ACL and management area sub-ACLs from being exceeded during the fishing year, as well as improve the likelihood that the total ACL (OY) can be caught on a continuing basis while preventing overfishing.

Amendment 5 to the Atlantic Herring FMP was approved by Council in June 2012. After review and revision, the final submission for Amendment 5 was presented to NMFS on March 25, 2013, and measures approved in Amendment 5 just recently became effective (March 17, 2014). The focus of Amendment 5 is to establish a comprehensive catch monitoring program for the Atlantic herring fishery, address river herring bycatch, establish criteria for midwater trawl vessel access to groundfish closed areas, and adjust other aspects of the fishery management program to keep

the Herring FMP in compliance with the MSA. The amendment also establishes a long-term strategy for river herring bycatch avoidance/minimization through industry-based avoidance and, presumably, a catch cap for river herring.

Amendment 14 to the Mackerel Squid Butterfish (MSB) FMP was developed by the MAFMC concurrent with Amendment 5. Many of the actions contained with both Amendments have been developed to compliment and/or replicate each other, to avoid conflicting overlaps of restrictions on vessels that participate in both fisheries. In some cases, however, the actions contained in both Amendments present some conflict with each other. Actions proposed in Amendment 14 include: vessel reporting measures, dealer reporting measures, at-sea observation optimization measures, other sampling and monitoring measures such as port-side monitoring, at-sea observer coverage requirements, mortality caps on river herring, restrictions in areas of high river herring catch, mesh requirements, and the potential addition of river herring as a stock in the fishery. The ways in which these actions overlap can be seen in Table 196 of the Amendment 5 FEIS. The MAFMC also implemented a RH/S catch cap for the directed mackerel fishery through its specifications process. The 2014 RH/S catch cap for the Atlantic mackerel fishery is 236 mt. During the MSB specifications process (June 2014), the MAFMC recommended a catch cap of 89-155 mt for the directed mackerel fishery for the 2015 fishing year (the amount will be scaled based on mackerel catch in the directed mackerel fishery during the fishing year). These measures are expected to have positive impacts on the RH/S resources.

Quickly following the completion of Amendment 5 in 2013, the Council developed Framework 3 to the Atlantic Herring FMP, which also expanded on the management measures in Amendment 5 and established catch caps for RH/S as well as related provisions to manage and minimize interactions with these species in the directed Atlantic herring fishery. The RH/S catch caps implemented through Framework 3 became effective in late 2014. The long-term impact of the catch cap process/provisions on fishery-related businesses and communities is expected to be low positive. Framework 3 enhances industry-based bycatch reduction initiatives and builds on the approach taken in Amendment 5 to the Herring FMP. It reduces the likelihood that more restrictive limits will be imposed in the future if the industry can continue to reduce and avoid RH/S interactions. The RH/S catch caps proposed for the 2014 and 2015 fishing years were expected to have a low negative impact on fishery-related businesses and communities, but the catch caps are not likely to preclude directed Atlantic herring fishing in all areas and provide midwater trawl vessels an opportunity to fish in Area 3 (Georges Bank) without a RH/S catch cap, thereby potentially mitigating some of the negative impacts.

NMFS has also led the development of an omnibus amendment to address the Standardized Bycatch Reporting Methodology (Amendment 6 to the Atlantic Herring FMP). This amendment establishes a process and provisions for allocating observer coverage across all Federally-managed fisheries. The proposed measures include bycatch reporting and monitoring mechanisms; analytical techniques and allocation of at-sea fisheries observers; a standardized bycatch reporting methodology performance standard; a review and reporting process; framework adjustment and annual specifications provisions; a prioritization process; and provisions for industry-funded observers and observer set-aside programs. The SBRM amendment measures became effective in mid-2015.

Reasonably Foreseeable Future Actions: Framework 4 to the Atlantic Herring FMP builds on measures implemented in Amendment 5 to the Atlantic Herring FMP (effective March 17, 2014) and proposes management measures to further enhance catch monitoring and address net

slippage on vessels participating in the Atlantic herring fishery. It would implement a third-party catch verification program for limited access herring vessels, a requirement that herring vessel fish holds be empty of fish before leaving the dock, and measures to further address net slippage in the herring fishery. Approval and implementation of Framework 4 are pending. To the extent that the Framework 4 measures enhance the Atlantic herring catch monitoring program and reduce bycatch to the extent practicable, the long-term impacts of this action on fishery-related businesses and communities are expected to be low positive.

The NEFMC and MAFMC are working with NMFS to develop an omnibus amendment to implement provisions for industry-funded monitoring across all fisheries. This amendment considers provisions for observer coverage in the Atlantic herring and mackerel fisheries. The target implementation date for the omnibus amendment is in 2016.

Implementation of the Omnibus EFH Amendment may result in additional habitat protections, which may or may not affect fishery-related businesses and communities depending on changes in vessel effort. This amendment may also modify the boundaries and access provisions (including those for midwater trawl gear) related to the year-round groundfish closed areas. Similarly, if revisions are made to the Harbor Porpoise Take Reduction Plan, vessels could face additional restrictions, possibly resulting in positive impacts to bycatch through effort reductions.

NMFS is currently considering proposing changes to the regulatory requirements for trawl fisheries to protect sea turtles. As described in a NOI to prepare an EIS (74 FR 88 May 8, 2009), NMFS is considering expanding the use of TEDs to other trawl fisheries and modifying the geographic scope of the TED requirements. TED requirements may have a negative effect on fishery-related businesses and communities, as they may increase the cost of fishing, however the extent of the measures is unknown at this time.

Amendment 8 to the Atlantic Herring FMP was initiated by the Council in January 2015 to consider a range of alternatives to establish a long-term ABC CR for Atlantic herring, including alternatives that explicitly account for Atlantic herring's role in the ecosystem. At its June 2015 meeting, the Council approved the following goals and objectives for Amendment 8:

Goal 1. To account for the role of Atlantic herring within the ecosystem, including its role as forage;
Goal 2. To stabilize the fishery at a level designed to achieve OY;
Goal 3. To address localized depletion in inshore waters.

Objective: Develop and implement an ABC control rule that manages Atlantic herring within an ecosystem context and addresses the goals of Amendment 8.

Amendment 8 is currently under development by the Council, and implementation is expected prior to the next round of Atlantic herring fishery specifications. While it is premature to predict the impacts of Amendment 8 on fishery-related businesses and communities, the impacts have potential to be positive to the extent that the Amendment 8 measures enhance the long-term management of the Atlantic herring fishery.

Table 65 - Summary of effects of past, present, and reasonably foreseeable future actions on the VECs

VEC	Past Actions	Present Actions	Reasonably Foreseeable Future Actions	Combined Effects of Past, Present, Future Actions
Atlantic Herring	**Positive** Controlled effort and provided a sustainable fishery with a rebuilt resource	**Positive** Current regulations continue to manage for a sustainable stock	**Positive** Future actions are anticipated to strive to maintain a sustainable stock	**Positive** Stock are being managed for sustainability
Non-Target Species	**Low Positive** Decreased effort and reduced bycatch	**Positive** Current regulations continue to decrease effort and reduced bycatch	**Positive** Future regulations are being developed to improve monitoring and further address bycatch issues	**Low Positive** Decreased effort and reduced bycatch continue
Physical Environment and Essential Fish Habitat	**Positive** Decreased effort and improved habitat protection	**Positive** Effort reductions and better control of non-fishing activities have been positive but fishing activities and non-fishing activities continue to reduce habitat quality	**Positive** Future actions are anticipated to continue rebuilding a healthy environment and increase habitat quality	**Positive** Continued management of physical environment and EFH for an increased quality of habitat
Protected Resources	**Positive** Reduced effort and thus interactions with protected resources	**Positive** Current regulations continue to control effort, thus reducing opportunities for interactions	**Mixed** Future regulations will likely control effort and thus protected species interactions, but as stocks improve, effort will likely increase, possibly increasing interactions	**Positive** Continued effort controls along with past regulations will likely help stabilize protected species interactions
Fishery-Related Businesses and Communities	**Mixed** Effort reductions and better control of non-fishing activities have been positive, but fishing industry and thus businesses have reduced	**Mixed** Continue to manage for a sustainable stock, thus controlling effort on the herring resource provides additional yield for fishery and non-fishery activities	**Mixed** Future regulations will likely control effort and but as stocks improve, effort will likely increase for fishery and non-fishing activities	**Mixed** Continued fisheries management will likely control effort for a sustainable fishery and thus fishery and non-fishery related activities will continue

7.6.5 Baseline Conditions

For the purposes of a cumulative effects assessment, the baseline conditions for resources and human communities are the present condition of the VECs plus the combined effects of the past, present, and reasonably foreseeable future actions. Table 66 summarizes the added effects of the condition of the VECs (i.e., status/trends, Section 6.0) and the sum effect of the past, present and reasonably foreseeable future actions (Section 7.6.4). The resulting CEA baseline for each VEC is in the last column (shaded). In general, straightforward quantitative metrics of the baseline conditions are only available for the managed resources, non-target species, and protected resources. The conditions of the habitat and human communities VECS are complex and varied. Characterizations in Section 6.0 (Affected Environment) should be referenced.

Table 66 - Cumulative effects assessment baseline conditions of the VECs

VEC	Status/Trends	Combined Effects of Past, Present Reasonably Foreseeable Future Actions (Table 65)	Combined CEA Baseline Conditions
Atlantic Herring Resource	Not overfished and overfishing is not occurring.	**Positive** Stocks are being managed to meet sustainable fishing levels.	**Positive** Stocks are being managed to meet sustainable fishing levels.
Non-Target Species	*Mixed* Status of other non-target species varies.	**Low Positive** Combined effect of reduced effort and measures to address bycatch.	**Low Positive** Combined effects of FMP management reduced effort and reduced bycatch.
Habitat and EFH	Fishing impacts are complex and variable and typically adverse; Non-fishing activities had historically negative but site-specific effects on habitat quality.	**Mixed** Future regulations will likely control effort and thus habitat impacts but as stocks improve, effort will likely increase along with additional non-fishing activities.	**Mixed** Reduced habitat disturbance by fishing gear but impacts from non-fishing actions, such as global warming, could increase and have a negative impact.

Table 66 cont. - Cumulative effects assessment baseline conditions of the VECs

Protected Resources	**Sea Turtles**	Leatherback, Kemp's ridley and green sea turtles are classified as endangered under the ESA and NWA DPS loggerhead sea turtles are classified as threatened.	**Positive** Reduced gear encounters through effort reductions and management actions taken under the ESA and MMPA have had a positive impact	**Positive** Reduced gear encounters through effort reductions and additional management actions taken under the ESA and MMPA.
	Large Cetaceans	Of the baleen whales (right, humpback, fin, blue, sei and minke whales) and sperm whales, all are protected under the MMPA and with the exception of minke whales, all are listed as endangered under the ESA.		
	Small Cetaceans	Pilot whales, dolphins and harbor porpoise are all protected under the MMPA. The most recent stock assessment for harbor porpoise shows that takes are increasing and nearing PBR.		
	Pinnipeds	Harbor, Grey, Harp and Hooded seals are all protected under the MMPA.		
	Fish	Atlantic sturgeon		
Human Communities		Complex and variable. In general, herring catch for New England states since 1996 has declined, but catch year to year has been variable. Revenues have also generally been variable.	**Mixed** Although future sustainable resources should support viable communities and economies, continued effort reductions over the past few years have had negative impacts on communities.	**Negative –** short term: Lower revenues would continue until stocks are sustainable. **Positive** – long term: Sustainable resources should support viable communities and economies.

7.6.6 Summary of Impacts from 2016-2018 Atlantic Herring Fishery Specifications

The impacts of the proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps, are in Sections 7.1 to 7.5 and summarized in Table 67. Impacts are described as positive, negligible, or negative, as defined in Table 60.

Because the Atlantic herring ABC specification proposed for the 2016-2018 fishing years only differs from the 2013-2015 ABC specification by 3,000 mt (2.6%), there is no discernable difference between the impacts of Alternatives 1-3 on the Atlantic herring resource. The projections in Section 7.1.1 show that under the OFL/ABC specifications of all alternatives, Atlantic herring spawning stock biomass (SSB) and fishing mortality (F) resulting from fully utilizing ABC fall within the same range (based on the 80% confidence intervals). Because the overall status of Atlantic herring (rebuilt, B > SSB) is not expected to be jeopardized, and there would be mortality controls in the fishery, all three alternatives under consideration for the 2016-2018 fishery specifications are expected to have a ***low positive impact*** on the Atlantic herring resource. The proposed specifications are expected to have a ***negligible*** impact on non-target species, because interactions with the primary non-target species in the Atlantic herring fishery (haddock and RH/S) will continue to be managed through catch caps, the impacts of all three alternatives on non-target species are expected to be ***negligible***. Given the minimal and temporary nature of adverse effects on Essential Fish Habitat (EFH) in the Atlantic herring fishery, all alternatives are expected to have a ***negligible*** impact on the physical environment and EFH. The impacts on protected resources are expected to be ***low negative to neutral***. The impacts on fishing businesses and communities are expected to be ***low positive***, as stability in specifications provides a sense of certainty about regulations and the future of the Atlantic herring fishery, and harvesting within OFL, ABC, and ACL constraints should provide for a sustainable fishery.

In general, the proposed 2016-2018 RH/S catch caps are expected to have ***negligible*** impacts on most VECs and ***low positive*** impacts on non-target species. The RH/S catch caps are not expected to affect the amount of Atlantic herring available for harvest in any given fishing year, which is specified through the Atlantic herring OFL, ABC, and the stockwide ACL/OY. The proposed RH/S catch caps (by gear and area) are intended to provide an opportunity for the vessels participating in the directed Atlantic herring fishery to fully use the total stockwide ACL for Atlantic herring (U.S. OY), if they can continue to avoid RH/S. Assuming this, the impacts of all of the RH/S catch cap alternatives under consideration for 2016-2018 on the Atlantic herring resource and fishery-related businesses and communities are expected to be ***negligible***.

River herring and shad are non-target species of particular concern in this management action and are discussed in detail in Section 6.2.3 (p. 51). All of the alternatives for 2016-2018 RH/S catch caps are expected to have a ***low positive*** impact on non-target species, particularly river herring and shad. While stock and fishery data are not robust enough at this time to determine a biologically-based RH/S catch cap and/or the potential impacts of such a catch cap on the RH/S stocks, setting a cap on the catch of these species in the directed Atlantic herring fishery is a proactive action intended to manage and minimize catch to the extent practicable while allowing the Atlantic herring fishery to continue to operate and fully use OY during 2016-2018, if RH/S can be avoided. The catch of RH/S in the directed Atlantic herring fishery would likely be less under any of the alternatives when compared to not specifying catch caps in the fishery, because catch would be capped, and there would be a regulatory incentive for the fleet to avoid RH/S. Generally, lower catches should result in positive impacts on RH/S.

Table 67 - Summary of impacts of alternatives under consideration on each VEC

	Atlantic Herring	Non-Target Species	Physical Envt/EFH	Protected Resources	Fishery-Related Businesses and Communities
2016-2018 Atlantic Herring Fishery Specifications					
Alt 1 (No Action)	Low positive	Negligible	Negligible	Low negative to negligible	Low positive
Alt 2	Low positive	Negligible	Negligible	Low negative to negligible	Low positive
Alt 3 (Preferred)	Low positive	Negligible	Negligible	Low negative to negligible	Low positive
2016-2018 RH/S Catch Caps					
RH/S Alt 1 (No Action)	Negligible	Low positive	Negligible	Low negative to negligible	Negligible
RH/S Alt 2	Negligible	Low positive	Negligible	Low positive to Low negative	Negligible (Possibly negative for SNE/MA SMBT)
RH/S Alt 3 (Preferred)	Negligible	Low positive	Negligible	Option 1 – Low positive to low negative Option 2 (Preferred) – Low negative to negligible	Negligible (Possibly negative for SNE/MA SMBT)
Note: The overall impacts of the alternative on each VEC are provided. The differential impacts of the alternatives are discussed in detail throughout Section 7.0. Preferred alternatives are shaded.					

7.6.7 Cumulative Effects Summary

The cumulative effect is the sum of: the CEA baseline (Table 66), which represents the sum of the past, present, and reasonably foreseeable future (identified hereafter as "other") actions, present conditions of each VEC, plus the impacts from the Proposed Action. When an alternative has a positive effect on a VEC, for example, reduced fishing mortality on a managed species, it has a positive cumulative effect on the stock size of the species when combined with the "other" actions that were also designed to increase stock size. In contrast, when an alternative has a negative effect on a VEC, such as increased mortality, the cumulative effect on the VEC would be negative and tend to reduce the positive effects of the "other" actions. The resultant positive and negative cumulative effects are described below for each VEC.

Atlantic Herring Resource

Section 7.1 addresses the impacts of the 2016-2018 Atlantic herring fishery specifications on the Atlantic herring resource. Analysis of the measures proposed in the 2016-2018 Atlantic herring fishery specifications considered the potential impacts of the proposed action and other alternatives on the Atlantic herring resource, in combination with relevant past, present, and

reasonably foreseeable future actions as well as applicable non-fishing impacts. The incremental benefits from the proposed action are not likely to result in significantly negative cumulative effects on the Atlantic herring resource. The significance criteria that applies to the Atlantic herring resource requires the consideration of whether or not the proposed action is reasonably expected to jeopardize the sustainability of any target species (Atlantic herring) and whether or not the proposed action is expected to result in cumulative adverse impacts with a substantial effect on Atlantic herring.

The impacts of the proposed 2016-2018 Atlantic herring fishery specifications are likely to be *low positive*. The impacts of the proposed 2016-2018 RH/S catch caps on the Atlantic herring resource are likely to be *negligible*. Overall, past and present impacts, combined with the impacts of the ***Preferred Alternative*** and future actions on the Atlantic herring resource should yield a **positive** cumulative impact that is not significant.

Non-Target Species

Section 7.2 addresses the impacts of the proposed 2016-2018 Atlantic herring fishery specifications on non-target species. The impacts of the 2016-2018 Atlantic herring fishery specifications on non-target species are likely to be *negligible*. The impacts of the proposed 2016-2018 RH/S catch caps on non-target species – particularly river herring and shad – is expected to be *low positive*. Overall, past and present impacts, combined with the ***Preferred Alternative*** and future actions, are expected to continue reducing bycatch and striving to maintain sustainable stocks, should yield a **positive** cumulative impact on non-target species that is not significant.

Physical Environment and EFH

Section 6.3 addresses the impacts of the 2016-2018 Atlantic herring fishery specifications on habitat and EFH. Because fishing with midwater trawls and purse seines, the gears used in the directed herring fishery, does not impact EFH in a manner that is more than minimal or more than temporary in nature, the impacts to EFH of these alternatives are negligible, regardless of how much fishing takes place in any particular area. It is likely that fishing and non-fishing activities will continue to degrade habitat quality. Overall, the ***Preferred Alternatives*** in this document would not have any adverse effects on EFH as compared to the No Alternative, and the impacts are therefore expected to be *negligible*. The combination of past, present, and future actions is expected to reduce fishing effort and hence reduce damage to habitat and have a **positive** cumulative impact on habitat and EFH that is not significant**.**

Protected Resources

Section 7.4 addresses the impacts of the 2016-2018 Atlantic herring fishery specifications on protected species and supports the conclusion that the impacts on protected species are expected to be minor. Consistent with the impacts of maintaining the status quo, the impacts of the proposed Atlantic herring fishery specifications on protected resources are expected to be *low negative to negligible*. Similar impacts are expected from the proposed RH/S catch caps, with the exception of Alternatives 1 and 2, which could result in *low positive to low negative* impacts. Overall, past and present impacts, combined with the impacts of the ***Preferred Alternative*** and future actions on protected resources should yield a **positive** cumulative impact that is not significant.

Fishery-Related Businesses and Communities

Section 7.5 addresses the impacts of the 2016-2018 Atlantic herring fishery specifications on fishery-related businesses and communities. For the most part, the impacts of the proposed 2016-2018 Atlantic herring fishery specifications are expected to be *low positive* and RH/S catch caps on fishery-related businesses and communities are expected to be *negligible*, although some alternatives for RH/S catch caps may result in a negative impact on the SNE/MA small mesh bottom trawl fleet. Over the long-term, however, the combination of past, present, and future actions, including the proposed action, is expected to enable a sustainable harvest of Atlantic herring, and should lead to a **positive** cumulative impact on fishery-related businesses and communities that is not significant.

8.0 APPLICABLE LAWS/EXECUTIVE ORDERS

8.1 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

8.1.1 National Standards

Section 301 of the Magnuson-Stevens Fishery Conservation and Management Act requires that fishery management plans (FMPs) contain conservation and management measures that are consistent with ten National Standards:

In General. – Any fishery management plan prepared, and any regulation promulgated to implement any such plan, pursuant to this title shall be consistent with the…national standards for fishery conservation and management.

(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

The primary goal of managing the Atlantic herring fishery is to maintain long-term sustainable catch levels, consistent with the National Standards of the MSA. The first objective of the Atlantic Herring FMP is to prevent overfishing. The Atlantic Herring FMP established a fishery specifications process that ensures a consistent review of the herring stock status, fishery performance, and other factors to manage by Annual Catch Limits (ACLs) and prevent overfishing. The additional management measures implemented through the Atlantic Herring FMP should further achieve the goals/objectives and reduce the possibility of overfishing the Atlantic herring resource. Optimum Yield (OY) for the Atlantic herring fishery is defined in the Herring FMP (as modified by Amendments 1 – 4) and specified annually (in this document for 2016-2018) so that it will not exceed the Allowable Biological Catch (ABC, which accounts for scientific uncertainty), and cannot exceed the Overfishing Limit (OFL), which is based upon a target fishing mortality rate that is determined as prescribed in the overfishing definition. This ensures that yield from the fishery can be optimized while preventing overfishing on a continuing basis.

The specification of ABC for 2016-2018 recommended by the Council is based on SSC advice provided at its May 20, 2015 meeting. This specification maintains the current (2013-2015) ABC control rule for Atlantic herring, which involves a constant catch approach over fishing years 2016-2018, with the ABC set such that the probability of overfishing does not exceed 50% in any of those years. Based on the projection, probability of overfishing may reach 50% in the third year (2018). The SSC included the following in its rationale for the 2016-2018 ABC specification (see May 20, 2015 SSC Report for additional discussion/rationale):

- Key attributes of the stock and assessment (SSB, recruitment, F, survey indices, etc.) have not changed significantly since the benchmark assessment, on which the current control rule was based. However, survey indices suggest that the 2011 year class is the second largest in time series and will contribute significantly to the total population abundance and biomass in 2016-2018.
- Although the probability of overfishing reaches 50% in the third year, the probability of the stock becoming overfished is close to 0% in all years.

- The realized catch in the fishery is generally well below the annual ABC, which reduces the expected risk of overfishing.

The biological analysis in Section 7.1.1 (p. 105) demonstrates that the 2016-2018 Atlantic herring fishery specifications should prevent overfishing of the Atlantic herring resource while allowing vessels engaged in the Atlantic herring fishery to harvest OY from the fishery in each year from 2016-2018. The Council's intent regarding the 2016-2018 RH/S catch caps is to provide strong incentive for the herring industry to continue to avoid river herring/shad and reduce RH/S catch to the extent practicable while still using the available Atlantic herring OY. The Council recommendation for the ***Preferred Alternative*** for the 2016-2018 RH/S catch caps (Alternative 3, Weighted Mean, Section 4.3.3) should allow vessels participating in the herring fishery to achieve OY on a continuing basis, if they can continue to avoid RH/S.

(2) Conservation and management measures shall be based upon the best scientific information available.

The 2016-2018 Atlantic herring specifications are supported by the best available scientific information, and recommendations for Atlantic herring catch during 2016-2018 are based on advice from the NEFMC Scientific and Statistical Committee (SSC). The supporting science and analyses, upon which the proposed action is based, are described in Section 2.2 and Section 7.0. All supporting materials, information, data, and analyses within this document have been, to the maximum extent practicable, properly referenced according to commonly-accepted standards for scientific literature to ensure transparency. Qualitative discussion is provided where quantitative information was unavailable, using appropriate references as necessary.

Biological information from peer-reviewed stock assessments is used to formally evaluate stock condition. In 2012, the 54th stock assessment workshop completed an Atlantic herring benchmark stock assessment (NEFSC 2012). These formal stock assessments undergo rigorous development and are peer-reviewed through the Stock Assessment Review Committee (SARC) process, which are the only such comprehensive assessments. SAW 54 was updated in April 2015 during the Atlantic Herring Operational Assessment (April 8-9, 2015). The NEFMC SSC reviewed the operational assessment and used these data to form its recommendations for the 2016-2018 Atlantic herring ABC specification. The operational assessment (update to SAW 54) and the SSC advice regarding ABC represent the best available information regarding the status of the Atlantic herring resource and acceptable fishing levels in the upcoming three years.

The economic information and analyses in this document are based primarily on landings, revenue, and effort information collected through the NMFS data collection systems used for this fishery. Although there are some limitations to the data used in the analysis of impacts of management measures, these data have been thoroughly reviewed and are considered to be the best available. Information about bycatch is based on reports collected by the NEFSC Sea Sampling (Observer) Branch and incorporated into the NOAA Fisheries observer database. The observer data are collected using an approved, scientifically-valid sampling process. Furthermore, the analyses were prepared by and reviewed by the Council's Herring Plan Development Team and complies with the Information Quality Act (IQA, see Section 8.6 for more discussion related to the IQA).

(3) To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The Atlantic Herring FMP and all related management actions address the long-term management of Atlantic herring throughout the range of the species in U.S. waters, in accordance with the jurisdiction of U.S. law. Most Atlantic herring are caught in the Exclusive Economic Zone (EEZ). While most herring are landed in Maine, Massachusetts, and Rhode Island, Atlantic herring landings have been reported in every state from Maine through Virginia. To address that portion of the resource that is caught in State waters, the Atlantic Herring FMP and related actions, including these specifications, were developed in coordination with the Atlantic States Marine Fisheries Commission.

While the Atlantic Herring FMP manages the coastal Atlantic herring stock complex as a single unit, it also considers impacts of fishing mortality on individual spawning components. The sub-ACL system for the Atlantic herring fishery allocates the stockwide Atlantic herring ACL (OY) among four management areas (Figure 1, p. 3). This system is designed to protect the individual spawning components from excessive fishing pressure while allocating catch in a way that maximizes opportunities for participants in the fishery to fully use OY.

The coastal stock complex of Atlantic herring includes herring that are caught in the Canadian fixed gear fishery in New Brunswick and in Canadian waters on Georges Bank (Canadian GB catch is minimal and not considered in the specifications). Catch from the NB weir fishery is summarized in Section 4.2.2.1 (p. 16). While the Atlantic Herring FMP considers Atlantic herring catch that may occur in Canadian waters, it does not explicitly regulate those catches because of a lack of U. S. jurisdiction. In general, allowable biological catch (ABC) is estimated for the entire coastal stock complex of Atlantic herring based on scientific uncertainty, and OY for the U. S. fishery is then determined by accounting for the Canadian catch (NB weir fishery) as part of management uncertainty. For these specifications, estimates of the Canadian catch that are deducted from the ABC to account for management uncertainty are intended to reflect a general expectation of catch from the NB weir fishery for 2016-2018 (see Section 4.2.1 for more information about the specification of management uncertainty).

(4) Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

Fishery-related businesses and communities that participate in/depend on the Atlantic herring fishery are described in detail in Section 6.5. The proposed 2016-2018 Atlantic herring specifications do not discriminate between residents of different States. This action does not allocate or assign fishing privileges among various fishermen.

The measures proposed in the 2016-2018 Atlantic herring fishery specifications are intended to be applied equally to Atlantic herring permit holders of the same category (A/B, C, and/or D), regardless of homeport or location. Similarly, the RH/S catch caps are intended to apply equally on all trips that land 6,600 pounds of Atlantic herring or more when vessels are fishing with gear

types that are subject to catch caps (midwater trawl and small mesh bottom trawl). However, the fact that Atlantic herring are not distributed evenly, and that individual vessels may target specific stocks/fisheries at different times of the year, means that distributive impacts cannot be avoided in some cases. While the measures do not discriminate between permit holders from different States, they may result in variable impacts across permit holders/fishery participants. The impacts of the proposed measures on fishing-related businesses and communities are discussed in Section 7.5; differential impacts are identified and evaluated to the extent possible in the analyses. Overall, however, the impacts of the proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps on fishing-related businesses and communities are expected to be *low positive to negligible*.

(5) Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

The proposed 2016-2018 Atlantic herring fishery specifications allocate the stockwide Atlantic herring ACL to management areas in a manner that is intended to maximize opportunities for the fishery while minimizing the potential for overfishing. Objective of the Atlantic herring FMP is to minimize the risk of overfishing a stock component (inshore/offshore); consequently, economic allocation is not the sole purpose of distributing the catch among management areas. This approach is essential to balance the needs of the fishery, both biologically and economically. The specifications proposed for the 2016-2018 fishing years should promote efficiency in the utilization of fishery resources through appropriate measures intended to provide access to the Atlantic herring fishery for both current and historical participants while minimizing the race to fish in any of the Atlantic herring management areas.

Economic allocation is not the sole purpose of the other proposed 2016-2018 Atlantic herring fishery specifications and/or RH/S catch caps. The ***Preferred Alternatives*** are intended to promote biological stability in the fishery and also provide a benefit to the industry over the long-term. The proposed RH/S catch caps (by gear and area) for 2016-2018 are intended to provide an opportunity for the vessels participating in the directed Atlantic herring fishery to fully utilize the total stockwide ACL for Atlantic herring (U.S. OY), if they can continue to avoid RH/S and continue to minimize bycatch to the extent practicable.

(6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

Changes in fisheries occur continuously, both as the result of human activity (for example, new technologies or shifting market demand) and natural variation (for example, oceanographic perturbations). There are a number of factors which could introduce variations into the Atlantic herring fishery. As discussed in the Atlantic Herring FMP, as well as other recent stock assessment documents, there is some uncertainty in the estimate of current stock size. In addition, the structure and status of individual spawning components cannot be determined with precision, resulting in the assessment of a coastal stock complex rather than separate assessments for each individual spawning component. Because of the lack of a permitting and reporting system prior to VTR requirements and implementation of the Herring FMP, there is some

uncertainty regarding the total harvest of Atlantic herring and the proportion of herring that is utilized for food/bait, particularly in more historical years. Market fluctuations, environmental factors, and predator-prey interactions constantly introduce additional variations among, and contingencies in, the herring resource, the fishery, and the available catch.

The proposed 2016-2018 Atlantic herring fishery specifications balance the needs of the Atlantic herring fishery and account for the possible variations among the fishery, resource, and catches. For example, many herring fishermen in Area 2 are dependent on the Atlantic mackerel fishery, and oftentimes, herring is caught concurrently when targeting mackerel, especially in the winter months in Area 2. If the sub-ACL is caught early in Area 2 and the directed herring fishery closes, the mackerel fishery may be affected because the incidental catch possession limit of 2,000 lbs. Atlantic herring precludes directed mackerel fishing. For this reason, the Council allocates a substantial proportion of yield to Area 2. The sub-ACL in Area 1A and 1B is split into seasons, and sub-ACL carryover provisions (implemented in Framework 2) provide flexibility to allow for variations in the Atlantic herring fishery.

The RH/S catch caps proposed in this action account for variations among and contingencies in the Atlantic herring fishery, the Atlantic herring resource, RH/S resources, and related catches by specifying RH/S catch caps by gear type and area. The RH/S catch caps are intended to provide opportunity for the directed herring fleet to use the total ACL for Atlantic herring (OY) if it can continue to avoid RH/S to the extent practicable. The RH/S Catch Cap Areas and related Catch Cap Closure Areas are different than the herring management areas; this area-based approach reduces the likelihood that reaching one or more RH/S catch caps in a fishing year would result in closure of the directed herring fishery in all management areas.

(7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

The Council considered the costs and benefits of the proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps. Any costs incurred as a result of the proposed management action are considered necessary to achieve the goals and objectives of the Atlantic herring FMP and are viewed to be outweighed by the benefits of taking the management action. The management measures proposed in this document are not duplicative and were developed in close coordination with NMFS, the Atlantic States Marine Fisheries Commission (ASMFC), the MAFMC, and other interested entities and agencies to minimize duplicity.

(8) Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

The proposed 2016-2018 Atlantic herring fishery specifications account for the importance of fishery resources to fishing communities. A complete description of the fishing communities participating in and dependent on the Atlantic herring fishery is in Section 6.5.7 (p. 98). Relative to No Action alternative, the measures proposed are expected to have *low positive to negligible* impacts on communities engaged in and dependent on the Atlantic herring fishery by managing

the Atlantic herring resource in a precautionary manner to ensure long-term sustainable catch and minimizing the race to fish. Thus, the participation of communities dependent on the Atlantic herring resource is expected to be sustained by this action.

(9) Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

The proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps minimize bycatch, and to the extent that bycatch cannot be avoided, the specifications minimize bycatch mortality to the extent practicable. The MSA defines bycatch as fish that are harvested in a fishery, but which are not sold or kept for personal use. This includes economic discards and regulatory discards. The fish that are being targeted may be bycatch if they are not retained. Comprehensive information related to bycatch in the Atlantic herring fishery is in Section 3.2 (*Non-Target Species*). In this document, "non-target species" refers to species other than Atlantic herring which are caught by federally-permitted vessels while fishing for Atlantic herring. These non-target species may be caught by the same gear while fishing for herring, and may be sold assuming the vessel has proper authorization or permit(s) and the regulations allow for the sale of the species (incidental catch). Available data indicate that the vast majority of catch by herring vessels on directed trips is Atlantic herring, with extremely low percentages of bycatch (discards). Non-target species of particular concern relative to this management action are river herring and shad (see Section 6.2.3 for more information).

Because of the high-volume nature of the fishery, some unwanted catch is landed incidentally as well. Therefore, it has been important to examine the details of reporting by vessels and dealers, in addition to sea sampling protocols, to better identify species of concern and/or other bycatch issues and minimize the occurrence of bycatch in the herring fishery. Monitoring– through both at-sea and portside sampling – and avoidance are critical steps to better understanding the nature and extent of bycatch in the fishery and working with the industry to minimize it to the extent practicable. Towards this end, the Council recognizes the importance of portside sampling for the Atlantic herring fishery and is proposing to maintain a 3% research set-aside for 2016-2018. The Council identified river herring bycatch avoidance, portside sampling, and electronic monitoring as three of the top priorities for cooperative research (see Section 2.2.3.1 for more information about the proposed RSA). Establishing a RSA for 2016-2018 with the priorities identified by the Council is consistent with goals, objectives, and long-term management strategies to be implemented through Amendment 5. The measures implemented in Amendment 5 promote cooperation with the industry and acknowledge the need to better understand bycatch problems to develop effective solutions. A 3% RSA for the 2016-2018 fishing years encourages the industry to participate in the collection of scientific information and conduct research to reduce interactions with non-target species affected by the operation of the Atlantic herring fishery.

The proposed 2016-2018 RH/S catch caps, in part, reduce bycatch and bycatch mortality to the extent practicable by providing an incentive to avoid the incidental catch of river herring and shad by allowing an opportunity to achieve Optimum Yield while maintaining a trigger that implements a low Atlantic herring possession limit (area closure) that is expected to further limit bycatch and bycatch mortality once the cap is reached. Based on the ASMFC recent river herring

and shad assessments, data are not robust enough to determine a biologically-based river herring/shad catch cap and/or the potential effects of such a catch cap on river herring/shad populations on a coast-wide scale. However, setting a RH/S catch cap is a proactive action intended to manage and minimize catch to the extent practicable. The catch of RH/S in the directed Atlantic herring fishery would likely be less under any of the alternatives when compared to not specifying catch caps in the fishery. Thus, the catch caps proposed for 2016-2018 should continue to provide a strong incentive for the Atlantic herring industry to avoid river herring and shad catch and bycatch, while still allowing an opportunity to use the full Atlantic herring ACL.

(10) Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

Fishing is a dangerous occupation; participants must constantly balance the risks imposed by weather against the economic benefits. A FMP should be designed so that it does not encourage dangerous behavior by the participants. According to the National Standard guidelines, the safety of the fishing vessel and the protection from injury of persons aboard the vessel are considered the same as safety of human life at sea. The safety of a vessel and the people aboard is ultimately the responsibility of the master of that vessel. Each master makes many decisions about vessel maintenance and loading and about the capabilities of the vessel and crew to operate safely in a variety of weather and sea conditions. National Standard 10 does not replace the judgment or relieve the responsibility of the vessel master related to vessel safety. The Councils, the USCG, and NMFS, through the consultation process of paragraph (d) of this section, review all FMPs, amendments, and regulations during their development to ensure they recognize any impact on the safety of human life at sea and minimize or mitigate that impact where practicable.

The Council has the utmost concern regarding safety, and understands how important safety is when considering allocations for the stockwide Atlantic herring ACL to the individual management areas. The proposed 2016-2018 Atlantic herring specifications ensure that access to the herring fishery is provided for vessels of all sizes and gear types, which is one reason for distributing the catch in both inshore and offshore areas (example of safety concerns include – concern of vessel maintenance, duration at sea). The specifications proposed here, to the extent practicable, promote human life at sea while allowing the industry to benefit from increased yield and revenues due to a healthy Atlantic herring resource.

8.1.2 Other Required Provisions of MSA

Section 303 of the Magnuson-Stevens Fishery Conservation and Management Act contains 14 additional required provisions for FMPs, which are discussed below. Any FMP prepared by any Council, or by the Secretary, with respect to any fishery, shall:

(1) contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States, which are-- (A) necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery; (B) described in this subsection or subsection (b), or both; and (C) consistent with the National Standards, the other provisions of this Act, regulations implementing recommendations by international organizations in which the United States

participates (including but not limited to closed areas, quotas, and size limits), and any other applicable law;

The Atlantic Herring FMP, modified through a number of amendments and framework adjustments, includes a comprehensive set of conservation and management measures applicable to U.S. fishing vessels which are necessary and appropriate for the conservation and management of the fishery to prevent overfishing, and to protect, restore, and promote the long-term health and stability of the Atlantic herring fishery. The proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps further enhance the Atlantic herring management program, consistent with the goals and objectives of the Atlantic Herring FMP and its related amendments and framework adjustments.

The original Atlantic Herring FMP included the MSA requirement to consider Total Allowable Level of Foreign Fishing (TALFF) when domestic fishing capacity is not adequate (NEFMC 1999). Generally, foreign fishing for the Atlantic herring resource is considered during the fishery specifications process when Optimum Yield is determined and the management area sub-ACLs are established for a fishing year. In previous specifications for the Atlantic herring fishery, the Council would specify OY for Atlantic herring and then consider a domestic annual harvest (DAH) specification. If, at any point in this process, DAH is not adequate to utilize the available OY, then TALFF would be specified. During recent fishing years, however, the domestic Atlantic herring fleet has been shown to have the capacity to fully utilize DAH. As a result, the Council eliminated the need to annually consider TALFF in Amendment 4 to the Atlantic Herring FMP. However, eliminating the need to specify TALFF annually does not eliminate the legal requirement under the MSA to provide TALFF if DAH is not adequate.

(2) contain a description of the fishery, including, but not limited to, the number of vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location, the cost likely to be incurred in management, actual and potential revenues from the fishery, any recreational interest in the fishery, and the nature and extent of foreign fishing and Indian treaty fishing rights, if any;

This document updates Atlantic herring stock and fishery information through the 2014 fishing year when available. A thorough description of the Atlantic herring analysis regarding the catch information methods, fishing gear used, species of fish involved and their location, costs incurred in management, and actual and potential revenues from the fishery is in Section 6.5, which supplements and updates the information in the Amendment 5 FEIS. Atlantic herring vessels primarily use purse seines, single midwater trawls, midwater pair trawls, or small mesh bottom trawls for fishing gear, with the midwater trawl fleet (single and paired) harvesting the majority of landings in recent years, with over hundred million dollars in revenue.

The proposed 2016-2018 Atlantic herring fishery specifications are consistent with the goals, objectives, and provisions of the Atlantic Herring FMP and its related amendments and adjustments. Aside from the importance of Atlantic herring as a forage species in the Northeast Region and the use of Atlantic herring as bait, both of which are addressed in this and other related documents, there is no specific recreational interest in the fishery. Currently, there is neither foreign fishing for Atlantic herring in the EEZ, nor Indian treaty rights related to the Atlantic herring fishery.

(3) assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specification;

The present and probable future condition of the Atlantic herring resource and estimates of MSY were updated through the most recent Atlantic herring operational stock assessment in April 2015 (SAW 54 update). Information related to the Atlantic herring stock assessment and updated biological reference points are in Section 6.1 (p. 40).

For the proposed 2016-2018 Atlantic herring specifications, the Optimum Yield (OY) should be less than or equal to acceptable biological catch (ABC) minus the management uncertainty buffer, which accounts for expected catch of Atlantic herring in the Canadian New Brunswick (NB) weir fishery. The domestic annual harvest (DAH) proposed is set equal to OY for the U.S. Atlantic herring fishery. DAH is established based on the expected catch from U.S. fishing vessels during the upcoming fishing year. Section 4.2 (p. 15) has more detailed description of these specifications, including supporting information.

(4) assess and specify-- (A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield specified under paragraph (3); (B) the portion of such optimum yield which, on an annual basis, will not be harvested by fishing vessels of the United States and can be made available for foreign fishing; and (C) the capacity and extent to which United States fish processors, on an annual basis, will process that portion of such optimum yield that will be harvested by fishing vessels of the United States;

This provision relates directly to the Atlantic herring fishery specification process and is addressed when the Council develops the specifications for the Atlantic herring fishery, including OY, Domestic Annual Processing (DAP), and Domestic Annual Harvesting (DAH). Information related to DAP and DAH is in Section 4.2.3.

DAH is proposed to be specified equal to the stockwide Atlantic herring ACL, which represents OY for the Atlantic herring fishery. The stockwide Atlantic herring ACL/OY is specified below ABC to account for management uncertainty. In previous Atlantic herring fishery specifications, it was determined that sufficient harvesting capacity exists in the domestic fishery to harvest the entire available yield in a given year. Section 4.2.3 has information related to the specification of DAH for the 2016-2018 fishing years.

Domestic annual processing (DAP) is the amount of U.S. Atlantic herring harvest that domestic processors will use, combined with the amount of the resource that will be sold as fresh fish (including bait). The Atlantic Herring FMP specifies that DAP is a subset of DAH and is composed of estimates of production from U.S. shoreside and at-sea processors. In previous Atlantic herring fishery specifications, it was determined that sufficient processing capacity exists in the U.S. processing sector of the fishery to harvest the entire available Atlantic herring yield in a given year. DAP is therefore proposed to be set equal DAH minus 4,000 mt for BT during the 2016-2018 fishing years (Section 4.2.3). While it is difficult to predict whether or not the U.S. processing sector will use the entire available DAP in 2016-2018, it is certainly possible given the capacity of the domestic processing sector.

The original Atlantic Herring FMP (1999) included the MSA requirement to consider TALFF when domestic fishing capacity is not adequate. Generally, foreign fishing for the Atlantic herring resource is considered during the fishery specifications process when OY is determined and the management area sub-ACLs are established for a fishing year. In previous specifications for the Atlantic herring fishery, the Council would specify OY for Atlantic herring and then consider a domestic annual harvest (DAH) specification. If, at any point in this process, DAH is not adequate to use the available OY, then TALFF would be specified. During recent fishing years, however, the domestic Atlantic herring fleet has had the capacity to fully utilize DAH. As a result, the Council eliminated the need to annually consider TALFF (NEFMC 2010). However, eliminating the need to specify TALFF annually does not eliminate the legal requirement under the MSA to provide TALFF if DAH is not adequate.

(5) specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter fishing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors;

Regulations implemented through the Atlantic Herring FMP apply to all federally-permitted herring vessels and dealers. Reporting requirements for the Atlantic herring fishery are addressed in the Atlantic Herring FMP and its related amendments and framework adjustments, Frameworks 43 and 46 to the Northeast Multispecies FMP (haddock catch cap for the herring fishery), and the 2011 herring rulemaking action taken by NMFS to clarify reporting and implement VMS reporting for limited access herring vessels. All limited access Atlantic herring vessels are required to use a VMS for reporting and enforcement purposes. In addition, ASMFC Amendment 2 to the Interstate Herring FMP implemented an IVR reporting requirement for fixed gear state waters fishermen during the 2006 fishing year; this ensured that the fixed gear measures in the Atlantic Herring FMP can be adequately monitored and enforced. There is no direct recreational component to the fishery. However, herring is an important bait for businesses and communities. Data on the type and quantity of fishing gear used, catch by species, areas fished, season, sea sampling hauls, and domestic harvesting/processing capacity are updated to the extent possible from the Amendment 5 FEIS and in the Affected Environment (Section 6.5).

The proposed 2016-2018 Atlantic herring fishery specifications address the commercial fishery for Atlantic herring and will be implemented in State waters through continued coordination with the ASMFC. The information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors is summarized and updated in the Affected Environment (Section 3.0). It is recognized that the majority Atlantic herring vessel operators primarily use purse seines, single midwater trawls, midwater pair trawls, or small mesh bottom trawls for fishing gear. Summary information about Atlantic herring catch by vessels using these gear types is in Section 6.5.

(6) consider and provide for temporary adjustments, after consultation with the Coast Guard and persons utilizing the fishery, regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safe conduct of the fishery; except that the adjustment shall not adversely affect conservation efforts in other fisheries or discriminate among participants in the affected fishery;

The proposed 2016-2018 Atlantic herring fishery specifications do not alter any adjustments made in the Atlantic Herring FMP that address opportunities for vessels that would otherwise be prevented from harvesting, because of weather or other ocean conditions affecting the safe conduct of the fisheries. No consultation with the Coast Guard is required relative to this issue. The safety of fishing vessels and life at-sea is a high priority issue for the Council and was considered throughout the development of the management measures proposed in this document (see discussion of National Standard 9, Section 8.1.1). The Amendment 5 FEIS includes more detailed discussion regarding this issue.

(7) describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), 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;

Essential fish habitat was identified for Atlantic herring in the Atlantic Herring FMP and has been addressed through all subsequent related management actions in a manner that is consistent with the MSA. This document describes the physical environment and EFH (Section 6.3) and evaluates the impacts of the proposed management action and other alternatives considered on EFH (Section 7.3). Overall, the proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps are expected to have *negligible* impacts on the Physical Environment and EFH.

(8) in the case of a fishery management plan that, after January 1, 1991, is submitted to the Secretary for review under section 304(a) (including any plan for which an amendment is submitted to the Secretary for such review) or is prepared by the Secretary, assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan;

The FEIS for Amendment 5 to the Atlantic Herring FMP provides an updated list of data and research needs with respect to the Atlantic herring fishery and its management program. Included are general research needs as well as those specific to cooperative research and improving information about the importance of herring as a forage species in the Northeast Region ecosystem. These data and research needs will be reviewed and updated again as part of the next major Atlantic herring management action (likely Amendment 8 to the Atlantic Herring FMP, currently under development).

Biological information from stock assessments is used to evaluate stock condition. In April 2015, the SSC reviewed an update to the 54th stock assessment workshop (Atlantic herring operational assessment; Section 6.1). The operational assessment therefore represents the best available information regarding the status of the Atlantic herring resource at this time. Conclusions and

results were available during the development of the action proposed in this document and were evaluated with respect to the proposed management measures during the specifications process.

Consistent with this requirement, the Council is proposing to maintain the specification of 3% RSA from each management area for the 2016-2018 fishing years. The Council has identified river herring bycatch avoidance, portside sampling, and electronic monitoring as three of the top priorities for cooperative research (see Section 2.2.3.1 for more information about the proposed RSA). Establishing a RSA for 2016-2018 with the priorities identified by the Council is consistent with goals, objectives, and long-term management strategies to be implemented through Amendment 5. A 3% RSA for the 2016-2018 fishing years encourages the industry to participate in the collection of scientific information and conduct research to reduce interactions with non-target species affected by the operation of the Atlantic herring fishery.

(9) include a fishery impact statement for the plan or amendment (in the case of a plan or amendment thereto submitted to or prepared by the Secretary after October 1, 1990) which shall assess, specify, and describe the likely effects, if any, of the conservation and management measures on-- (A) participants in the fisheries and fishing communities affected by the plan or amendment; and (B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants;

The Council developed the proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps in consultation with the ASMFC and MAFMC through the participation of its staff/members on the Herring PDT, Advisory Panel, and Committee, in addition to attendance at Council meetings. This action is not an FMP or an amendment, but this document does include analyses and discussion of the impacts of the proposed management measures and other alternatives considered on the affected human environment, including herring fishery participants and communities. The fishery impact statement is in Section 7.0 (various sections addressing the potential impacts of the proposed action on VECs). Impacts of future Atlantic herring fishery specifications on participants in the fishery and fisheries in adjacent areas will continue to be evaluated through the specifications process.

(10) specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery;

The status determination criteria for Atlantic herring were established in the Atlantic Herring FMP and were further addressed in Amendment 4. Objective and measurable criteria for determining when the fishery is overfished, including an analysis of how the criteria were determined, is in the Herring FMP (NEFMC 1999), based on a report from the Council's Overfishing Definition Review Panel (1998). Included in the status determination criteria (overfishing definition) is a rebuilding program (control rule) if the stock ever becomes overfished.

For the proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps, the best available science was used to determine the status of the Atlantic herring stock complex. Recent stock assessments have evaluated status determination criteria and updated biological reference points for the Atlantic herring stock complex. The 2015 Atlantic herring operational (update) assessment results estimated that Atlantic herring spawning stock biomass (SSB) in 2014 was 622,991 mt (retro-adjusted), which is well above the new B_{MSY} reference point (311,145 mt). Estimated fishing mortality in 2014 was 0.16 (retro-adjusted), which is below F_{MSY} (0.24). Currently, the Atlantic herring fishery is not overfished and overfishing is not occurring; Atlantic herring is currently considered rebuilt. More information is in Section 6.1.1 (p. 40).

(11) establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority-- (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided;

The first Standardized Bycatch Reporting Methodology (SBRM) Omnibus Amendment to the fishery management plans of the Northeast region was implemented in February 2008 to address the requirements of the MSFCMA to include standardized bycatch reporting methodology in all FMPs of the NEFMC and MAFMC. SBRM can be viewed as the combination of sampling design, data collection procedures and analyses used to estimate bycatch and allocate observer coverage across multiple fisheries.

On September 15, 2011, upon the order of the U.S. Court of Appeals for the District of Columbia Circuit, the U.S. District Court for the District of Columbia, in the case of Oceana, Inc. v. Locke (Civil Action No. 08-318), vacated the Northeast Region SBRM Omnibus Amendment and remanded the case to NMFS for further proceedings consistent with the D.C. Circuit Court's decision.

To comply with the ruling, NMFS announced on December 29, 2011 (76 FR 81844) that the Northeast Region SBRM Omnibus Amendment is vacated and all regulations implemented by the SBRM Omnibus Amendment final rule (73 FR 4736, January 28, 2008) are removed. This removed the SBRM section at § 648.18 and removes SBRM-related items from the lists of measures that can be changed through the FMP framework adjustment and/or annual specification process for the Atlantic mackerel, squid, and butterfish; Atlantic surfclam and ocean quahog; Northeast multispecies, monkfish; summer flounder; scup; black sea bass; bluefish; Atlantic herring; spiny dogfish; deep-sea red crab; and tilefish fisheries. This action also makes changes to the regulations regarding observer service provider approval and responsibilities and observer certification. The SBRM Omnibus Amendment had authorized the development of an industry-funded observer program in any fishery, and the final rule modified regulatory language in these sections to apply broadly to any such program. This action revises that regulatory language to refer specifically to the industry-funded observer program in the scallop fishery, which existed prior to the adoption of the SBRM Omnibus Amendment.

NMFS and the New England and Mid-Atlantic Fishery Management Councils consequently developed a new omnibus amendment to bring Northeast fishery management plans into compliance with MSFCMA requirements for a SBRM. The revised SBRM amendment was implemented in mid-2015.

This document updates information about and considers impacts of the proposed action on non-target species (species other than Atlantic herring which are caught by federally-permitted vessels while fishing for Atlantic herring). It also includes conservation and management measures that, to the extent practicable, continue to (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided in the directed Atlantic herring fishery. Overall, catch levels for the 2016-2018 fishing years are expected to be the same or slightly less than in 2013-2015. With the implementation of enhanced reporting requirements through Amendment 5, as well as fishery-wide efforts to minimize bycatch, the collection of bycatch information under the 2016-2018 Atlantic herring fishery specifications should remain effective, and bycatch should continue to be minimized to the extent practicable. Additional discussion about this issue is in Section 8.1.1 (National Standard 9).

(12) assess the type and amount of fish caught and released alive during recreational fishing under catch and release fishery management programs and the mortality of such fish, and include conservation and management measures that, to the extent practicable, minimize mortality and ensure the extended survival of such fish;

There is no direct recreational component to the fishery, however it is recognized that Atlantic herring is an important resource as bait for businesses and communities. The proposed action does not address recreational fishing regulations.

(13) include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors;

A detailed and updated description of all participants in the Atlantic herring fishery is in the Affected Environment (Section 6.5) and updates information in the FEIS for Amendment 5 to the Atlantic Herring FMP. This includes data for herring vessels, processors, dealers, communities, and information about industries and other sectors that are dependent on Atlantic herring (lobster, tuna, ecotourism, recreational, other). It updates all available information about the fishery and characterizes trends through the 2013 and 2014 fishing years wherever possible. Aside from the importance of Atlantic herring as a forage species in the Greater Atlantic Region and the use of Atlantic herring as bait, both of which were considered during the development of measures proposed in this document, there is no specific recreational interest in the fishery. Information about the use of Atlantic herring as bait is in Section 6.5.6 (p. 95).

(14) to the extent that rebuilding plans or other conservation and management measures which reduce the overall harvest in a fishery are necessary, allocate any harvest restrictions or recovery benefits fairly and equitably among the commercial, recreational, and charter fishing sectors in the fishery.

The 2015 Atlantic herring operational assessment evaluated status determination criteria and updated biological reference points for the Atlantic herring stock complex. According to the best available science, the Atlantic herring stock is not in an overfished condition and overfishing is not occurring –the stock is, in fact, currently considered rebuilt. A rebuilding plan and/or other

conservation and management measures to reduce the overall harvest in the fishery are not necessary at this time.

The overall harvest from the Atlantic herring fishery, including ABC, OY, DAH, DAP, ACLs, will continue to be reviewed, established, and analyzed through the Atlantic herring fishery specifications process, which includes buffers/reductions from an overfishing limit and acceptable biological catch to account for scientific and management uncertainty. Actions related to the specification process will continue to consider fairness and equity as it relates to a reduction in the overall harvest of Atlantic herring, should such a reduction occur in the future.

(15) establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability.

Amendment 1 to the Herring FMP implemented a multiyear specifications process for the Atlantic herring fishery (completed every three years). Amendment 4 to the Atlantic Herring FMP implemented changes to the herring fishery specifications process to comply with the new ACL/AM provisions adopted in the MSA. Future actions will continue to address the mechanism for specifying ACLs and the need to ensure accountability in the fishery. The proposed 2016-2018 Atlantic herring fishery specifications would implement multiyear ACLs and sub-ACLs at a level such that overfishing of the Atlantic herring resource is not expected to occur. The Council will continue to work with NMFS to ensure adequate monitoring and accountability in the Atlantic herring fishery, so that overfishing does not occur and the fishery can continue to achieve OY on a continuing basis.

8.2 NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act (NEPA) provides a mechanism for identifying and evaluating the full spectrum of environmental issues associated with federal actions, and for considering a reasonable range of alternatives to avoid or minimize adverse environmental impacts. This document is designed to meet the requirements of both the MSA and NEPA. The Council on Environmental Quality (CEQ) has issued regulations specifying the requirements for NEPA documents (40 CFR 1500 – 1508). All of those requirements are addressed in this document, as referenced below.

To prepare the 2016-2018 Atlantic herring fishery specifications, the Council held meetings of its Scientific and Statistical Committee, Herring Plan Development Team, Herring Oversight Committee, and Herring Advisory Panel, in addition to Council meetings. All of these meetings were open to the public. Final selection of the Atlantic herring fishery specifications proposed here occurred at the September 2015 New England Fishery Management Council meeting.

8.2.1 Environmental Assessment

The required elements of an Environmental Assessment (EA) are specified in 40 CFR 1508.9(b). They are included in this document, in addition to other relevant sections, as follows:

- An Executive Summary (Section 1.0);
- A Table of Contents (Section 2.1);
- The need for this action (Section 3.2);
- The alternatives that were considered (Section 4.0);
- A description of the Affected Environment (Section 6.0);
- The environmental impacts of the Proposed Action (Section 7.0);
- Cumulative impacts of the Proposed Action (Section 7.6);
- A Finding of No Significant Impact (Section 8.2.2);
- The list of preparers and agencies consulted on this action (Section 8.2.3).

8.2.2 Finding of No Significant Impact (FONSI)

National Oceanic and Atmospheric Administration Order (NAO) 216-6 (revised May 20, 1999) provides sixteen criteria for determining the significance of the impacts of a final fishery management action. These criteria are discussed below:

1. **Can the Proposed Action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?**

<u>Response:</u> The proposed action is not expected to jeopardize the sustainability of the target species affected by this action – Atlantic herring. Relative to No Action, the proposed action is more conservative and is consistent with the best available science (Atlantic herring operational assessment, April 2015). Overall, based on the updated stock assessment and related recommendations of the Herring PDT and the SSC, the Council has concluded the Atlantic herring resource is healthy at this time (rebuilt), and the proposed action is therefore

biologically-sound. The acceptable biological catch level for 2016-2018 has been endorsed by the NEFMC SSC.

Three-year projections, in Section 7.1.1 (p. 105), indicate that Atlantic herring SSB is expected to decrease under the catch levels implemented through the 2016-2018 fishery specifications, but not to a level that would change or jeopardize the biological status of the stock (rebuilt, above the SSB target). The proposed RH/S catch caps are expected to have a *negligible* impact on the Atlantic herring resource (Section 7.1.2). Moreover, the proposed 2016-2018 Atlantic herring specifications continue to manage the Atlantic herring fishery at reduced harvest levels when compared to historical levels.

2. Can the Proposed Action reasonably be expected to jeopardize the sustainability of any non-target species?

Response: The proposed 2016-2018 Atlantic herring fishery specifications cannot reasonably be expected to jeopardize the sustainability of any non-target species that may be affected. Non-target species are described in Section 6.2, and impacts are Section 7.2. The proposed 2016-2018 Atlantic herring fishery specifications are expected to have a negligible impact on non-target species. Under the *Preferred Alternative* (Alternative 3), the Atlantic herring ABC specification proposed for 2016-2018 is only 2.6% lower than the 2013-2015 ABC specification (Alternative 1). When the stockwide Atlantic herring ACL is distributed across the four management areas, the sub-ACLs mostly change by less than 1,000 mt (Table 7). Overall, because the change in Atlantic herring catch is expected to be minor under any of the alternatives, and because interactions with the primary non-target species in the Atlantic herring fishery will continue to be managed through catch caps (haddock and river herring/shad), the impacts of all three alternatives on non-target species are expected to be *negligible*.

River herring and shad are non-target species of particular concern, and catch of RH/S in the directed Atlantic herring fishery is managed through gear and area-specific catch caps, which are proposed here to be set for 2016-2018. Due to the depleted status of many of the RH/S stocks, and concerns about the impact of RH/S catch/bycatch and associated mortality in the Atlantic herring fishery, there is likely to be a biological benefit to continuing to specify RH/S catch caps for the directed Atlantic herring fishery. The impacts of all of the RH/S catch cap alternatives on non-target species, particularly RH/S, are therefore expected to be *low positive*.

3. Can the Proposed Action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?

Response: The proposed 2016-2018 Atlantic herring specifications and RH/S catch caps cannot be reasonably expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the MSFCMA and identifies in the FMP. EFH and habitat are described in Section 6.3, and impacts are discussed throughout Section 7.3. In general, EFH that occurs in areas where the fishery occurs is designated as the bottom habitats consisting of varying substrates (depending upon species) within the Gulf of Maine, Georges Bank, and the continental shelf off southern New England and the Mid-Atlantic south to Cape Hatteras. The primary gears used to harvest Atlantic herring are purse seines and midwater trawls, which

typically do not impact bottom habitats. An evaluation of the impacts to EFH in the proposed 2016-2018 specifications stated that given the minimal and temporary nature of adverse effects on EFH in the Atlantic herring fishery, the specifications and RH/S catch caps proposed in this document are expected to have a *negligible* impact on the physical environment and EFH.

4. Can the Proposed Action be reasonably expected to have a substantial adverse impact on public health or safety?

Response: Nothing in the proposed 2016-2018 Atlantic herring specifications and RH/S catch caps can reasonably be expected to have a substantial adverse impact on public health or safety. When developing management measures, the Council usually receives extensive comments from the affected public regarding the safety implications of measures under consideration. No such impacts were expected from specifications for previous years, and the Council has received no comments from affected members of the public suggesting that such impacts could be expected from the specifications that are proposed for the 2016-2018 fishing years. The safety of human life at sea is discussed further in Section 8.1.1 (National Standard 10).

5. Can the Proposed Action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?

Response: Protected resources that may be affected by the proposed action are described in Section 6.4, and impacts on protected resources are described in Section 7.4. The proposed action is not reasonably expected to have an adverse impact on endangered or threatened species, marine mammals, or critical habitat for these species. The activities to be conducted under the proposed action are within the scope of the Atlantic herring FMP and do not change the basis for the determinations made in previous consultations. Though the proposed action may increase interactions with protected species relative to the status quo, any interaction that may occur is not expected to change or jeopardize the status of any protected resources.

6. Can the Proposed Action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?

Response: The proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps are not expected to have a substantial impact on biodiversity and ecosystem function within the affected area. While Atlantic herring is recognized as one of many important forage fish for marine mammals, other fish, and birds throughout the region, the resource appears to be large enough at this time to accommodate all predators including Atlantic bluefish, Atlantic striped bass, and several other pelagic species such as shark and tuna. To the extent possible, the proposed 2016-2018 Atlantic herring fishery specifications account for these important issues.

The proposed action is intended to continue to ensure biodiversity and ecosystem stability over the 2016-2018 fishing years, and the proposed specifications account for scientific and management uncertainty and have been endorsed by the NEFMC SSC. In addition to accounting for forage/predation through the stock assessment, the additional buffer between the F_{MSY}-based catch level (OFL) and the U.S. OY (ACL) should ensure that an adequate forage base continues

to be available for important fish, marine mammal, and bird species in the Gulf of Maine region during the upcoming years.

7. Are significant social or economic impacts interrelated with natural or physical environmental effects?

Response: A complete discussion of the potential impacts of the proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps is in Section 7.0. The environmental assessment concludes that no significant natural or physical effects will result from the implementation of the 2016-2018 Atlantic herring specifications. The impacts of the 2016-2018 Atlantic herring fishery specifications and RH/S catch caps are expected to be *low positive to negligible*; *low positive* impacts on the RH/S stocks are expected from the 2016-2018 RH/S catch caps.

NMFS has determined that, despite the potential socio-economic impacts resulting from this action, there is no need to prepare an EIS. The purpose of NEPA is to protect the environment by requiring Federal agencies to consider the impacts of their Proposed Actions on the human environment, defined as "the natural and physical environment and the relationship of the people with that environment." This Environmental Assessment (EA) describes and analyzes the proposed specifications and alternatives and concludes there will be no significant impacts to the natural and physical environment. Any impacts expected from the proposed specifications do not require the preparation of an EIS, as supported by the NEPA implementing regulations (40 C.F.R. 1508.14). Consequently, because the EA demonstrates that the action's potential natural and physical impacts are not significant, the execution of a FONSI remains appropriate.

8. Are the effects on the quality of the human environment likely to be highly controversial?

Response: The effects of the proposed 2016-2018 Atlantic herring specifications and RH/S catch caps on the quality of human environment are not expected to be highly controversial. The need to maintain a sustainable Atlantic herring resource is grounded in Federal fisheries law and forms the basis of the goals and objectives of the herring management program, as described in the Atlantic Herring FMP. The Council developed the proposed 2016-2018 Atlantic herring fishery specifications while considering the needs of herring fishery participants, other fishery-related interests, and the long-term health of the Atlantic herring resource.

9. Can the Proposed Action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?

Response: The proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps are not expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas. The proposed action affects fishing for herring in the U.S. Exclusive Economic Zone and is not expected to have any impacts on shoreside historical and/or cultural resources. In addition, the proposed action is not expected to substantially affect fishing and other vessel operations

around the unique historical and cultural resources encompassed by the Stellwagen Bank National Marine Sanctuary.

10. Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

Response: The proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps are not expected to result in highly uncertain effects on the human environment or involve unique or unknown risks. The specifications proposed are generally consistent with those adopted in past years and are based on the provisions for the specifications process outlined in the Atlantic Herring FMP. Scientific uncertainty related to the Atlantic herring stock assessment is addressed through the reduction in the F_{MSY}-based catch level to the proposed ABC level, as recommended by the NEFMC SSC. Management uncertainty is addressed through the reduction in the ABC to the total U.S. OY (stockwide Atlantic herring ACL). The proposed specifications account for uncertainty such that the risk of overfishing the Atlantic herring resource has been minimized to the extent practicable.

11. Is the Proposed Action related to other actions with individually insignificant, but cumulatively significant impacts?

Response: The proposed 2016-2018 Atlantic herring specifications and RH/S catch caps are not related to other actions with individually insignificant, but cumulatively significant impacts. The cumulative effects analysis (Section 7.6) considers the impacts of the proposed action in combination with relevant past, present, and reasonably foreseeable future actions and concludes that no additional significant cumulative impacts are expected from the 2016-2018 Atlantic herring fishery specifications.

12. Is the Proposed Action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

Response: The proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps are not likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, nor is the proposed action expected to cause loss or destruction to significant scientific, cultural, or historical resources. The proposed action is specific only to the specifications and catch levels for the Atlantic herring fishery, which occurs primarily in the EEZ.

13. Can the Proposed Action reasonably be expected to result in the introduction or spread of a non-indigenous species?

Response: The proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps are not expected to result in the introduction or spread of a non-indigenous species. The proposed action relates specifically to removals of Atlantic herring in the Northeast Region using traditional fishing practices. Vessels affected by the proposed action are those currently engaged

in the Atlantic herring fishery. The fishing-related activity of these vessels is anticipated to occur solely within the Greater Atlantic Region and should not result in the introduction or spread of a non-indigenous species.

14. Is the Proposed Action likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

Response: The proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps are not likely to establish a precedent for future actions with significant effects and do not represent a decision in principle about a future consideration. The proposed action adopts specifications for the 2016-2018 fishing years only, with flexibility to adjust the specifications during the interim years if the need arises or if new information becomes available. This action is consistent with specifications adopted in past years and is based on the provisions for the specifications process outlined in the Atlantic Herring FMP. The intent of the process is to establish specifications and other sub-ACLs for a short time frame (in this case, three years) so that new stock and fishery information can be reviewed and considered prior to making decisions about specifications in future years. The measures are designed to specifically address current stock and fishery conditions and are not intended to represent a decision about future management actions that may include other measures.

15. Can the Proposed Action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

Response: The proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps are intended to establish catch levels that will offer protection to marine resources, particularly Atlantic herring, and would not threaten a violation of Federal, State, or Local law or other requirements to protect the environment. NMFS will determine whether this action is consistent with the Coastal Zone Management Act (CZMA) requirements of the affected States.

16. Can the Proposed Action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

Response: As specified in the responses to the first two criteria of this section, the proposed 2016-2018 Atlantic herring specifications and RH/S catch caps are not expected to result in cumulative adverse effects that would have a substantial effect on target or non-target species. Impacts on herring and other resources are expected to be minimal (Section 7.6).

In view of the analysis presented in this document, the establishment of the 2016-2018 Atlantic herring fishery specifications will not significantly impact the quality of the human environment as described above and in the supporting Environmental Assessment. In addition, all beneficial and adverse impacts of the Proposed Action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an EIS for this action is not required.

for JOHN BULLARD — 10/6/16

Regional Administrator, NOAA — *Date*

8.2.3 List of Preparers and Agencies Consulted

This document was prepared by the New England Fishery Management Council and the National Marine Fisheries Service, in consultation with the Atlantic States Marine Fisheries Commission and the Mid-Atlantic Fishery Management Council. Members of the New England Fishery Management Council's Atlantic Herring Plan Development Team include:

- Lori Steele, NEFMC Staff, Herring PDT Chair (through October 2015)
- Rachel Feeney, NEFMC Staff (Interim PDT Chair after October 2015)
- Michelle Bachman, NEFMC Staff
- Matt Cieri, MEDMR Biologist, ASMFC Herring TC Chair
- Sara Weeks, NEFOP
- Jon Deroba, NEFSC Population Dynamics
- Min-Yang Lee, NEFSC Social Sciences
- Micah Dean, MADMF Biologist
- Madeleine Hall-Arber, MIT Sea Grant
- Carrie Nordeen, NMFS GARFO
- Tim Cardiasmenos, NMFS GARFO
- Danielle Palmer, NMFS GARFO
- Brandt McAfee, NMFS GARFO
- Jason Didden, MAFMC Staff
- Renee Zobel, NH Fish and Game Marine Biologist

The following agencies were consulted during the development of the 2013-2015 Atlantic Herring Specifications, either through direct communication/correspondence and/or participation on the Herring Committee or Herring PDT:

- NOAA Fisheries, National Marine Fisheries Service, Greater Atlantic Regional Office, Gloucester MA
- Northeast Fisheries Science Center, Woods Hole MA
- Atlantic States Marine Fisheries Commission and Atlantic Herring Section (Ashton Harp, ASMFC Staff)
- Mid-Atlantic Fishery Management Council (Jason Didden, MAFMC Staff)

8.3 MARINE MAMMAL PROTECTION ACT

The Council has reviewed the impacts of the proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps on marine mammals and has concluded that the management actions proposed are consistent with the provisions of the Marine Mammal Protection Act (MMPA). Although they are likely to affect marine mammals inhabiting the management unit, the specifications will not alter the effectiveness of existing MMPA measures to protect those species, such as take reduction plans, based on the overall reductions in fishing effort and the effectiveness of other management measures that have been implemented through the Atlantic Herring FMP.

8.4 ENDANGERED SPECIES ACT

Section 7 of the Endangered Species Act (ESA) requires federal agencies conducting, authorizing or funding activities that affect threatened or endangered species to ensure that those effects do not jeopardize the continued existence of listed species. A description of the protected resources potentially affected by the proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps is in Section 6.4 (p. 73). For further information on the potential impacts of the fishery as well as the ***Preferred Alternative*** and other alternatives considered by the Council on listed species, see Section 1.0.

8.5 PAPERWORK REDUCTION ACT

The purpose of the Paperwork Reduction Act (PRA) is to control and, to the extent possible, minimize the paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by or for the Federal Government. The authority to manage information and recordkeeping requirements is vested with the Director of the Office of Management and Budget (OMB). This authority encompasses establishment of guidelines and policies, approval of information collection requests, and reduction of paperwork burdens and duplications.

The proposed 2016-2018 Atlantic herring fishery specifications and RH/S catch caps contain no new or additional collection-of-information requirements.

8.6 INFORMATION QUALITY ACT

Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Public Law 106-554, also known as the Data Quality Act or Information Quality Act, IQA) directed the Office of Management and Budget (OMB) to issue government-wide guidelines that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by federal agencies." OMB directed each federal agency to issue its own guidelines, establish administrative mechanisms allowing affected persons to seek and obtain correction of information that does not comply with the OMB guidelines, and report periodically to OMB on the number and nature of complaints. The NOAA Section 515 Information Quality

Guidelines require a series of actions for each new information product subject to the Data Quality Act. Information must meet standards of utility, integrity and objectivity. This section provides information required to address these requirements.

Utility of Information Product

The proposed 2016-2018 Atlantic herring fishery specifications include: a description of the management issues to be addressed, statement of goals and objectives, a description of the proposed action and other alternatives/options considered, analyses of the impacts of the proposed specifications and other alternatives/options on the affected environment, and the reasons for selecting the preferred specifications. These proposed modifications implement the FMP's conservation and management goals consistent with the Magnuson-Stevens Fishery Conservation and Management Act as well as all other existing applicable laws.

Utility means that disseminated information is useful to its intended users. "Useful" means that the content of the information is helpful, beneficial, or serviceable to its intended users, or that the information supports the usefulness of other disseminated information by making it more accessible or easier to read, see, understand, obtain or use. The information in this document is helpful to the intended users (the affected public) by presenting a clear description of the purpose and need of the proposed action, the measures proposed, and the impacts of those measures. A discussion of the reasons for selecting the proposed action is included so that intended users may have a full understanding of the proposed action and its implications. The intended users of the information contained in this document are participants in the Atlantic herring fishery and other interested parties and members of the general public. The information contained in this document may be useful to owners of vessels holding an Atlantic herring permit as well as Atlantic herring dealers and processors since it serves to notify these individuals of any potential changes to management measures for the fishery. This information will enable these individuals to adjust their fishing practices and make appropriate business decisions based on the new management measures and corresponding regulations.

The information about the status of the Atlantic herring fishery is updated based on landings and effort information through the 2013 and 2014 fishing years when possible. Information in this document is intended to support the proposed 2016-2018 specifications, which have been developed through a multi-stage process involving all interested members of the public. Consequently, the information pertaining to management measures contained in this document has been improved based on comments from the public, fishing industry, members of the Council, and NMFS.

The media being used in the dissemination of the information contained in this document will be contained in a *Federal Register* notice announcing the Proposed and Final Rules for this action. This information will be made available through printed publication and on the Internet website for the NMFS Greater Atlantic Regional Office. In addition, the final 2016-2018 Atlantic Herring Specifications document will be available on the Council website (www.nefmc.org) in standard PDF format. Copies will be available for anyone in the public on CD ROM and paper from the Council office.

Integrity of Information Product

Integrity refers to security – the protection of information from unauthorized access or revision, to ensure that the information is not compromised through corruption or falsification. Prior to dissemination, NOAA information, independent of the intended mechanism for distribution, is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information. All electronic information disseminated by NOAA adheres to the standards set out in Appendix III, "Security of Automated Information Resources," OMB Circular A-130; the Computer Security Act; and the Government Information Security Reform Act. If information is confidential, it is safeguarded pursuant to the Privacy Act and Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business and financial information).

Objectivity of Information Product

Objective information is presented in an accurate, clear, complete, and unbiased manner, and in proper context. The substance of the information is accurate, reliable, and unbiased; in the scientific, financial, or statistical context, original and supporting data are generated and the analytical results are developed using sound, commonly-accepted scientific and research methods. "Accurate" means that information is within an acceptable degree of imprecision or error appropriate to the particular kind of information at issue and otherwise meets commonly accepted scientific, financial, and statistical standards.

For purposes of the Pre-Dissemination Review, this document is considered a "Natural Resource Plan." Accordingly, the document adheres to the published standards of the Magnuson-Stevens Act; the Operational Guidelines, Fishery Management Plan Process; the Essential Fish Habitat Guidelines; the National Standard Guidelines; and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act. Several sources of data were used in the development of this document, including the analysis of potential impacts. These data sources include, but are not limited to: landings data from vessel trip reports, landings data from individual voice reports, information from resource trawl surveys, data from the dealer weighout purchase reports, descriptive information provided (on a voluntary basis) by processors and dealers of Atlantic herring, and ex-vessel price information. Although there are some limitations to the data used in the analysis of impacts of management measures and in the description of the affected environment, these data are considered the best available.

This information product uses information of known quality from sources acceptable to the relevant scientific and technical communities. Stock status (including estimates of biomass and fishing mortality) reported in this document are based on either assessments subject to peer-review through the Stock Assessment Review Committee (SARC) or on updates of those assessments. Landings and revenue information is based on information collected daily VMS catch reports and VTR reports, and supplemented with state/federal dealer data. Information on catch composition and bycatch is based on reports collected by the NMFS observer program and incorporated into the sea sampling or observer database systems. These reports are developed using an approved, scientifically valid sampling process. In addition to these sources, additional information is presented that has been accepted and published in peer-reviewed journals or by scientific organizations. Original analyses in this document were prepared using data from

accepted sources, and the analyses have been reviewed by members of the Herring Plan Development Team.

The 2016-2018 Atlantic herring specifications and RH/S catch caps are supported by the best available science. The supporting science and analyses, upon which the proposed action is based, are summarized and described in Sections 4.2 and 6.0. All supporting materials, information, data, and analyses within this document have been, to the maximum extent practicable, properly referenced according to commonly accepted standards for scientific literature to ensure transparency. Qualitative discussion is provided in cases where quantitative information was unavailable, utilizing appropriate references as necessary.

The review process for any action under an FMP involves the Greater Atlantic Regional Office (GARFO) of NMFS, the Northeast Fisheries Science Center (NEFSC), and NMFS Headquarters (Headquarters). The Council review process involves public meetings at which affected stakeholders have the opportunity to provide comments on the proposed changes to the FMP. Reviews by staff at GARFO are conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. The NEFSC's technical review is conducted by senior-level scientists with specialties in population dynamics, stock assessment methodology, fishery resources, population biology, and the social sciences.

Final approval of the 2016-2018 Atlantic herring specifications and clearance of the Proposed and Final Rules is conducted by staff at NOAA Fisheries Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget. This review process is standard for any action under an FMP, and provides input from individuals having various expertise who may not have been directly involved in the development of the proposed actions. Thus, the review process for any FMP modification, including the fishery specifications for the 2016-2018 fishing years, is performed by technically-qualified individuals to ensure the action is valid, complete, unbiased, objective, and relevant.

8.7 IMPACTS ON FEDERALISM/E.O. 13132

This E.O. established nine fundamental federalism principles for Federal agencies to follow when developing and implementing actions with federalism implications. The E.O. also lists a series of policy making criteria to which Federal agencies must adhere when formulating and implementing policies that have federalism implications. This action does not contain policies with federalism implications sufficient to warrant preparation of an assessment under E.O. 13132. The affected States have been closely involved in the development of the proposed fishery specifications through their representation on the Council (all affected states are represented as voting members of at least one Regional Fishery Management Council) and coordination with the Atlantic States Marine Fisheries Commission and the Mid-Atlantic Fishery Management Council.

8.8 ADMINISTRATIVE PROCEDURES ACT

This action was developed in compliance with the requirements of the Administrative Procedures Act (APA), and these requirements will continue to be followed when the proposed regulation is published. Section 553 of the Administrative Procedure Act establishes procedural requirements applicable to informal rulemaking by Federal agencies. The purpose of these requirements is to ensure public access to the Federal rulemaking process, and to give the public adequate notice

and opportunity for comment. At this time, the Council is not requesting any abridgement of the rulemaking process for this action.

8.9 COASTAL ZONE MANAGEMENT ACT

Section 307(c)(1) of the Coastal Zone Management Act (CZMA) of 1972 requires that all Federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. Pursuant to the CZMA regulations at 15 CFR 930.35, a negative determination may be made if there are no coastal effects and the subject action: (1) Is identified by a state agency on its list, as described in § 930.34(b), or through case-by-case monitoring of unlisted activities; or (2) which is the same as or is similar to activities for which consistency determinations have been prepared in the past; or (3) for which the Federal agency undertook a thorough consistency assessment and developed initial findings on the coastal effects of the activity. The Council has determined that this action is consistent with the coastal zone management plan and policies of the coastal states in this region. NMFS will formally request consistency reviews by CZM state agencies following Council submission of the 2016-2018 Atlantic herring fishery specifications.

8.10 REGULATORY FLEXIBILITY ACT/E.O. 12866

8.10.1 E.O. 12866 (Regulatory Planning and Review)

The purpose of Executive Order 12866 is to enhance planning and coordination with respect to new and existing regulations. This E.O. requires the Office of Management and Budget (OMB) to review regulatory programs that are considered to be "significant." E.O. 12866 requires a review of proposed regulations to determine whether or not the expected effects would be significant, where a significant action is any regulatory action that may:

1. Have an annual effect on the economy of $100 million or more, or adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;
2. Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
3. Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
4. Raise novel legal or policy issues arising out of legal mandates, the President's priorities, of the principles set forth in the Executive Order.

In deciding how whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, include the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider.

8.10.1.1 Statement of the Problem/Goals and Objectives

The purpose and need for the proposed management action and the goals of the Atlantic Herring FMP are in Section 3.2.

8.10.1.2 Management Alternatives and Rationale

The management alternatives and their rationale are in Section 4.0.

8.10.1.3 Description of the Fishery

The fishery is described in Section 6.5.

8.10.1.4 Summary of Impacts

The expected impacts of each alternative relative to the status quo for the fishery-related businesses and communities are discussed in Section 7.5. The alternatives for the 2016-2018 Atlantic Herring Fishery Specifications are all very similar: the ***Preferred Alternative*** (Alternative 3) results in ACLs that are 2.6% lower than status quo. Alternative 2 would result in ACLs that are slightly higher than status quo. At a nominal price of $300/mt, Alternative 3 would result in $0.9M less revenue in the herring fishery. Price increases due to decreases in quantity supplied may mitigate this decrease, although this effect is likely to be quite small given the large number of substitute goods for domestic herring. The benefits of Alternative 3 include better management of the stock and a lower risk of overfished status. It is difficult to convert this to dollar values. The net benefits of other specifications (DAH, DAP, BT, and USAP) relative to status quo are likely to be close to zero.

Of the fishery specifications considered, the RH/S catch cap specifications are likely to have the largest impact on the Atlantic herring fishery. One of the objectives of a RH/S catch cap is to "provide strong incentive for the industry to continue to avoid river herring/shad and reduce river herring/shad catch to the extent practicable." The benefits of achieving this objective are difficult to convert to dollar values. Similarly, the value of maintaining RH/S catch below a threshold is also difficult to convert to dollar values, especially without a stock assessment for RH/S.

RH/S catch is observed relatively rarely in this fishery. Simply computing average or median RH/S catch in a year does not fully describe the effects of changes in the RH/S catch caps. The effects of a RH/S catch cap were examined in Framework 3 using a simulation model. The same model, using updated data from 2011-2014, is used to evaluate the effects of changes in the catch caps on herring and RH/S catch. Table 68 and Table 69 illustrate selected percentiles of gross herring revenue and RH/S catch under each of the alternatives considered. The ***Preferred Alternative*** (Alternative 3, Option 2) results in higher average herring revenue and lower variability about that average compared to the other alternatives. It also dominates (has a higher value) than the other alternatives.

Table 68 - Selected percentiles, means, and standard deviations of Atlantic herring revenue ($M) for each RH/S catch cap alternative

Percentile	No Action (status quo)	Alternative 2		Alternative 3	
		Option 1	Option 2	Option 1	Option 2
99	$30.26	$28.88	$29.71	$29.33	$30.51
95	$29.80	$28.29	$29.16	$28.79	$29.98
90	$29.46	$27.83	$28.93	$28.56	$29.75
75	$28.90	$26.97	$28.40	$27.93	$29.32
50	$28.00	$25.83	$27.75	$27.11	$28.83
25	$27.03	$24.82	$26.95	$26.09	$28.15
10	$26.26	$23.91	$25.97	$25.26	$27.33
5	$25.84	$23.33	$25.56	$24.76	$26.88
1	$24.97	$22.51	$24.78	$23.76	$26.02
Mean	$27.90	$25.88	$27.61	$27.00	$28.70
Std. Deviation	1.23	1.47	1.11	1.27	0.95

Table 69 Selected percentiles, means, and standard deviations of RH/S catch (mt) for each RH/S catch cap alternative

Percentile	No Action (status quo)	Alternative 2		Alternative 3	
		Option 1	Option 2	Option 1	Option 2
95	220.86	124.65	177.37	146.34	249.15
90	210.03	122.14	174.39	143.46	228.02
75	188.56	118.36	161.43	138.05	203.46
50	164.12	113.77	142.48	124.68	176.86
25	138.12	100.29	117.24	112.54	144.27
10	117.03	82.10	97.66	94.27	122.13
5	104.81	74.81	89.18	85.63	111.76
1	84.35	62.17	73.26	69.08	88.24
Mean	163.36	107.90	139.00	122.36	175.60
Std. Deviation	35.00	15.50	28.00	18.60	41.50

The *Preferred Alternative* also results in mean RH/S catch, higher variability about that catch compared to the other alternatives (Table 68 and Table 69). To further examine the effects of these catch caps on herring revenue in each management area and RH/S catch for each gear type, box plots summarize each of these simulation model outcomes for each alternative and option (Figure 18 to Figure 29).

Figure 18 - Atlantic herring revenue by management area under RH/S catch cap Alternative 1 (No Action)

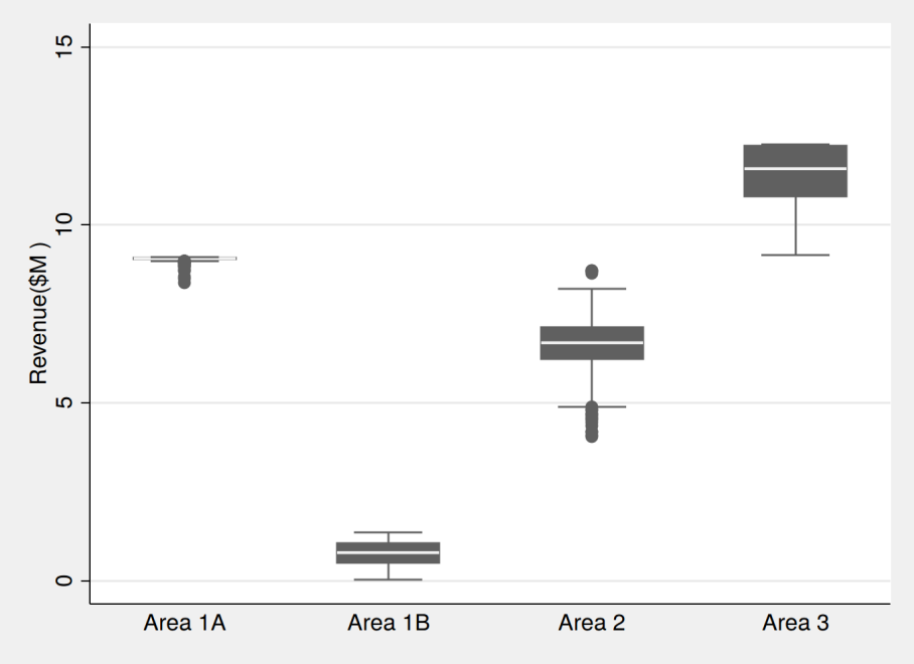


Figure 19 - Atlantic herring revenue by management area under RH/S catch cap Alternative 2, Option 1

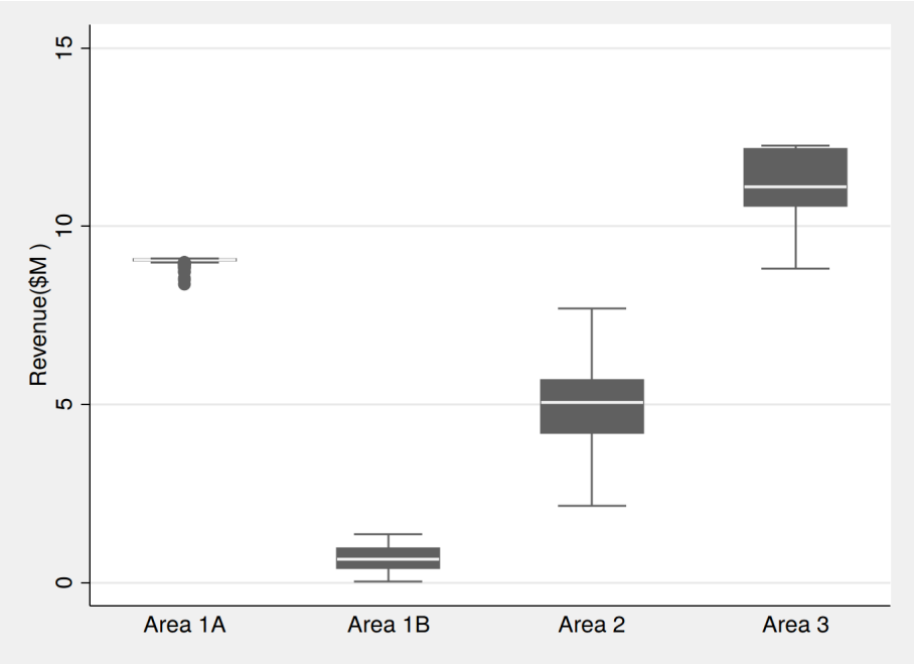


Figure 20 - Atlantic herring revenue by management area under RH/S catch cap Alternative 2, Option 2

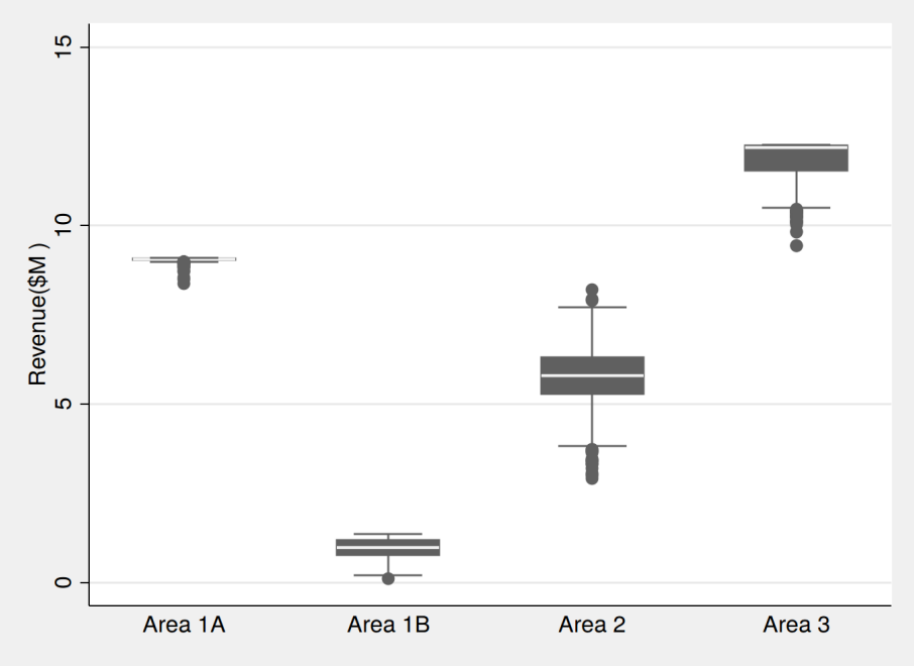


Figure 21 - Atlantic herring revenue by management area under RH/S catch cap Alternative 2, Option 1

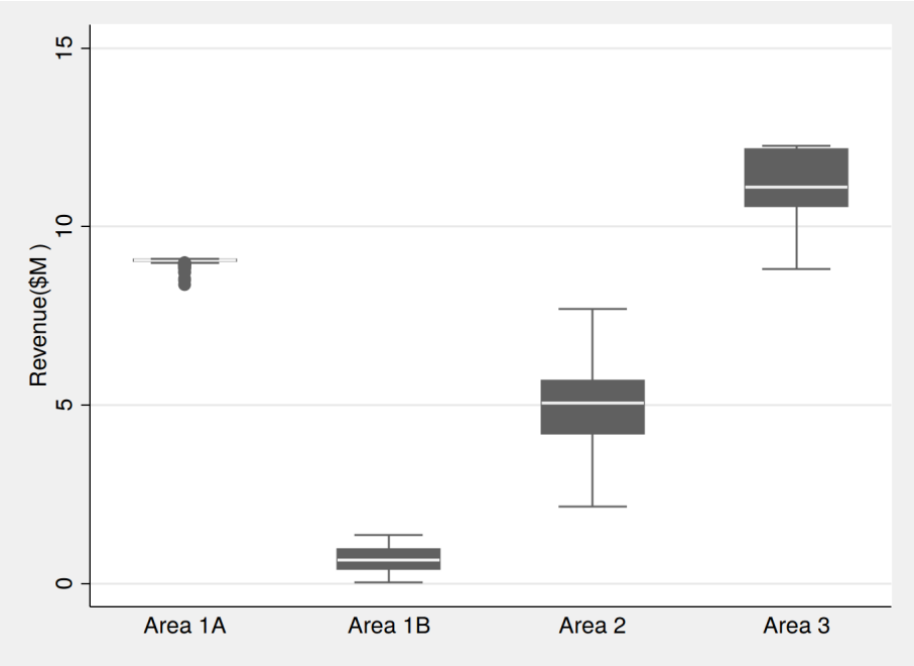


Figure 22 - Atlantic herring revenue by management area under RH/S catch cap Alternative 2, Option 2

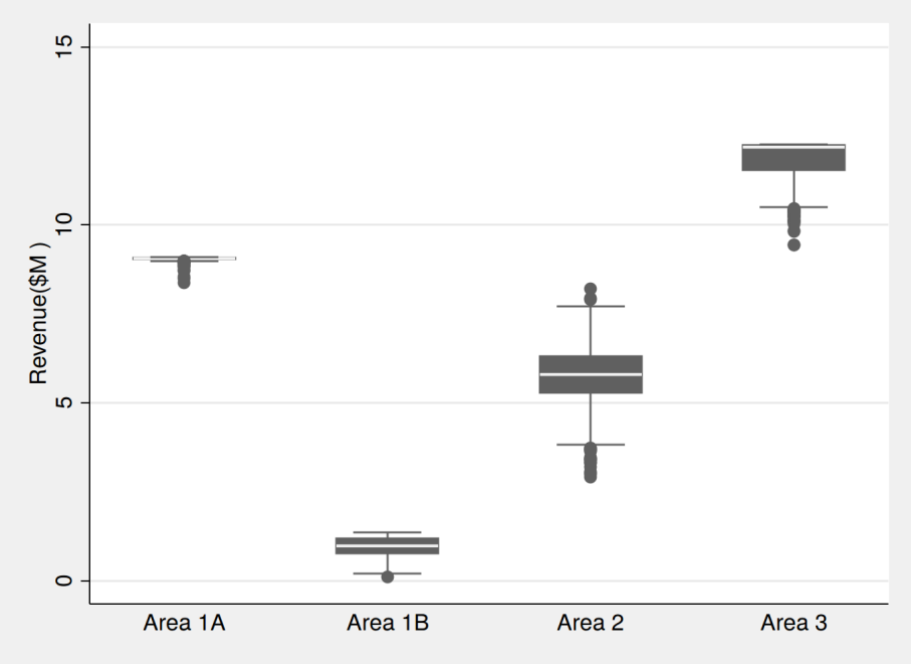


Figure 23 - Atlantic herring revenue by management area under RH/S catch cap Alternative 3, Option 1

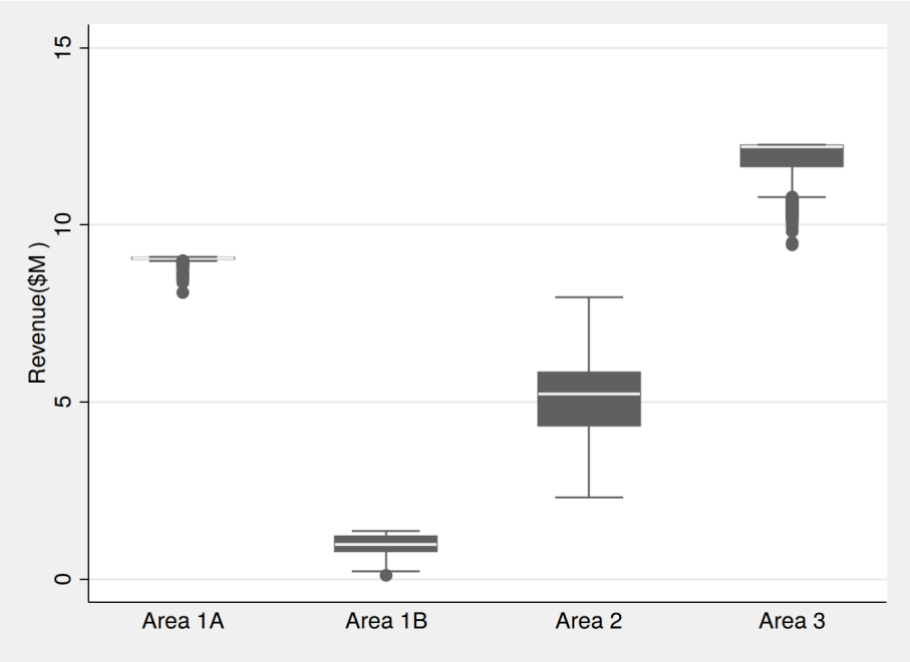


Figure 24 - Atlantic herring revenue by management area under RH/S catch cap Alternative 3, Option 2 (Preferred Alternative)

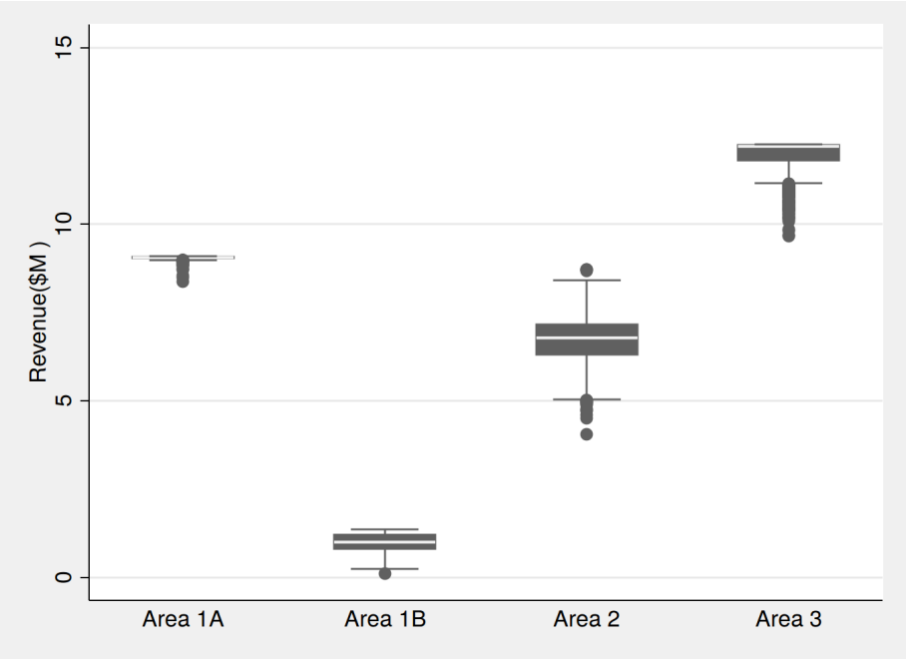


Figure 25 - RH/S catch by gear type under RH/S catch cap Alternative 1 (No Action)

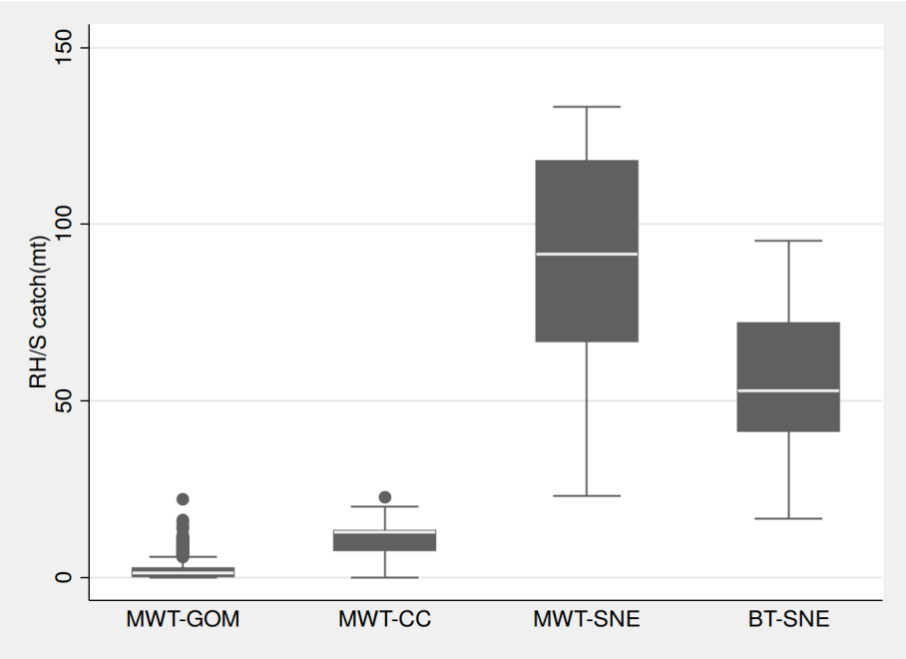


Figure 26 - RH/S catch by gear type under RH/S catch cap Alternative 2, Option 1

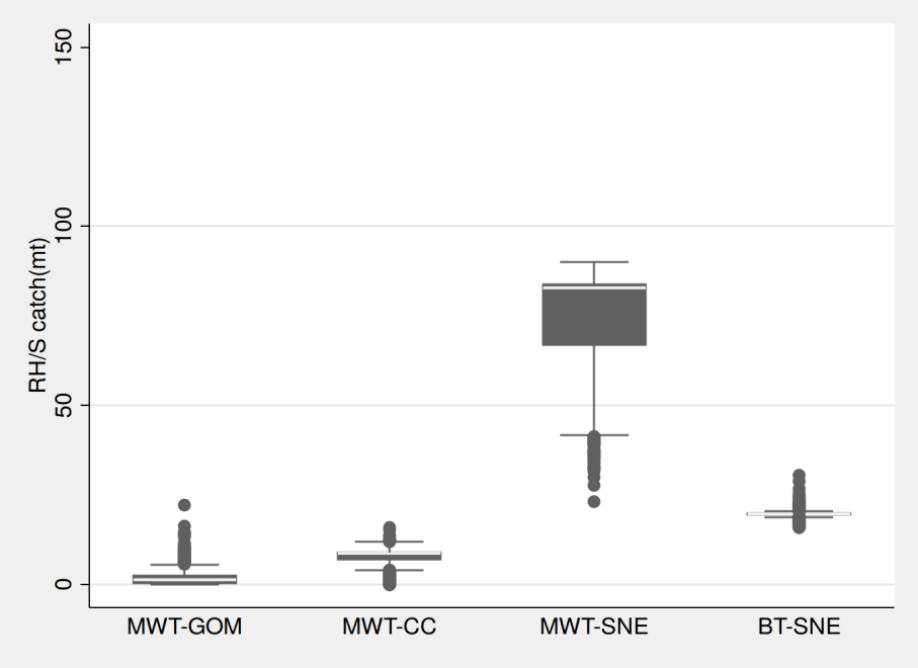


Figure 27 - RH/S catch by gear type under RH/S catch cap Alternative 2, Option 2

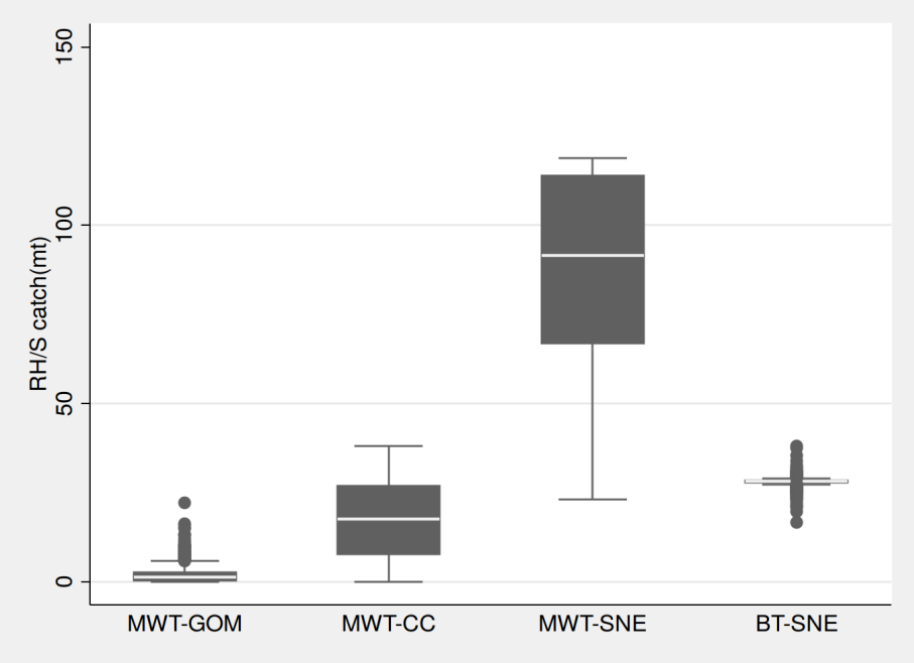


Figure 28 - RH/S catch by gear type under RH/S catch cap Alternative 3, Option 1

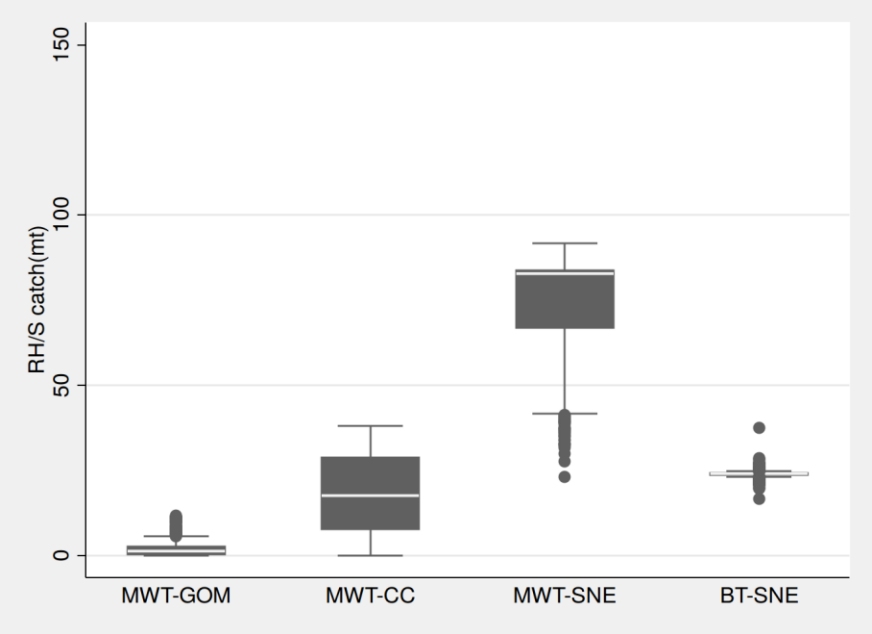
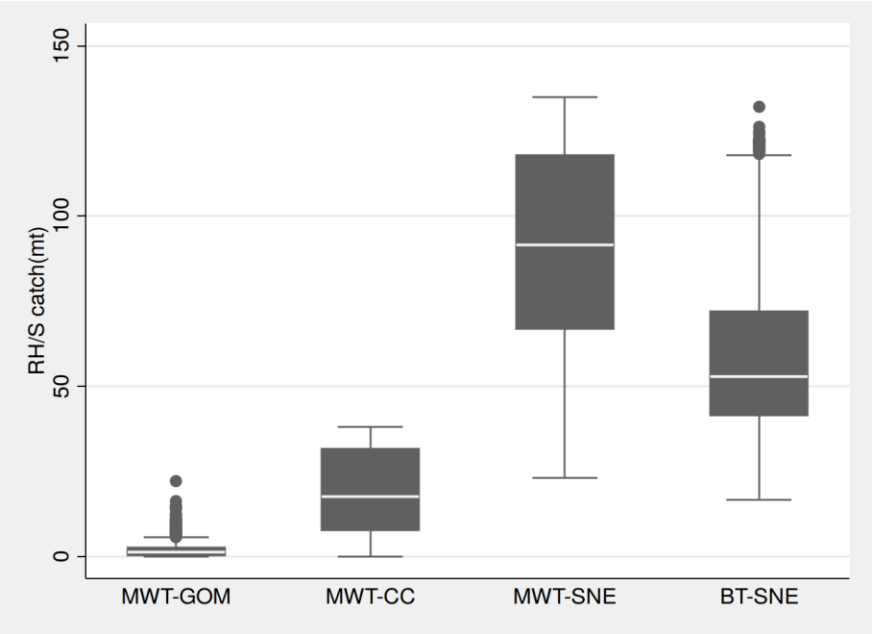


Figure 29 - RH/S catch by gear type under RH/S catch cap Alternative 3, Option 2 (Preferred Alternative)



Finally, the simulation model will overestimate RH/S catch and underestimate herring revenue. This analysis assumes that trips that would have occurred after a RH/S catch cap is exceeded do not occur. For some gear-area combinations, this is a reasonable assumption. Depending on the time of year that a RH/S catch cap is reached, a trawl vessel may be able to use other areas to catch herring. In addition, the analysis assumes that fishing under a RH/S catch cap is similar to fishing in 2011-2014. This analysis does not account for costs of "averting behavior" –

economically rational agents should undertake costly behavior to avoid experiencing bad events. Exceeding the RH/S catch caps, and the resultant closure of the directed Atlantic herring fishery, is a bad event. Therefore, fishing vessels are expected to undertake steps to reduce the probability that the directed fishery will close. This imposes costs on participants in the directed herring fishery; however, these costs are difficult to quantify at this time. In addition, to the extent that avoiding RH/S is possible, the analysis overestimates the probability of the RH/S catch cap being exceeded.

8.10.1.5 Determination of Significance

Based on the analyses in this document, the 2016-2018 Atlantic herring specifications are not expected to constitute a "significant regulatory action." This action is not expected to have an impact of $100M or more on the economy, or adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or State, local, or tribal governments or communities. They are not expected to raise novel legal and policy issues. The proposed action also does not interfere with an action taken or planned by another agency. It does not materially alter the budgetary impact of entitlements, grants, user fees, or loan programs, or the rights and obligations of recipients.

8.10.2 Regulatory Flexibility Act (RFA) – Initial Regulatory Flexibility Analysis

8.10.2.1 Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to reduce the impacts of burdensome regulations and recordkeeping requirements on small businesses. To achieve this goal, the RFA requires Federal agencies to describe and analyze the effects of proposed regulations, and possible alternatives, on small business entities. To this end, this section contains an Initial Regulatory Flexibility Analysis (IRFA), which includes an assessment of the effects that the Proposed Action and other alternatives are expected to have on small entities.

Under Section 603(b) of the RFA, an IRFA must describe the impact of the proposed rule on small entities and contain the following information:

1. A description of the reasons why the action by the agency is being considered.
2. A succinct statement of the objectives of, and legal basis for, the proposed rule.
3. A description–and, where feasible, an estimate of the number–of small entities to which the proposed rule will apply.
4. A description of the projected reporting, recordkeeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirement and the types of professional skills necessary for preparation of the report or record.
5. An identification, to the extent practicable, of all relevant federal rules that may duplicate, overlap, or conflict with the proposed rule.

8.10.2.2 Reasons for Considering the Action

The purpose and need of the proposed action are in Section 3.2 and are incorporated herein by reference.

8.10.2.3 Objectives and Legal Basis for the Action

The objectives of the proposed action are in Section 3.2 and are incorporated herein by reference.

8.10.2.4 Description and Estimate of Small Entities to Which the Rule Applies

The RFA recognizes three kinds of small entities: small businesses, small organizations, and small governmental jurisdictions. The size standard for finfish fishing is $20.5 million of gross revenue and the size standard for shellfish fishing is $5.5 million of gross revenues. A firm is classified as a finfish firms if more than half of the firm's gross receipts are derived from finfish. It is classified as a shellfish firm if more than half of the firm's gross receipts are derived from shellfish.

Ownership entities in regulated commercial harvesting businesses

For the purpose of this analysis, ownership entities are defined as those entities with common ownership personnel as listed on permit application documentation. Permits with identical ownership personnel are categorized as a single entity. For example, if five permits have the same seven personnel listed as co-owners on their application paperwork, those seven personnel form one ownership entity, covering those five permits. If one or several of the seven owners also own additional vessels, with sub-sets of the original seven personnel or with new co-owners, those ownership arrangements are deemed to be separate ownership entities for the purpose of this analysis.

Regulated Commercial Harvesting Entities

This proposed rule would affect all permitted herring vessels; therefore, the regulated entity is the business that owns at least one herring permit. There are many businesses that hold an open-access Category D permit. These businesses catch a small fraction of herring; furthermore, they are minimally affected by the regulations. The impacts on Category D vessels are minimal, occurring only if the sub-ACLs for herring and catch caps for RH/S are approached, which would result in the possession limits for these vessels decreasing from 6,600 lbs to 2,000 lbs. This section describes the directly regulated small entities in four classes: All permitted firms, all active firms, Limited Access permitted firms, and active LA permitted firms.

In 2014, there were 1,206 firms (1,188 small) that held at least one herring permit. There were 67 (63 small) active firms that held at least one herring permit. There were 103 (96 small) firms that held at least one Limited Access permit. There were 38 (34 small) firms that held a limited access permit and were active in the herring fishery (Table 70). Active large entities all held at least one limited access herring permit. Table 71 describes gross receipts from both all fishing and only the herring fishery for firms that were active in the herring fishery. The small firms with Limited Access permits had 60% higher gross receipts and 85% higher revenue from herring than the small firms without a limited access herring permit.

Table 70 - Small and large firms in the Atlantic herring fishery

	All Permits		Limited Access Only	
	All	**Active**	**All**	**Active**
Small	1,188	63	96	34
Large	18	4	7	4
Total	**1,206**	**67**	**103**	**38**

Table 71 - Average revenues for active small and large entities in the Atlantic herring fishery

	All Permits		Limited Access Only	
	All Revenue	**Herring Revenue**	**All Revenue**	**Herring Revenue**
Small	$986,399	$339,155	$1,588,059	$624,820
Large	$15,913,950	$1,426,152	$15,913,948	$1,426,152

8.10.2.5 Recordkeeping and Reporting Requirements

Requirements of the proposed rule including an estimate of the classes of small entities, will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records. The proposed rules in these specifications are not expected to create any additional reporting, record-keeping or other compliance requirements.

8.10.2.6 Duplication, Overlap, or Conflict with Other Federal Rules

No relevant Federal rules have been identified that would duplicate or overlap the proposed rule.

8.10.2.7 Impacts of the Proposed Rule on Small Entities

Small entities are expected to experience slight declines in both gross revenues and herring revenues due to ACLs that are approximately 3% lower than in years immediately prior. This may result in fishing vessels taking slightly fewer fishing trips and incurring slightly less variable operating costs. Fixed and quasi-fixed costs are expected to remain the same. Because these ACLs and resultant closures would apply to the entire fishery, the effects of these closures should be felt proportionally by the herring industry.

The simulation model used in Framework 3 analysis is updated to examine the effects of RH/S catch caps (Section 8.10). The results indicate that Atlantic herring revenue is likely to increase relative to the status quo. It also produces lower variability of those revenues. These represent positive impacts on small entities.

8.11 E.O. 13158 (MARINE PROTECTED AREAS)

The Executive Order on Marine Protected Areas requires each federal agency whose actions affect the natural or cultural resources that are protected by an MPA to identify such actions, and, to the extent permitted by law and to the extent practicable, avoid harm to the natural and cultural resources that are protected by an MPA. The E.O. defines a Marine Protected Area as "any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." The E.O. requires that the Departments of Commerce and the Interior jointly publish and maintain such a list of MPAs. The Tilefish Gear Restricted Areas in Oceanographer, Lydonia, Veatch, and Norfolk canyons are included in the National System of Marine Protected Areas (MPAs). This action under the Atlantic Herring FMP is not expected to occur within any of these MPAs. No further guidance related to this E.O. available at this time.

8.12 E.O 12898 (ENVIRONMENTAL JUSTICE)

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations provides guidelines to ensure that potential impacts on these populations are identified and mitigated, and that these populations can participate effectively in the NEPA process (EO 12898 1994). These individuals or populations must not be excluded from participation in, denied the benefits of, or subjected to discrimination because of their race, color, or national origin. Although the impacts of the Atlantic herring specifications may affect communities with environmental justice concerns, the actions in this document should not have disproportionately high effects on low income or minority populations. The proposed measures would apply to all participants in the affected area, regardless of minority status or income level.

The existing demographic data on participants in the Atlantic herring fishery (i.e. vessel owners, crew, dealers, processors, employees of supporting industries) do not allow identification of those who live below the poverty level or are racial or ethnic minorities. Thus, it is not possible to fully determine how the actions within this specification document may impact these population segments. The public comment processes is an opportunity to identify issues that may be related to environmental justice, but none have been raised relative to the 2016-2018 Atlantic herring specifications. The public has never requested translations of documents pertinent to the Atlantic herring fishery.

9.0 REFERENCES

ASMFC. (1999). *Amendment 1 to the Interstate Fishery Management Plan for Atlantic Sea Herring*. Alexandria, VA: Atlantic States Marine Fisheries Commission. Fishery Management Report No. 33 112 p.

ASMFC. (2007). *American Shad Stock Assessment Report for Peer Review*.Vol. I. Alexandria, VA: ASMF Commission. Stock Assessment Report No. 01-01 (Supplement). 224 p.

ASMFC. (2015). *Fisheries Focus*. Arlington (VA): Atlantic States Marine Fisheries Commission. 24(1) February/March 2015.

ASSRT. (2007). *Status Review of Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus) - Report of the Atlantic Sturgeon Status Review Team to NMFS*. Gloucester, MA: U.S. Department of Commerce. 174 p.

Baumgartner MF, Lysiak NSJ, Schuman C, Urban-Rich J & Wenzel FW. (2011). Diel vertical migration behavior of *Calanus finmarchicus* and its influence on right and sei whale occurrence. *Marine Ecology Progress Series. 423*: 167-184.

Blumenthal JM, Solomon JL, Bell CD, Austin TJ, Ebanks-Petrie G, Coyne MS, Broderick AC & Godley BJ. (2006). Satellite tracking highlights the need for international cooperation in marine turtle management. *Endangered Species Research. 2*: 51-61.

Braun-McNeill J & Epperly S. (2004). Spatial and temporal distribution of sea turtles in the western North Atlantic and the U.S. Gulf of Mexico from Marine Recreational Fishery Statistics Survey (MRFSS). *Marine Fisheries Review. 64*(4): 50-56.

Braun-McNeill J, Epperly SP, Avens L, Snover ML & Taylor JC. (2008). Life stage duration and variation in growth rates of loggerhead *(Caretta caretta)* sea turtles from the western North Atlantic. *Herpetological Conservation and Biology. 3*(2): 273-281.

Braun J & Epperly SP. (1996). Aerial surveys for sea turtles in southern Georgia waters, June 1991. *Gulf of Mexico Science. 1996*(1): 39-44.

Burdge RJ. (1998). *A Conceptual Approach to Social Impact Assessment*. Revised ed. Madison, WI: Social Ecology Press. 284 p.

CeTAP. (1982). *Final Report of the Cetacean and Turtle Assesment Program: A Characterization of Marine Mammals and Turtles in the Mid- and North Atlantic Areas of the U.S. Outer Continental Shelf*. Washington, DC: University of Rhode Island. AA511-CT8-48. 568 p.

Clapham PJ, Baraff LS, Carlson MA, Christian DK, Mattila CA, Mayo CA, Murphy MA & Pittman S. (1993). Seasonal occurrence and annual return of humpback whales, *Megaptera novaeangliae*, in the southern Gulf of Maine. *Canadial Journal of Zoology. 71*: 440-443.

Clay PM, Colburn LL, Olson J, Pinto da Silva P, Smith SL, Westwood A & Ekstrom J. (August 22, 2012). Community Profiles for the Northeast U.S. Fisheries. Woods Hole, MA: Northeast Fisheries Science Center; Retrieved from: http://www.nefsc.noaa.gov/read/socialsci/communityProfiles.html.

Collins MR & Smith TIJ. (1997). Distribution of shortnose and Atlantic sturgeons in South Carolina. *North American Journal of Fisheries Management. 17*: 995-1000.

Conant TA, Dutton PH, Eguchi T, Epperly SP, Fahy CC, Godfrey MH, MacPherson SL, Possardt EE, Schroeder BA, Seminoff JA, et al. (2009). *Loggerhead Sea Turtle (Caretta caretta) 2009 Status Review under the U.S. Endangered Species Act.* Silver Spring, MD: U.S. Department of Commerce. Report of the Loggerhead Biological Review Team to the National Marine Fisheries Service. 222 p.

Dadswell MJ. (2006). A review of the status of Atlantic sturgeon in Canada, with comparisons to populations in the United States and Europe. *Fisheries. 31*: 218-229.

Dadswell MJ, Taubert BD, Squires TS, Marchette D & Buckley J. (1984). Synopsis of biological data on shortnose sturgeon, *Acipenser brevirostrum*. *LeSuer.* 1818.

Damon-Randall K, Colligan M & Crocker J. (2013). *Composition of Atlantic Sturgeon in Rivers, Estuaries, and Marine Waters*. Gloucester, MA. National Marine Fisheries Service/GARFO.

Dayton A, Sun JC & Larabee J. (2014). *Understanding Opportunities and Barriers to Profitability in the New England Lobster Industry*. Portland, ME: Gulf of Maine Research Institute. 19 p.

Deroba J. (2015). *Atlantic Herring Operational Assessment Report*. Woods Hole, MA: U.S. Department of Commerce. NEFSC Reference Document 15-16. 30 p.

Dodge KL, Galuardi B, Miller TJ & Lutcavage ME. (2014). Leatherback turtle movements, dive behavior, and habitat characteristics in ecoregions of the northwest Atlantic Ocean. *PLoS ONE. 9*(3 e91726): 1-17.

Dovel WL & Berggren TJ. (1983). Atlantic sturgeon of the Hudson River Estuary, New York. *New York Fish and Game Journal. 30*: 140-172.

Dunton KJ, Jordaan A, McKown KA, Conover DO & Frisk MG. (2010). Abundance and distribution of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) within the Northwest Atlantic Ocean, determined from five fishery-independent surveys. *Fishery Bulletin. 108*: 450-465.

Eckert SA, Bagley D, Kubis S, Ehrhart L, Johnson C, Stewart K & DeFreese D. (2006). Internesting and postnesting movements of foraging habitats of leatherback sea turtles (*Dermochelys coriacea*) nesting in Florida. *Chelonian Conservation Biology. 5*(2): 239-248.

Epperly SP, Braun J & Chester AJ. (1995). Areal surveys for sea turtles in North Carolina inshore waters. *Fishery Bulletin. 93*(254-261).

Epperly SP, Braun J, Chester AJ, Cross FA, Merriner JV & Tester PA. (1995). Winter distribution of sea turtles in the vicinity of Cape Hatteras and their interactions with the summer flounder trawl fishery. *Bulletin of Marine Science. 56*(2): 547-568.

Epperly SP, Braun J & Veishlow. (1995). Sea turtles in North Carolina waters. *Conservation Biology. 9*(2): 384-394.

Erickson DL, Kahnle A, Millard MJ, Mora EA, Bryja M, Higgs A, Mohler J, DuFour M, Kenney G, Sweka J, et al. (2011). Use of pop-up satellite archival tags to identify oceanic-migratory patterns for adult Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*. *Jounal of Applied Ichthyology. 27*: 356-365.

Griffin DB, Murphy SR, Frick MG, Broderick AC, Coker JW, Coyne MS, Dodd MG, Godfrey MH, Godley BJ, Mawkes LA, et al. (2013). Foraging habitats and migration corridors utilized by a recovering subpopulation of adult female loggerhead sea turtles: Implications for conservation. *Marine Biology. 160*: 3071-3086.

Hain JHW, Ratnaswamy MJ, Kenney RD & Winn HE. (1992). The fin whale, *Balaenoptera physalus*, in waters of the northeastern United States continental shelf. *Reports of the International Whaling Commission. 42*: 653-669.

Hawkes LA, Broderick AC, Coyne MS, Godfrey MH, Lopez-Jurado L-F, Lopez-Suarez P, Merino SE, Varo-Cruz N & Godley BJ. (2006). Phenotypically linked dichotomy in sea turtle foraging requires multiple conservation approaches. *Current Biology. 16*: 990-995.

Hawkes LA, Witt MJ, Broderick AC, Coker JW, Coyne MS, Dodd MG, Frick MG, Godfrey MH, Griffin DB, Murphy SR, et al. (2011). Home on the range: Spatial ecology of loggerhead turtles in Atlantic waters of the USA. *Diversity and Distributions. 17*: 624-640.

Hirth HF. (1997). *Synopsis of the Biological Data of the Green Turtle, Chelonia mydas (Linnaeus 1758).* In: US Fish and Wildlife Service Biological Report 97.Vol. 1. 120 p.

James M, Myers R & Ottenmeyer C. (2005). Behaviour of leatherback sea turtles, *Dermochelys coriacea*, during the migratory cycle. *Proceedings of the Royal Society of Biological Sciences. 272*(1572): 1547-1555.

James MC, Sherrill-Mix SA, Martin K & Myers RA. (2006). Canadian waters provide critical foraging habitat for leatherback sea turtles. *Biological Conservation. 133*: 347-357.

Jefferson TA, D. F, Bolanos-Jimenez J & Zerbini AN. (2009). Distribution of common dolphins (*Delphinus sp.*) in the western North Atlantic: A critical re-examination. *Marine Biology. 156*: 1109-1124.

Jury SH, Field JD, Stone SL, Nelson DM & Monaco ME. (1994). *Distribution and Abundance of Fishes and Invertebrates in North Atlantic Estuaries*. Silver Spring, MD: U.S. Department of Commerce. ELMR Rep. No. 13. 223 p.

Kelly KH & Moring JR. (1986). *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates - Atlantic Herring*. U.S. Fish and Wildlife Service. Biological Report 82 (11.38) TR EL-82-4. 22 p.

Kynard B, Horgan M, Kieffer M & Seibel D. (2000). Habitat use by shortnose sturgeon in two Massachusetts rivers, with notes on estuarine Atlantic sturgeon: A hierarchical approach. *Transactions of the American Fisheries Society. 129*: 487-503.

Laney RW, J.E. H, Versak BR, Mangold MF, Cole Jr. WW & Winslow SE. (2007). Distribution, habitat use, and size of Atlantic sturgeon captured during cooperative winter tagging cruises, 1988–2006. In: *Anadromous Sturgeons: Habitats, Threats, and Management*. Bethesda, MD: American Fisheries Society Symposium,.

MAFMC. (2013). *Amendment 14 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan*. Dover, DE: Mid-Atlantic Fishery Management Council.

Mansfield KL, Saba VS, Keinath J & Mauick JA. (2009). Satellite telemetry reveals a dichotomy in migration strategies among juvenile loggerhead sea turtles in the northwest Atlantic. *Marine Biology. 156*: 2555-2570.

McClellan CM & Read AJ. (2007). Complexity and variation in loggerhead sea turtle life history. *Biology Letters. 3*: 592-594.

MEDMR. (2008). *Initial Results of Lobster Effort Questionnaire Compiled at the Request of the Lobster Advisory Council*. Maine Department of Marine Resources. 36 p.

Mitchell GH, Kenney RD, Farak AM & Campbell RJ. (2003). *Evaluation of Ocurrence of Endangered and Threatened Marine Species in Naval Ship Trial Areas and Transit Lanes in the Gulf of Maine and Offshore of Georges Bank*. NUWC-NPT Technical Memo 02-121A. 113 p.

Morreale S & Standora E. (2005). Western North Atlantic waters: Crucial developmental habitat for Kemp's ridley and loggerhead sea turtles. *Chelonean Conservation and Biology. 4*(4): 872-882.

Munroe TA. (2002). Herrings. Family Clupeidae. In: *Bigelow and Schroeder's fishes of the Gulf of Maine*. 3rd ed. Washington, DC: Smithsonian Institution Press. p. 111-160.

Murphy TM, Murphy SR, Griffin DB & Hope CP. (2006). Recent occurrence, spatial distribution and temporal variability of leatherback turtles (*Dermochelys coriacea*) in nearshore waters of South Carolina, USA. *Chelonian Conservation Biology. 5*(2): 216-224.

NEFMC. (1999). *Final Atlantic Herring Fishery Management Plan, Incorporating the Environmental Impact Statement and Regulatory Impact Review*.Vol. I. Saugus, MA: M New England Fishery Management Council in consultation with the ASMFC, and NMFS.

NEFMC. (2006). *Final Amendment 1 to the Atlantic Herring Fishery Management Plan incorporating the Environmental Impact Statement Volume I and II*. Newburyport, MA: M New England Fishery Management Council in consultation with the ASMFC, and NMFS.

NEFMC. (2010). *Final Amendment 4 to the Atlantic Herring Fishery Managment Plan, Incorporating the Environmental Impact Statement*.Vol. I and II. Newburyport, MA: M New England Fishery Management Council in consultation with the ASMFC, and NMFS.

NEFMC. (2012). *Final Amendment 5 to the Atlantic Herring Fishery Managment Plan, Incorporating the Environmental Impact Statement*.Vol. I and II. Newburyport, MA: M New England Fishery Management Council in consultation with the ASMFC, and NMFS.

NEFMC. (2014a). *Framework Adjustment 2 to the Atlantic Herring Fishery Managment Plan and the 2013-2015 atlantic Herring Fishery Specifications, Incorporating the Environmental Assessment*. Newburyport, MA: M New England Fishery Management Council in consultation with the ASMFC, and NMFS.

NEFMC. (2014b). *Framework Adjustment 3 to the Atlantic Herring Fishery Managment Plan*. Newburyport, MA: New England Fishery Management Council. 241 p.

NEFMC. (2014c). *Framework Adjustment 4 to the Atlantic Herring Fishery Managment Plan*. Newburyport, MA: New England Fishery Management Council.

NEFMC. (2015). *Scientific and Statistical Committee report from May 20, 2015, meeting*. Newburyport, MA 5 p.

NEFSC. (2012). *54th Northeast Regional Stock Assessment Workshop (54th SAW) Assessment Summary Report*. Woods Hole, MA: U.S. Department of Commerce. NEFSC Reference Document 12-14. 45 p.

NEFSC. (2015). Northeast Fisheries Observer Program: Incidental Take Reports. Omnibus data request and supplemental data for 2014. Woods Hole, MA: U.S. Department of Commerce; Retrieved from: http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html.

NMFS. (1991). *Final Recovery Plan for the Humpback Whale (Megaptera novaeangliae)*. Silver Spring, MD: U.S. Department of Commerce. 105 p.

NMFS. (2005). *Essential Fish Habitat Environmental Impact Statement for Atlantic Herring*. Gloucester, MA: U.S. Department of Commerce.

NMFS. (2007). *Guidelines for Assessment of the Social Impact of Fishery Management Actions*. In: NMFS Council Operational Guidelines - Fishery Management Process. Silver Spring, MD: National Oceanic and Atmospheric Administration. 39 p.

NMFS. (2009). NMFS National Standards Guidelines. 50 CFR 600310 et seq.

NMFS. (2010). *Final recovery plan for the fin whale (Balaenoptera physalus).* Silver Spring, MD: U.S. Department of Commerce. 121 p.

NMFS. (2011). *Final recovery plan for the sei whale (Balaenoptera borealis).* Silver Spring, MD: U.S. Department of Commerce. 108 p.

NMFS. (2012a). *Endangered Species Act Section 7 Review of Amendment 5 to the Atlantic Herring Fishery Management Plan*. Gloucester, MA: U.S. Department of Commerce. NMFS issuance date: December 21, 2012.

NMFS. (2012b). *Section 7 Consultation for Continued Authorization of the Tilefish, Herring, Red Crab and Atlantic Surfclam and Ocean Quahog Fishery Management Plans Due to Listing of New Species*. Gloucester, MA: U.S. Department of Commerce. NMFS issuance date: April 23, 2012.

NMFS. (2013). *Endangered Species Act Section 7 Consultation on the Continued Implementation of Management Measures for the Northeast Multispecies, Monkfish, Spiny Dogfish, Atlantic Bluefish, Northeast Skate Complex, Mackerel/Squid/Butterfish, and Summer Flounder/Scup/Black Sea Bass Fisheries*. Gloucester, MA: U.S. Department of Commerce. Consultation No. F/NER/2012/01956.

NMFS. (2014a). *Endangered Species Act Section 7 Review of Framework Adjustment 3 for the Atlantic Herring Fishery Management Plan*. Gloucester, MA: U.S. Department of Commerce. NMFS issuance date: February 21, 2014.

NMFS. (2014b). *Endangered Species Act Section 7 Review of Framework Adjustment 4 for the Atlantic Herring Fishery Management Plan*. Gloucester, MA: U.S. Department of Commerce. NMFS issuance date: September 17, 2014.

NMFS & USFWS. (1991). *Recovery Plan for U.S. Population of Atlantic Green Turtle (Chelonia mydas)*. Washington, DC: U.S. Department of Commerce and U.S. Department of the Interior. 58 p.

NMFS & USFWS. (1992). *Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic and Gulf of Mexico*. Silver Spring, MD: U.S. Department of Commerce and U.S. Department of the Interior. 65 p.

NMFS & USFWS. (1995). *Status Reviews for Sea Turtles Listed under the Endangered Species Act of 1973*. Washington, DC: U.S. Department of Commerce and U.S. Department of the Interior. 139 p.

NMFS & USFWS. (1998a). *Recovery Plan for U.S. Pacific Populations of the Green Turtle (Chelonia mydas)*. Silver Spring, MD: U.S. Department of Commerce and U.S. Department of the Interior. 58 p.

NMFS & USFWS. (1998b). *Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (Dermochelys coriacea)*. Silver Spring, MD: USDo Commerce. 65 p.

NMFS & USFWS. (2007a). *Green Sea Turtle (Chelonia mydas) 5 Year Review: Summary and Evaluation*. Silver Spring, MD: U.S. Department of Commerce and U.S. Department of the Interior. 102 p.

NMFS & USFWS. (2007b). *Kemp's Ridley Sea Turtle (Lepidochelys kempii) 5 Year Review: Summary and Evaluation*. Silver Spring, MD: U.S. Department of Commerce and U.S. Department of the Interior. 50 p.

NMFS & USFWS. (2008). *National Recovery Plan for the Loggerhead Sea Turtle (Caretta caretta)*.2nd ed. Siver Spring, MD: U.S. Department of Commerce. 325 p.

NMFS & USFWS. (2011). *Bi-national Recovery Plan for the Kemp's Ridley Sea Turtle (Lepidochelys kempii)*.2nd ed. Siver Spring, MD: National Marine Fisheries Service. 156 & appendices p.

NMFS & USFWS. (2013). *Leatherback Sea Turtle (Dermochelys coriacea) 5 Year Review: Summary and Evaluation*. Silver Spring, MD: U.S. Department of Commerce and U.S. Department of the Interior. 91 p.

NOAA. (2007). *An Assessment of the Leatherback Turtle Population in the Atlantic Ocean - A Report of the Turtle Expert Working Group*. Miami, FL: U.S. Department of Commerce. NOAA Tech Memo NMFS-SEFSC-555. 116 p.

O'Leary SJ, Dunton KJ, King L, Frisk MG & Chapman DD. (2014). Genetic diversity and effective size of Atlantic sturgeon, *Acipenser oxyrhinchus oxyrhinchus* river spawning populations estimated from the microsatellite genotypes of marine-captured juveniles. *Conservation Genetics.* 1-9.

Page LM & Burr BM. (1991). *A Field Guide to Freshwater Fishes of North America North of Mexico*. Boston, MA: Houghton Mifflin Company,. 432 p.

Payne PM & Heinemann DW. (1993). The distribution of pilot whales (*Globicephala sp.*) in shelf/shelf edge and slope waters of the northeastern United States, 1978-1988. *Reports of the International Whaling Commission. 14*: 51-68.

Payne PM, Nicholas JR, O'Brien L & Powers KD. (1986). The distribution of the humpback whale, *Megaptera novaeangliae*, on Georges Bank and in the Gulf of Maine in relation to densities of the sand eel, *Ammodytes americanus*. *Fishery Bulletin. 84*: 271-277.

Payne PM, Selzer LA & Knowlton AR. (1984). *Distribution and density of cetaceans, marine turtles, and seabirds in the shelf waters of the northeastern United States, June 1980 - December 1983, based on shipboard observations*. Woods Hole, MA: U.S. Department of Commerce. NMFS NEFSC. 294 p.

Payne PM, Wiley DN, Young SB, Pittman S, Clapham PJ & Jossi JW. (1990). Recent fluctuations in the abundance of baleen whales in the southern Gulf of Maine in relation to changes in selected prey. *Fishery Bulletin. 88*: 687-696.

Reid RN, Cargnelli LM, Griesbach SJ, Packer DB, Johnson DL, Zetlin CA, Morse WW & Berrien PL. (1999). *Essential Fish Habitat Source Document: Atlantic Herring, Culpea Harengus L., Life History and Habitat Characteristics*. Highlands, NJ: USDo Commerce.

Risch D, Clark CW, Dugan PJ, Popescu M, Siebert U & Van Parijs SM. (2013). Minke whale acoustic behavior and multi-year seasonal and diel vocalization patterns in Massachusetts Bay, USA. *Marine Ecological Progress Series. 489*: 279-295.

Schilling MR, Seipt I, Weinrich MT, Frohock SE, Kuhlberg AE & Clapham PJ. (1992). Behavior of individually-identified sei whales *Balaenoptera borealis* during an episodic influx into the southern Gulf of Maine in 1986. *Fishery Bulletin. 90*(749-755).

Sherman K, Jaworski NA & Smayda TJ eds. (1996). *The Northeastern Shelf Ecosystem - Assessment, Sustainability, and Management*. Cambridge, MA: Blackwell Science. 564 p.

Shoop C & Kenney R. (1992). Seasonal distributions and abundances of loggerhead and leatherback sea turtles in waters of the northeastern United States. *Herpetological Monographs. 6*: 43-67.

SMAST. (2015). Bycatch Avoidance Programs: River herring avoidance in the Atlantic herring and mackerel fisheries. New Bedford, MA: University of Massachusetts School for Marine Science and Technology; Retrieved from: http://www.umassd.edu/smast/bycatch/.

Stein A, Friedland KD & Sutherland M. (2004a). Atlantic sturgeon marine bycatch and mortality on the continental shelf of the Northeast United States. *North American Journal of Fisheries Management. 24*: 171-183.

Stein A, Friedland KD & Sutherland M. (2004b). Atlantic sturgeon marine distribution and habitat use along the northeastern coast of the United States. *Transactions of the American Fisheries Society. 133*: 527-537.

Stevenson D, Chiarella L, Stephan D, Reid R, Wilhelm K, McCarthy J & Pentony M. (2004). *Characterization of the Fishing Practices and Marine Benthic Ecosystems of the Northeast U.S. Shelf, and an Evaluation of the Potential Effects of Fishing on Essential Fish Habitat*. Woods Hole, MA: U.S. Dept. of Commerce. NEFSC Technical Memo NMFS-NE-181. 179 p.

Stone SL, Lowery TA, Field JD, Jury Sh, Nelson DM, Monaco ME, Williams CD & Andreasen LA. (1994). *Distribution and Abundance of Fisheries and Invertebrates in Mid-Atlantic Estuaries*. Silver Spring, MD: USDo Commerce. ELMR Rep. No. 12. 280 p.

Swingle W, Barco S, Pitchford T, McLellan W & Pabst D. (1993). Appearance of juvenile humpback whales feeding in the nearshore waters of Virginia. *Marine Mammal Science. 9*: 309-315.

TEWG. (1998). *An Assessment of the Kemp's Ridley (Lepidochelys kempii) and Loggerhead (Caretta caretta) Sea Turtle Populations in the Western North Atlantic*. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-SEFSC-409. 96 p.

TEWG. (2000). *Assessment of the Kemp's Ridley and Loggerhead Sea Turtle Populations in the Western North Atlantic*. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-SEFSC-444. 115 p.

TEWG. (2009). *An Assessment of the Loggerhead Turtle Population in the Western North Atlantic*. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-SEFSC-575. 131 p.

Timoshkin VP. (1968). Atlantic sturgeon (*Acipenser sturio* L.) caught at sea. *Journal of Ichthyology. 8*(4): 598.

Vu E, Risch D, Clark CW, Gaylord S, Hatch L, Thompson M, Wiley DN & Van Parijs SM. (2012). Humpback whale song occurs extensively on feeding grounds in the western North Atlantic Ocean. *Aquatic Biology. 14*(2): 175-183.

Waldman JR, King T, Savoy T, Maceda L, Grunwald C & Wirgin I. (2013). Stock origins of subadult and adult Atlantic sturgeon, *Acipenser oxyrinchus*, in a non-natal estuary, Long Island Sound. *Estuaries and Coasts. 36*: 257-267.

Waring G, Josephson E, Fairfield-Walsh C & Maze-Foley K. (2007). *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2007*. Woods Hole, MA: U.S. Department of Commerce. NOAA Technical Memorandum NMFS NE 205. 415 p.

Waring G, Josephson E, Maze-Foley K & Rosel P. (2014). *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2013*. Woods Hole, MA: U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-228. 475 p.

Waring G, Josephson E, Maze-Foley K & Rosel P. (2015). *Trends in Selected U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2014*. Woods Hole, MA: U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-231. 370 p.

Waring GT, Fairfiled CP, Ruhsam CM & Sano M. (1992). Cetaceans associated with Gulf Stream features off the northeastern USA shelf. *ICES Journal of Marine Science. 1992/N:12*: 29.

Wirgin II, Breece MW, Fox DA, Maceda L, Wark KW & King T. (2015). Origin of Atlantic sturgeon collected off the Delaware Coast during spring months. *North American Journal of Fisheries Management. 35*: 20-30.

Wirgin II, Maceda L, Waldman JR, Wehrell S, Dadswell MJ & King T. (2012). Stock origin of migratory Atlantic sturgeon in Minas Basin, Inner Bay of Fundy, Canada determined by microsatellite and mitochondrial DNA analyses. *Transactions of the American Fisheries Society. 141*(5): 1389-1398.

10.0 INDEX

2016-2018 Atlantic Herring Fishery Specifications

APPENDIX I

Development of Options for River Herring and Shad Catch Caps in the Atlantic Herring Fishery, 2016-2018

Atlantic Herring Plan Development Team
New England Fishery Management Council

September 2015

Background and Herring PDT Methods for Updating Catch Data and Estimating RH/S Catch

During the development of specifications for the 2016-18 Atlantic herring (AH) fishery, the PDT re-examined all available data on river herring and shad (RH/S) catch, as well as the methods previously used to set the catch cap. The RH/S catch caps were originally established by the Council under Framework 3 and were set at the median level of catch observed over a 5 year reference period (2008-2012). At that time, an examination of available data identified a weak relationship between the total landings per trip (K_{ALL}) and RH/S catch. Therefore, the annual RH/S catch was estimated by multiplying the average observed catch rate per trip by the total number of trips that occurred in the fishery, instead of using a ratio estimator that relied on K_{ALL}. However, this created an inconsistency between the setting and monitoring of the RH/S catch cap, because NOAA uses ratio estimators to monitor all catch caps. To ensure uniformity throughout the process, the PDT modified their methods for the 2016-2018 specifications by using a ratio estimator to derive annual RH/S catch:

$$\mathrm{RHS_{tot}} = \mathrm{KALL_{tot}} * \frac{\sum \mathrm{RHS_{obs}}}{\sum \mathrm{KALL_{obs}}}$$

This assumes that the amount of RH/S caught on an AH trip is proportional to the total landings of all species on that trip. This modification has resulted in significant change in the estimated amount of annual RH/S catch, particularly for gears and areas that have some large trips with low observed RH/S catch (e.g., GOM midwater trawl) (Table 1).

There is considerable interannual variability in the total annual RH/S catch amount estimated for this fishery (Figure 1; Table 2). As such, it is difficult to establish an “average” annual RH/S catch level (the basis of the catch caps) from only five years. For this reason, the PDT recommends including two additional years (2013-2014) to the reference period to provide better representation of the distribution of annual catch amounts. However, going forward it is not recommended to continue to include additional years to this reference period; 2014 is the last year that the AH fishery operated without the limitations imposed by a RH/S catch cap. Including “cap years” in the reference period would provide incentive for fishermen to increase their RH/S catch, which is in opposition to the goal of the RH/S catch caps.

The PDT also recommends using a weighted average of annual catch amounts (weighted by the number of samples in each year) to represent the “average” annual RH/S catch, instead of the median. There has been considerable variation in the number of observed trips between years, and a weighted mean takes into account this varying level of precision among annual estimates (Figures 2 and 3). The use of a median gives years with very few samples (e.g., SNEMA bottom trawl in 2008 – 1 observation) the same amount of weight as years with many samples (e.g., SNEMA bottom trawl in 2013 – 163 observations).

Under the original five year reference period (2008-2012), it was noted that nearly all of the observed RH/S catch was landed and not discarded at-sea. Because only rare small amounts of discarded bycatch were observed at-sea, the PDT did not consider this a problem for combining portside and at-sea datasets at the time. However, upon reviewing catch data from the most recent two years (2013-2014), it has become apparent that discards now constitute a much larger proportion of total RH/S catch, particularly for SNE/MA bottom trawl (up to ~73% in 2014).

Therefore, a more formal treatment of the two data types (landed catch vs discarded catch) is now warranted.

The method of calculating RH/S catch was modified by estimating total RHS_{kept} separately from $RHS_{discards}$. RHS_{kept} was estimated using the combined dataset of at-sea and portside observations of landed catch. $RHS_{discards}$ was estimated using only the at-sea observations of discarded bycatch. The variances for each component were added together to achieve the variance of total RHS catch.

Several other changes were made to either the data or methods used to estimate annual RH/S catch, all of which had a relatively minor influence over the resulting values:

- Included some shad landings that were previously omitted from RH/S estimates
- Included some trips that were previously omitted because sub-trips did not meet 6,600 lbs AH criteria
- Improved matching of trips sampled by multiple agencies (for removal of redundancies)
- Use of DMIS (NOAA-reconciled dealer/fishermen database) for K_{ALL} (total lbs of all species kept) in all expansions (to the trip and to the fishery).

Table 1 - Possible RH/S catch cap values based on annual estimates of total RH/S catch from two time periods (2008-2012; 2008-2014).

		Bottom Trawl		Midwater Trawl	
		Median	Wgt Mean	Median	Wgt Mean
GOM	Old (08-12)			85.5	96.3
	New (08-12)			98.1	98.3
	New (08-14)			11.3	76.7
CC	Old (08-12)			13.3	32.5
	New (08-12)			8.9	27.6
	New (08-14)			29.5	32.4
SNE/MA	Old (08-12)	88.9	61.5	123.7	235.3
	New (08-12)	19.6	28.2	83.9	115.4
	New (08-14)	24.0	122.3	83.9	129.6

Note: "Wgt Mean" is the arithmetic average of the total RH/S catch per year, weighted by the number of sampled trips. The previous cap values are shaded in gray.

Table 2 - Annual estimates of total RH/S catch (landed + discarded) from the Atlantic herring fishery.

Gear	Cap Area	2008	2009	2010	2011	2012	2013	2014	Median	Weighted Mean
Bottom Trawl	GOM				0.6	0.1	0.0		0.1	0.3
	SNEMA	0.0	105.9	13.5	19.6	24.0	236.5	58.5	24.0	122.3
Midwater Trawl	GOM	157.2	98.1	146.8	5.9	1.9	11.3	6.7	11.3	76.7
	CC	39.8	0.0	0.7	8.9	49.6	29.5	45.3	29.5	32.4
	SNEMA	348.7	83.9	28.0	29.6	157.3	231.5	30.3	83.9	129.6
	GBK	0.0	0.2	1.6	0.9	0.5	1.3	0.4	0.5	0.8
Purse Seine	GOM	2.0	2.8	2.9	0.1	1.2	4.1	66.5	2.8	7.0
	Total	**547.7**	**290.8**	**193.5**	**65.6**	**234.4**	**514.2**	**207.6**		

Table 3 - Total number of trips and total landings from trips that landed > 6,600 lbs of Atlantic herring

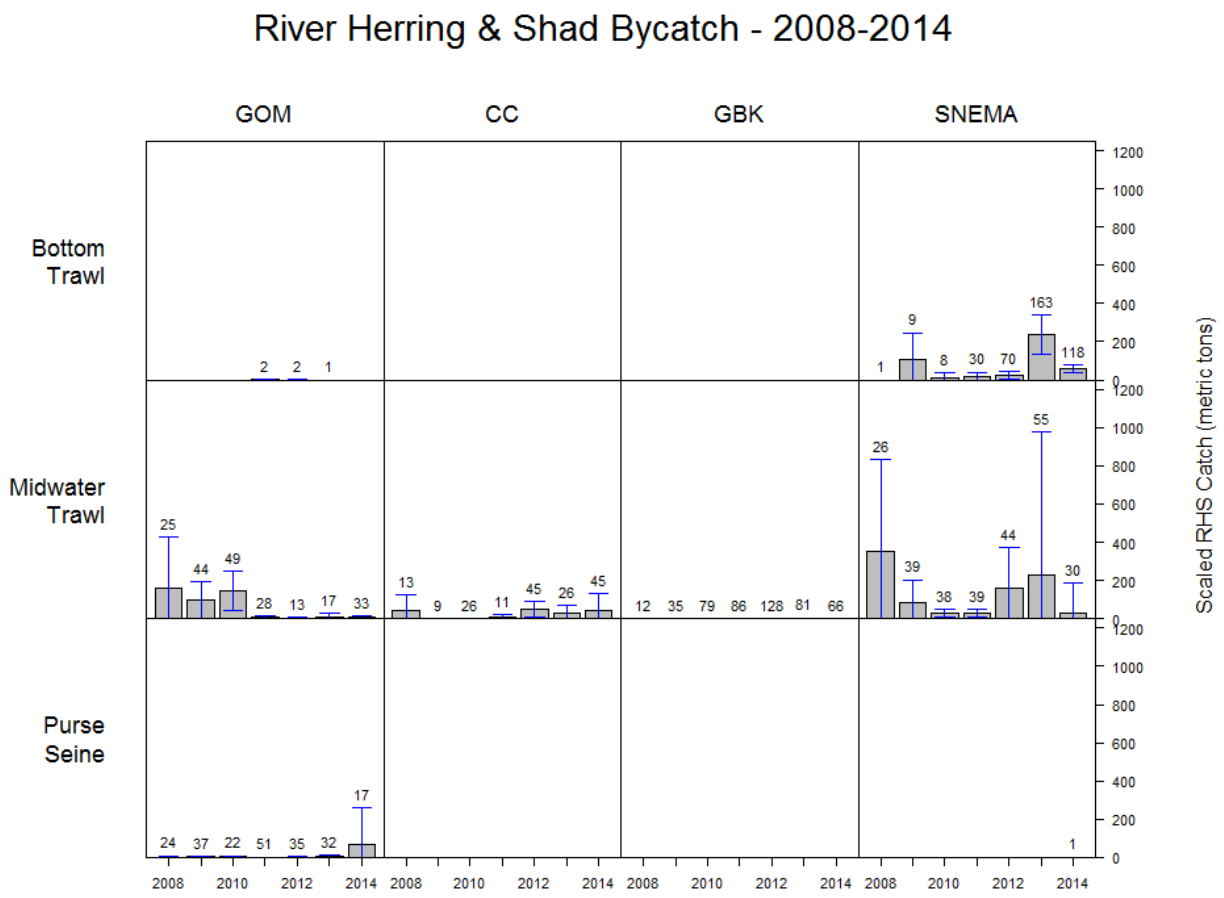
Trips with Atlantic Herring Landings >6,600 lbs									
Gear	**Cap Area**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
Bottom Trawl	**GOM**	5	18	24	9	27	3	9	**95**
	CC	0	0	0	0	0	0	0	**0**
	SNEMA	70	135	103	118	73	223	175	**897**
	GB	1	0	1	0	2	0	0	**4**
Midwater Trawl	**GOM**	88	115	109	65	25	23	36	**461**
	CC	40	16	40	28	50	39	75	**288**
	SNEMA	152	188	116	77	148	219	146	**1,046**
	GB	36	103	87	183	169	189	154	**921**
Purse Seine	**GOM**	243	225	205	265	275	314	313	**1,840**
	CC	0	0	1	0	0	0	0	**1**
	SNEMA	0	0	0	0	0	0	2	**2**
	GB	0	0	0	0	0	0	0	**0**
	Total	**635**	**800**	**686**	**745**	**769**	**1,010**	**910**	**5,555**
Total Landings (mt) from Trips with Atlantic Herring Landings >6,600 lbs									
Gear	**Cap Area**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
Bottom Trawl	**GOM**	32	100	109	40	121	10	39	**451**
	CC	0	0	0	0	0	0	0	**0**
	SNEMA	3,186	5,952	4,558	4,629	4,935	9,422	5,503	**38,185**
	GB	67	0	66	0	89	0	0	**222**
Midwater Trawl	**GOM**	17,663	22,803	18,628	12,875	4,258	6,563	7,381	**90,171**
	CC	7,280	2,806	5,522	5,769	12,569	6,002	17,199	**57,147**
	SNEMA	26,460	36,070	22,158	9,799	18,207	16,788	14,230	**143,712**
	GB	7,564	26,669	14,237	32,172	30,355	35,795	27,052	**173,844**
Purse Seine	**GOM**	25,200	21,694	8,272	17,001	19,295	22,981	27,247	**141,690**
	CC	0	0	9	0	0	0	0	**9**
	SNEMA	0	0	0	0	0	0	58	**58**
	GB	0	0	0	0	0	0	0	**0**
	Total	**87,452**	**116,094**	**73,559**	**82,285**	**89,829**	**97,561**	**98,709**	**645,489**

Table 4 - Sampled RH/S catch cap trips by strata, 2008-2014

NEFOP At-Sea Observed Cap Trips*									
Gear	**Cap Area**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
Bottom Trawl	**GOM**	0	0	0	2	2	1	0	**5**
	SNEMA	1	9	7	20	19	46	47	**149**
Midwater Trawl	**CC**	11	9	24	11	38	14	36	**143**
	GBK	12	33	79	77	114	72	44	**431**
	GOM	17	40	40	25	8	11	20	**161**
	SNEMA	26	30	34	34	23	13	5	**165**
Purse Seine	**GOM**	24	35	22	51	35	31	15	**213**
	Total	**91**	**156**	**206**	**220**	**239**	**188**	**167**	**1,267**
MADMF Portside Observed Cap Trips**									
Gear	**Cap Area**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
Bottom Trawl	**SNEMA**	0	0	0	9	49	112	67	**237**
Midwater Trawl	**CC**	2	0	2	0	6	12	9	**31**
	GBK	0	2	0	9	13	9	22	**55**
	GOM	8	4	9	3	4	6	13	**47**
	SNEMA	0	7	4	5	20	31	18	**85**
Purse Seine	**GOM**	0	2	0	0	0	0	1	**3**
	Total	**10**	**15**	**15**	**26**	**92**	**170**	**130**	**458**
MEDMR Portside Observed Cap Trips***									
Gear	**Cap Area**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
Bottom Trawl	**SNEMA**	0	0	1	1	2	5	4	**13**
Midwater Trawl	**CC**	0	0	0	0	1	0	0	**1**
	GBK	0	0	0	0	1	0	0	**1**
	SNEMA	0	2	0	0	1	11	7	**21**
Purse Seine	**GOM**	0	0	0	0	0	1	1	**2**
	Total	**0**	**2**	**1**	**1**	**5**	**17**	**12**	**38**

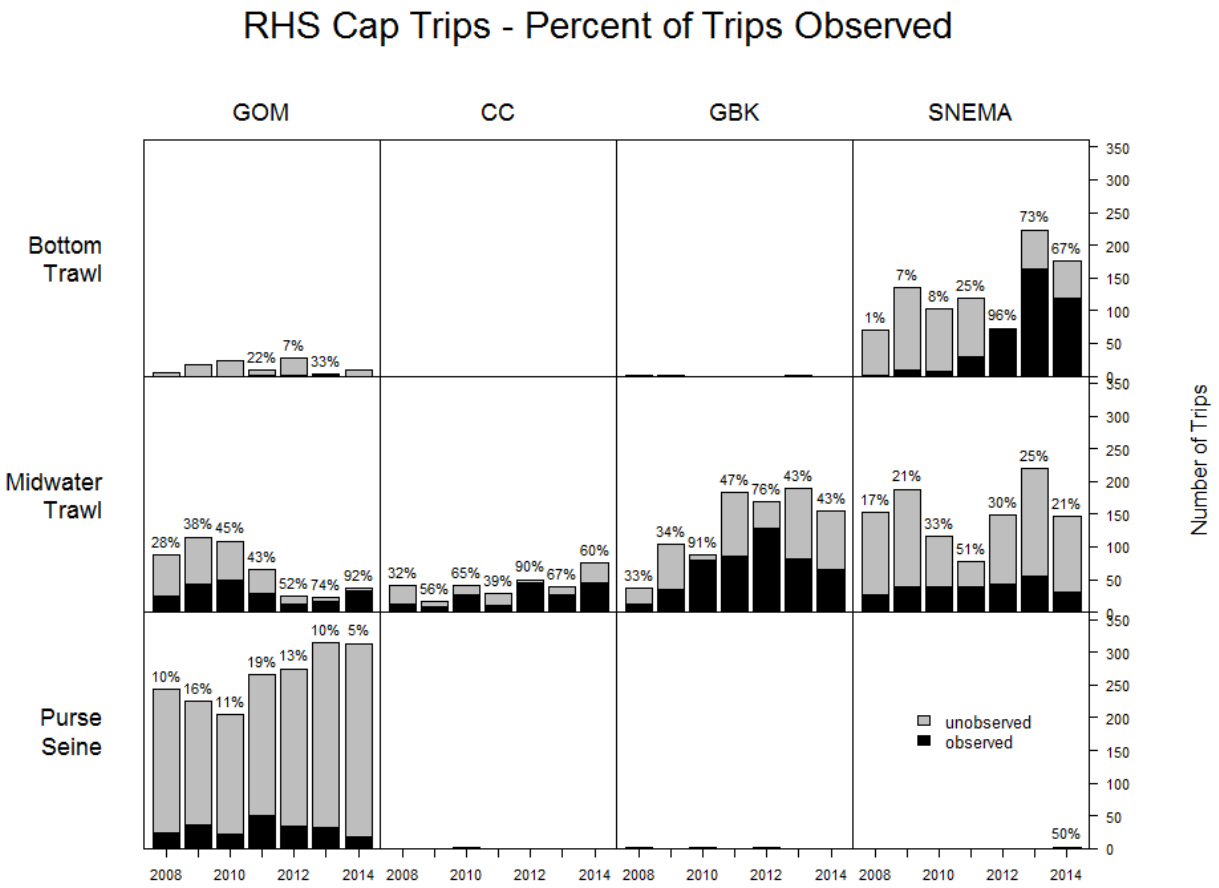
Note: If a trip occurred in multiple areas, it was assigned to the area where the majority of catch occurred.
* only includes trips with >6,600 lbs herring
** only includes trips with >6,600 lbs herring that were not also sampled at-sea by NEFOP
*** only includes trips with >6,600 lbs herring that were not also sampled at-sea by NEFOP

Figure 1 - Estimated total RH/S catch from trips that caught > 6,600 lbs of Atlantic herring by year, gear and cap area.



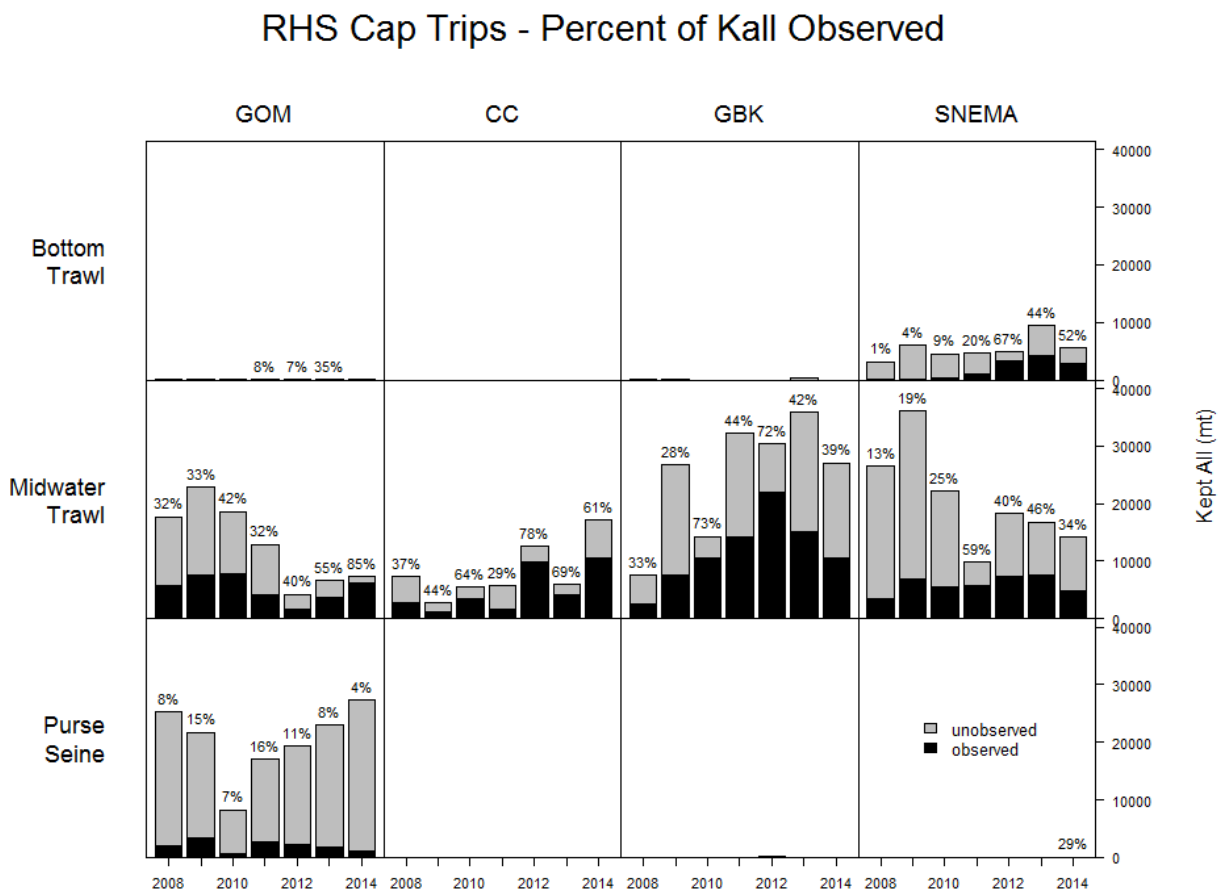
Note: The blue error bars represent 2 standard errors, and the number above each bar is the number of observed trips.

Figure 2 - Total number trips that caught > 6,600 lbs of Atlantic herring by year, gear, and cap area.



Note: The black portion of each bar represents the proportion of total trips that was observed in that year, with the % observed shown above each bar.

Figure 3 - Total catch of all species (K_{all}) from trips that caught > 6.600 lbs of Atlantic herring by year, gear, and cap area.



Note: The black portion of each bar represents the proportion of total K_{all} that was observed in that year, with the % observed shown above each bar.