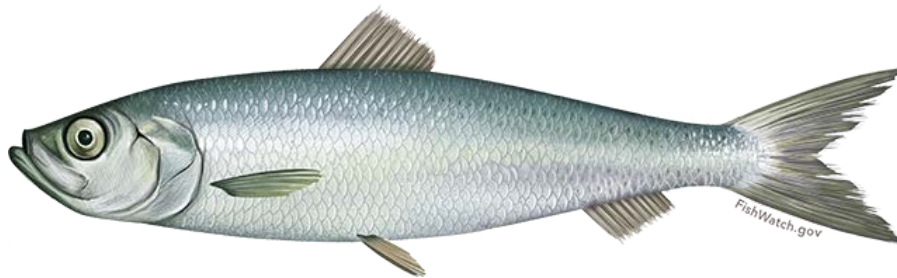


Atlantic Herring Fishery Management Plan

Framework Adjustment 6 and 2019-2021 Atlantic Herring Fishery Specifications

Including an Environmental Assessment and
Regulatory Flexibility Analysis



October 2019

Prepared by the
New England Fishery Management Council
In consultation with the
National Marine Fisheries Service and the
Mid-Atlantic Fishery Management Council



Document history

Initial Framework Meeting: June 12, 2018
Final Framework Meeting: June 11, 2019
Preliminary Submission: July 17, 2019
Final Submission: October 8, 2019

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FRAMEWORK ADJUSTMENT 6 TO THE ATLANTIC HERRING FISHERY MANAGEMENT PLAN AND 2019-2021 ATLANTIC HERRING FISHERY SPECIFICATIONS

Proposed Action: Propose an updated overfishing/overfished definition, fishery specifications for FY2019-2021, and temporary prohibition on carryover of unharvested herring catch.

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Abstract: The New England Fishery Management Council, in consultation with NOAA National Marine Fisheries Service, has prepared Framework Adjustment 6 to the Atlantic Herring Fishery Management Plan, which includes a draft environmental assessment that presents the range of alternatives to achieve the goals and objectives of the action. The proposed action focuses on updating the overfished/overfishing definition, fishery specifications for FY2019-2021, and a temporary prohibition on carryover of unharvested herring catch. The document describes the affected environment and valued ecosystem components and analyzes the impacts of the alternatives on both. It addresses the requirements of the National Environmental Policy Act, the Magnuson Stevens Fishery Conservation and Management Act, the Regulatory Flexibility Act, and other applicable laws.

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1.0 EXECUTIVE SUMMARY

This document contains the New England Fishery Management Council (Council) recommendations for updating the overfishing limit for Atlantic herring and for the Atlantic herring fishery specifications for the 2019-2021 fishing years (Table 1), consistent with the Magnuson-Stevens Fishery Conservation and Management Act (MSA) 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 2019-2021 fishing years (January – December), including:

- Overfishing Limit (OFL);
- Acceptable Biological Catch (ABC);
- Stock-wide 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 2019-2021 fishing years.

Proposed Action

The Council's preferred alternative includes updating the overfishing/overfished definition, Alternative 2, to be consistent with the updated herring assessment and Amendment 8 (in review). If approved, the updated overfishing/overfished definition would be: *The stock will be considered overfished if stock biomass is less than 1/2 the stock biomass associated with the MSY level or a proxy (e.g., SSB_{MSY} or $SSB_{MSY\ proxy}$). The stock will be considered subject to overfishing if the estimated fishing mortality rate exceeds the fishing mortality rate associated with the MSY level or a proxy (e.g., F_{MSY} or $F_{MSY\ proxy}$).*

The Council's preferred alternatives for FY2019-2021 fishery specifications includes Alternative 2a for OFL/ABC, Option 3 for management uncertainty, and Alternative 2, up to 100 mt for border transfer. The remaining fishery specifications did not include alternatives and are summarized in Table 1. In addition, Table 1 includes the RH/S catch caps proposed for 2019-2021.

The Council's preferred alternative related to carryover over unharvested catch is Alternative 2, temporarily prohibit carryover for FY2020 and FY2021. Any unused catch from FY2018 or FY2019 would not automatically carryover. This measure will automatically expire after the 2021 fishing year, up to 10% of unharvested sub-ACLs from FY2020 could rollover to FY2022, and the Council could revisit this measure for FY2021 in a subsequent action (rollover from FY2019).

Table 1. Preferred alternative for 2019-2021 Atlantic herring fishery specifications

Herring Fishery Specification	2019	2020	2021
Overfishing Limit (OFL)	30,668	41,830	69,064
Acceptable Biological Catch (ABC)	21,266	16,131	16,131
Management Uncertainty	6,200	4,560	4,560
Optimum Yield / Annual Catch Limit (OY/ACL)	15,065*	11,571*	11,571*
Domestic Annual Harvest (DAH)	15,065	11,571	11,571
Border Transfer (BT)	0	100	100
Domestic Annual Processing (DAP)	15,065	11,471	11,471
U.S. At-Sea Processing (USAP)	0	0	0
Area 1A Sub-ACL (28.9%)	4,354	3,344	3,344
Area 1B Sub-ACL (4.3%)	647	498	498
Area 2 Sub-ACL (27.8%)	4,188	3,217	3,217
Area 3 Sub-ACL (39%)	5,876	4,513	4,513
Fixed Gear Set-Aside (FGSA)	39	30	30
Research Set-Aside (RSA) as % of Sub-ACLs	3%	3%	3%
* If the New Brunswick weir fishery catch through October 1 is less than the associated trigger for the management uncertainty buffer (See Table 10), then 1,000 mt of the management uncertainty buffer will be added to the ACL.			

Seasonal sub-ACL divisions – Area 1A is allocated 0% of the sub-ACL for January – May and 100% from June – December. Area 1B is allocated 0% of the sub-ACL for January – April and 100% May – December.

Table 2. Preferred alternative for 2019-2021 river herring / shad catch caps

RH/S Catch caps	2019	2020	2021
Midwater Trawl Gulf of Maine	76.7 mt	76.7 mt	76.7 mt
Midwater Trawl Cape Cod	32.4 mt	32.4 mt	32.4 mt
Midwater Trawl Southern New England and Mid-Atlantic	129.6 mt	129.6 mt	129.6 mt
Bottom Trawl Southern New England and Mid-Atlantic	122.3 mt	122.3 mt	122.3 mt

Affected Environment

The Affected Environment for the 2019-2021 Atlantic herring fishery specifications is in Section 0. 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 2019-2021 Atlantic herring fishery specifications include: Atlantic Herring; Non-Target Species (focused on haddock and river herring/shad); Protected Resources; Physical Environment and Essential Fish Habitat (EFH); and Fishery-Related Businesses and Communities.

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 and summarized in Table 3. Overall, there are minimal differences in terms of potential impacts for the overfishing and overfished definition alternatives. The difference between those two alternatives is primarily administrative without direct impacts on the biological and human environments. The range of alternatives for Atlantic herring OFL/ABC specifications for the 2019-2021 fishing years only differs by less than 10,000 mt; therefore, there are minimal differences between the impacts of Alternatives 1-3 on the biological and human environments. The projections (Section 7.1.2) show that under all the OFL/ABC specification alternatives considered by the Council, there is a very low probability for the stock to experience overfishing (i.e. range of 1% to 7% for FY2020). However, because overall herring biomass is projected to remain at relatively low levels in the next few years, (currently estimated to be only about 30% of MSY levels of spawning stock biomass (SSB) in FY2020), the probability of the stock becoming overfished is relatively high under all alternatives (over 80%). The proposed specifications are expected to have low positive impacts on the resource by preventing overfishing, and negative impacts on the fishery from relatively high reductions in available catch compared to previous years. These reductions may help the stock recover more quickly with longer term benefits for the fishery, but short-term negative impacts are expected.

In general, the remaining specifications are expected to have primarily neutral to low positive impacts on both the biological and human environments. For example, maintaining the same RH/S catch caps are expected to continue to minimize impacts on bycatch to the extent practicable and control overall impacts on RH/S from the Atlantic herring fishery.

This action also proposes to temporarily prohibit carryover of unharvested catch. The plan normally requires up to 10% of unharvested catch in each herring management area to carryover to a future fishing year. The Council proposes this measure be temporarily prohibited to help prevent excessive exploitation of one stock component and minimize potential distributional impacts if one area is closed prematurely.

Table 3. Summary of potential impacts of the alternatives under consideration in Framework 6 across the valued ecosystem components (Preferred alternatives shaded).

FW6 Alternatives		Herring Resource	Non-target species	Protected Resources	Physical Env. (EFH)	Human Communities
Overfishing/ overfished definition	No Action (Alt. 1)	No direct impacts	No direct impacts	No direct or indirect impacts	No direct impacts	No direct impacts, indirect low - impacts
	Update OFD (Alt. 2)	No direct impacts, indirect low +	No direct impacts	No direct or indirect impacts	No direct impacts	No direct impacts, indirect low + impacts
OFL/ABC	No Action (Alt.1)	Low +	Low + to Neutral	Low – to Low +	Neutral	Negative (least)
	Alt. 2a	Low +	Low + to Neutral	Low – to Low +	Neutral	Negative
	Alt. 2b	Low +	Low + to Neutral	Low – to Low +	Neutral	Negative (most)
Management Uncertainty	No Action	Low +	Low + to Neutral	Low –	Neutral	Uncertain, Low + (least)
	Option 1	Low +	Low + to Neutral	Low –	Neutral	Uncertain, Low +
	Option 2	Low +	Low + to Neutral	Low –	Neutral	Uncertain, Low + (most)
	Option 3	Low +	Low + to Neutral	Low –	Neutral	Uncertain, Low +
Border Transfer	No Action (Alt. 1 – 0 mt)	No direct impacts	No direct impacts	No direct or indirect impacts	No direct impacts	Neutral to Low -
	Alt. 2 (up to 250 mt)	No direct impacts	No direct impacts	No direct or indirect impacts	No direct impacts	Low +
Carryover provisions	No Action (Alt. 1)	No direct impacts	Neutral to low +	Low –	Neutral	Low –
	Alt 2. Prohibit carryover in 2020 and 2021	Low + to neutral	Low +	Low –	Neutral	Low +

2.0 TABLE OF CONTENTS

1.0	EXECUTIVE SUMMARY.....	5
2.0	TABLE OF CONTENTS.....	9
2.1	Tables.....	12
2.2	Figures.....	14
2.3	Maps.....	14
2.4	Acronyms.....	14
3.0	INTRODUCTION AND BACKGROUND.....	17
3.1	Purpose and Need	17
3.2	Goals and Objectives	18
3.3	Background.....	18
4.0	ALTERNATIVES UNDER CONSIDERATION.....	20
4.1	Overfishing and Overfished Definitions	20
4.1.1	No Action Overfishing and Overfished Definitions (Alternative 1).....	20
4.1.2	Updated Overfishing and Overfished Definitions (Alternative 2) (<i>PREFERRED ALTERNATIVE</i>).....	20
4.2	2019-2021 Atlantic Herring Specifications with Alternatives.....	22
4.2.1	Overfishing Limit and Acceptable Biological Catch	22
4.2.2	Management Uncertainty and Annual Catch Limit	25
4.2.3	Border Transfer	26
4.3	Status Quo measures for 2019-2021 Atlantic Herring Specifications	27
4.3.1	Domestic Annual Harvest	27
4.3.2	Domestic Annual Processing	28
4.3.3	U.S. At-sea Processing.....	28
4.3.4	Management Area Sub-ACLs for 2019-2021	29
4.3.5	Seasonal (monthly) Sub-ACL Divisions.....	30
4.3.6	Research Set-Aside	31
4.3.7	Fixed Gear Set-Aside	31
4.3.8	River Herring/Shad (RH/S) Catch Caps.....	31
4.4	Summary of Specifications Alternatives Under Consideration	32
4.5	Carryover of Unharvested Catch.....	34
4.5.1	No Action – Maintain Current Carryover Provisions (Alternative 1).....	34
4.5.2	Prohibit Carryover for 2020 and 2021 (Alternative 2) (<i>PREFERRED ALTERNATIVE</i>).....	34
5.0	ALTERNATIVES CONSIDERED BUT REJECTED.....	35
5.1	River Herring/Shad Catch Caps.....	35

5.1.1	Adjust catch caps proportional to Atlantic herring ACL	35
5.1.2	Apply the same method for setting catch caps with updated years of data.....	35
5.1.3	Set using a survey index-based cap.....	35
5.1.4	Use the original catch cap allocations.....	36
5.1.5	Two phase approach that would hold some quota back and release it during the season.....	36
6.0	AFFECTED ENVIRONMENT	37
6.1	Target Species (Atlantic herring).....	37
6.1.1	Stock Status.....	37
6.1.2	Importance of Herring as Forage	41
6.1.3	Details about management uncertainty	42
6.2	Non-target Species (Bycatch)	43
6.2.1	Monitoring of Non-target Species in the Herring Fishery	46
6.2.2	Methods used for Monitoring.....	47
6.3	Protected Species	49
6.3.1	Protected Species and Critical Habitat Not Likely to be Affected (via interactions with gear or destruction of essential features of critical habitat) by the Atlantic herring FMP	51
6.3.2	Protected Species Potentially Affected by the Proposed Action.....	51
6.3.3	Gear Interactions with Protected Species.....	52
6.3.4	Seabirds.....	55
6.4	Physical Environment and Essential Fish Habitat	56
6.5	Human Communities	58
6.5.1	Herring Fishery	58
6.5.2	Other Managed Resources and Fisheries	72
6.5.3	Fishing Communities	72
7.0	ENVIRONMENTAL IMPACTS OF ALTERNATIVES.....	75
7.1	Impacts on Target Species (A. Herring)	76
7.1.1	Overfishing/Overfished Definition	76
7.1.2	OFL/ABC Alternatives	76
7.1.3	Management Uncertainty Buffer Alternatives	79
7.1.4	Border Transfer Alternatives.....	79
7.1.5	Carryover Provisions.....	79
7.2	Impacts on Non-target Species (Bycatch).....	81
7.2.1	Overfishing/Overfished Definition	81
7.2.2	OFL/ABC Alternatives	82
7.2.3	Management Uncertainty Buffer Alternatives	82
7.2.4	Border Transfer Alternatives.....	83

7.2.5	Carryover Provisions.....	83
7.3	Impacts on Protected Species.....	83
7.3.1	Overfishing/Overfished Definition	84
7.3.2	OFL/ABC Alternatives	84
7.3.3	Management Uncertainty Buffer Alternatives	85
7.3.4	Border Transfer Alternatives.....	85
7.3.5	Carryover Provisions.....	85
7.4	Impacts on Physical Environment and Essential Fish Habitat.....	86
7.4.1	Overfishing/Overfished Definition	87
7.4.2	OFL/ABC Alternatives	87
7.4.3	Management Uncertainty Buffer Alternatives	88
7.4.4	Border Transfer Alternatives.....	88
7.4.5	Carryover Provisions.....	88
7.5	Impacts on Human Communities.....	89
7.5.1	Overfishing/Overfished Definition	90
7.5.2	OFL/ABC Alternatives	90
7.5.3	Management Uncertainty Buffer Alternatives	92
7.5.4	Border Transfer Alternatives.....	92
7.5.5	Carryover Provisions.....	93
7.6	Cumulative Effects.....	93
7.6.1	Introduction	93
7.6.2	Past, Present, and Reasonably Foreseeable Future Actions	95
7.6.3	Baseline Conditions for Resources and Human Communities	98
7.6.4	Impacts from Framework 6 Alternatives	99
7.6.5	Cumulative Effects Analysis.....	101
8.0	APPLICABLE LAWS/EXECUTIVE ORDERS.....	104
8.1	Magnuson-Stevens Fishery Conservation and Management Act – National Standards	104
8.2	National Environmental Policy Act	104
8.2.1	Finding of No Significant Impact (FONSI)	109
8.2.2	Environmental Assessment	112
8.2.3	Point of Contact.....	112
8.2.4	Agencies Consulted.....	113
8.2.5	List of Preparers	113
8.2.6	Opportunity for Public Comment.....	113
8.2.7	Document Distribution.....	114
8.3	Marine Mammal Protection Act (MMPA).....	115

8.4	Endangered Species Act (ESA)	115
8.5	Administrative Procedure Act (APA)	116
8.6	Paperwork Reduction Act (PRA).....	116
8.7	Coastal Zone Management Act (CZMA).....	116
8.8	Information Quality Act.....	116
8.9	Executive Order 13158 (Marine Protected Area)	119
8.10	Executive Order 13132 (Federalism)	120
8.11	Executive Order 12898 (Environmental Justice)	120
8.12	Regulatory Flexibility Act (RFA) –Regulatory Flexibility Analysis.....	121
8.12.1	Reasons for Considering the Action	122
8.12.2	Objectives and Legal Basis for the Action.....	122
8.12.3	Description and Estimate of Small Entities to Which the Rule Applies.....	122
8.12.4	Record Keeping and Reporting Requirements.....	122
8.12.5	Duplication, Overlap, or Conflict with Other Federal Rules	122
8.12.6	Impacts of the Proposed Rule on Small Entities.....	123
8.13	Executive Order 12866 (Regulatory Planning and Review).....	124
8.13.1	Statement of the Problem/Goals and Objectives.....	124
8.13.2	Management Alternatives and Rationale	125
8.13.3	Description of the Fishery.....	125
8.13.4	Summary of Impacts.....	125
8.13.5	Determination of Significance	126
9.0	GLOSSARY	126
10.0	REFERENCES	129

APPENDICES

- I. Atlantic Herring Fishery Specifications – Definitions and Formulas
- II. Final SSC Report (October 2018)

2.1 TABLES

Table 1. Preferred alternative for 2019-2021 Atlantic herring fishery specifications.....	6
Table 2. Preferred alternative for 2019-2021 river herring / shad catch caps.....	6
Table 3. Summary of potential impacts of the alternatives under consideration in Framework 6 across the valued ecosystem components (<i>Preferred alternatives shaded</i>).	8
Table 4. Purpose and Need for Framework 6 (2019-2021 fishery specifications)	17
Table 5. SSC recommendations for OFL and ABC for 2019-2021 fishing years	22
Table 6. OFL/ABC Alternative 1 (No Action) for 2019-2021 Atlantic herring specifications	23

Table 7. OFL/ABC Alternative 2a (original projections) for 2019-2021 Atlantic herring specifications..	23
Table 8. OFL/ABC Alternative 2b (updated projections) for 2019-2021 Atlantic herring specifications..	24
Table 9. 2019 RH/S catch caps in the herring fishery, implemented by NMFS through in-season adjustment (mt).....	32
Table 10. Summary of Atlantic herring specifications for all OFL/ABC and management uncertainty buffer alternatives.....	33
Table 11. RH/S catch cap allocations from Framework 3.	36
Table 12. Trigger values associated with each management uncertainty buffer option in this action.....	42
Table 13. Midwater trawl (MWT), purse seine (PS), and small mesh bottom trawl (SMBT) observer coverage rates, SBRM (April-March) years 2012-2018	47
Table 14. Species protected under the ESA and/or MMPA that may occur in the affected environment of the herring FMP.....	49
Table 15. Small cetacean and pinniped species observed seriously injured and/or killed by Category II midwater trawl fisheries in the affected environment of the Atlantic herring fishery.....	54
Table 16. 2004-2016 Observed gray and harbor seal interactions with the Gulf of Maine Atlantic herring purse seine fishery.....	55
Table 17. Current EFH designation information sources.....	57
Table 18. Atlantic herring permit categories.	59
Table 19. Fishing vessels with federal Atlantic herring permits, permit years 2011-2019 (May-April)....	60
Table 20. Contribution of herring vessels by permit category to total landings, 2013-2016 (Jan.-Dec.)...	60
Table 21. Atlantic herring landings by fishing gear type and area, 2016-2018.	61
Table 22. Total annual Atlantic herring catch, 2003-2018.	62
Table 23. Atlantic herring sub-ACLs and catch by year and management area, 2009-2018.....	63
Table 24. Use of border transfer, 2013-2018.	64
Table 25. Active weirs and the catch per weir in the New Brunswick, Canada fishery, 1978-2018.....	68
Table 26. Monthly weir landings (mt) for weirs in New Brunswick, 1978-2018.....	69
Table 27. Canadian weir and shut-off landings from 2009-2018 (preliminary) with possible deductions for management uncertainty based on 3-year, 5-year and 10-year averages.	70
Table 28. Atlantic herring landings from fixed gear fishery, before and after November 1 rollover date .	71
Table 29. Atlantic herring discards, 2010-2017.....	72
Table 30. Annualized Atlantic herring landings to states and primary ports, 2007-2016.....	74
Table 31. Terms used to summarize impacts on VECs.	75
Table 32. 2019-2021 OFL and ABC projections for No Action OFL/ABC alternative (Alt. 1) (mt)	78
Table 33. Original 2019-2021 OFL and ABC projections reviewed by the SSC in October 2018 (mt)	78
Table 34. Updated 2019-2021 OFL and ABC projections (mt).....	78
Table 35. Estimate of 2018 catch by area and potential underage available for FY2020.....	80

Table 36. Summary of herring management area allocations under the preferred alternative for 2020 specifications with and without carryover allowed (both in green)	81
Table 37. Expected annual revenue from herring landings under each alternative, 2020 and 2021.....	91
Table 38. Summary of effects from past, present, and reasonably foreseeable future actions on the VECs	97
Table 39. Baseline conditions of the VECs	98
Table 40. Summary of Framework 6 impacts expected on each VEC (preferred alternatives shaded)....	100
Table 41. Public meetings related to Framework 6.....	114
Table 42. Demographic data for Atlantic herring fishing communities (counties)	121
Table 43. ACL for the baseline (2019) compared to 2020 and 2021.....	123
Table 44. Average percentage of small entity revenue derived from each herring fishing area.....	123
Table 45. Estimates for percent change in total entity revenue from this action.	124
Table 46. Estimated revenues for Framework 6 OFL/ABC and management uncertainty buffer options.	125

2.2 FIGURES

Figure 1. ABC control rule proposed in Amendment 8, as adopted by the Council in September 2018 (under review).	22
Figure 2. Atlantic herring spawning stock biomass (mt) and fishing mortality, 1965-2017	39
Figure 3. Atlantic herring annual recruit (000s) time series, 1965-2017.	40
Figure 4. Atlantic herring stock status based on the ASAP model	41
Figure 5. Total herring landings and value of herring, 2009-2018	65
Figure 6. Herring landings in New Brunswick, Canada (weir and shutoff).....	67

2.3 MAPS

Map 1. Atlantic herring management areas	30
Map 2. GOM and GB haddock stock areas (shaded) with herring MWT accountability measures (hatched)	44
Map 3. Atlantic herring management areas and RH/S catch cap areas.....	46

2.4 ACRONYMS

ABC	Acceptable Biological Catch
ACL	Annual Catch Limit
ALWTRP	Atlantic Large Whale Take Reduction Plan
AM	Accountability Measure
AP	Advisory Panel

APA	Administrative Procedures Act
ASMFC	Atlantic States Marine Fisheries Commission
B _{MSY}	Biomass that would allow for catches equal to Maximum Sustainable Yield when fished at the overfishing threshold (F _{MSY})
BiOp, BO	Biological Opinion, a result of a review of potential effects of a fishery on Protected Resource species
CEQ	Council on Environmental Quality
DFO	Department of Fisheries and Oceans (Canada)
DMF	Division of Marine Fisheries (Massachusetts)
DMR	Department of Marine Resources (Maine)
DPWG	Data Poor Working Group
EA	Environmental Assessment
EEZ	Exclusive economic zone
EFH	Essential fish habitat
ESA	Endangered Species Act
F	Fishing mortality rate
FEIS	Final Environmental Impact Statement
FMP	Fishery management plan
FW	Framework
FY	Fishing year
GARFO	Greater Atlantic Regional Fisheries Office
GB	Georges Bank
GIS	Geographic Information System
GOM	Gulf of Maine
HAPC	Habitat area of particular concern
HPTRP	Harbor Porpoise Take Reduction Plan
IFM	Industry-funded monitoring
LOA	Letter of authorization
MA	Mid-Atlantic
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MPA	Marine protected area
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum sustainable yield
NEMAP	Northeast Area Monitoring and Assessment Program
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fisheries Observer Program
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NLSA	Nantucket Lightship closed area
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OBDBS	Observer database system
OY	Optimum yield
PDT	Plan Development Team
PRA	Paperwork Reduction Act
RFA	Regulatory Flexibility Act
RPA	Reasonable and Prudent Alternatives
SA	Statistical Area
SARC	Stock Assessment Review Committee
SAW	Stock Assessment Workshop

SIA	Social Impact Assessment
SMB	Squid Mackerel Butterfish FMP (MAFMC)
SNE	Southern New England
SNE/MA	Southern New England-Mid-Atlantic
SSB	Spawning stock biomass
SSC	Scientific and Statistical Committee
TEWG	Technical Expert Working Group
TRAC	Trans-boundary Resources Assessment Committee
VEC	Valued Ecosystem Component
VMS	Vessel monitoring system
VTR	Vessel trip report

3.0 INTRODUCTION AND BACKGROUND

3.1 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 2019-2021 fishing years consistent with the best available science and the requirements of the Atlantic Herring FMP (Table 4). This action is needed to prevent overfishing while providing additional flexibility and promoting the full utilization of optimum yield (OY). It is important to note that the specifications for fishing year 2019 have already been set by NMFS through a separate action (84 FR 2760; EA signed January 22, 2019), and the Council is expected to revisit the 2021 specifications after the updated assessment is completed in spring 2020. Therefore, this action is essentially a one-year action; focus should be on fishery specifications for 2020.

Pursuant to the requirements of the MSA, the specifications and RH/S catch caps are also needed to continue to address and minimize the catch and bycatch mortality of river herring and shad to the extent practicable. The associated purpose is to implement river herring/shad catch caps that are intended to meet some of 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; and promote flexibility to adjust the catch cap(s) in the future as more information becomes available.

Another need for this action is to make it consistent with the best available science in terms of the status of the Atlantic herring resource, with an overall purpose of updating the overfishing definition to be consistent the 2018 Atlantic herring benchmark assessment.

Table 4. Purpose and Need for Framework 6 (2019-2021 fishery specifications)

Need	Purpose
To prevent overfishing while providing additional flexibility and promoting the full utilization of optimum yield (OY).	Specify OFL and ABC and set specifications for the 2019-2021 fishing years.
Continue to address and minimize the catch and bycatch mortality of river herring and shad to the extent practicable.	Implement RH/S catch caps that are intended to provide strong incentive for the industry to continue to avoid RH/S and reduce RH/S catch to the extent practicable and promote flexibility to adjust catch caps in the future as more information becomes available.
Update the overfishing definition to be consistent with the best available science regarding the status of the Atlantic herring resource.	Update the overfishing definition to be consistent with the 2018 Atlantic herring benchmark assessment.

3.2 GOALS AND OBJECTIVES

The 2019-2021 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.

3.3 BACKGROUND

Several important things occurred in 2018 and early 2019 that shaped the management decisions for Atlantic herring in this action as well as several others leading up to it. In June 2018 the Council was briefed on the draft assessment results that indicated poor recruitment and relatively high probabilities of the stock becoming overfished and overfishing occurring in the near future if current catch limits were fully harvested. Based on those results the Council requested NMFS make an in-season adjustment to reduce 2018 catch limits by over 50%, reducing the total ACL from over 100,000 mt. to just under 50,000 mt. This action was taken to address the population decline of Atlantic herring due to poor recruitment and to lead to more available herring biomass and higher catch limits in 2019 and beyond if 2018 catches are reduced.

At the very next Council meeting in September 2018 the Council again requested NMFS make another in-season adjustment to reduce 2019 catch limits further because a Council action would not be in place

in time to implement reductions needed near the start of the fishing year (January 1). Herring biomass was projected to decline further and additional reductions were needed to prevent overfishing beyond the reductions made for 2018. A proposed rule to reduce 2019 catch limits was published in November 2018, and the final rule was published in early February 2019 that ultimately reduced catch limits to prevent overfishing (<https://s3.amazonaws.com/nefmc.org/FR-Herring-Specs-2019-01658.pdf>).

In February 2019 NMFS also informed the Council that it determined that the Atlantic herring stock is approaching an overfished condition based on projections in the recent assessment and additional information. The Magnuson Act requires that NMFS notify the Council if the status of fishery has become overfished or is approaching the condition of being overfished. According to the Act, “a fishery shall be classified as approaching a condition of being overfished if, based on trends in fishing effort, fishery resource size, and other appropriate factors, the Secretary estimates that the fishery will become overfished within two years.” And within two years after such notifications the Council shall prepare an action to prevent overfishing from occurring.

The region was also nearing the end of a long process of prioritizing and potentially reorganizing all the stock assessment schedules in the region. Traditionally Atlantic herring has been assessed every three years, alternating between a benchmark assessment that is more involved considering new models etc., followed by an update assessment that is more streamlined, primarily only updating data using the same stock assessment model previously approved. It was decided in this process that Atlantic herring would move to a biannual schedule instead. Therefore, in the near term at least, the herring stock will be assessed every two years but the Council plans to continue setting herring specifications for three years at a time. In effect, the third year of a specifications package would likely get replaced by a subsequent three-year package. For example, the assessment completed in 2018 will be used to set specifications for 2019-2021, and the next scheduled assessment in 2020 will be used to set specifications for 2021-2023, potentially replacing measures for 2021. Similarly, the assessment planned for 2022 will be used to set specifications for 2023-2025, and so on.

During this time, the Council was also taking final action on Amendment 8, an action under development for several years that considered a long-term ABC control rule as well as other measures. The Council selected a biomass based control rule that explicitly accounts for herring’s role in the ecosystem. Specifically, when biomass is greater than 50% of SSB/SSB_{MSY} , the maximum fishing mortality allowed is 80% of F_{MSY} , so 20% of F_{MSY} is left for herring predators. Furthermore, as biomass declines, fishing mortality declines linearly, and if biomass falls below 10% of SSB/SSB_{MSY} , then ABC is set to zero, no fishery allocation. The ABC control rule selected by the Council in late 2018 is still under review. While NMFS has not approved or disapproved it as part of Amendment 8, the Council has recommended through this action that the proposed Amendment 8 ABC control rule also be used on a short-term basis in this specification process for 2019-2021, Section 4.1 explains more of the rationale for that recommendation as part of the preferred alternative.

4.0 ALTERNATIVES UNDER CONSIDERATION

4.1 OVERFISHING AND OVERFISHED DEFINITIONS

The MSA requires that every fishery management plan specify “objective and measurable criteria for identifying when the fishery to which the plan applies is overfished.” Guidance on this requirement identifies two elements that must be specified: a maximum fishing mortality threshold (MFMT; or reasonable proxy) and a minimum stock size threshold, or MSST. Overfishing occurs when the MFMT is exceeded; a stock is overfished when the stock size falls below the MSST.

Amendment 4 adopted status determination criteria for Atlantic herring and Amendment 8 adopted an ABC control rule (under review). In addition, in 2018 a benchmark assessment was approved for Atlantic herring that altered the parameters that status determination criteria are based on. This action is considering updating the overfishing and overfished definitions to be more consistent with the recent benchmark assessment and Amendment 8 to the Herring FMP.

4.1.1 No Action Overfishing and Overfished Definitions (Alternative 1)

Under the No Action alternative, the current overfishing and overfished definitions in the herring FMP would remain in places. Those definitions are below.

If stock biomass is equal or greater than B_{MSY} , overfishing occurs when fishing mortality exceeds F_{MSY} . If stock biomass is below B_{MSY} , overfishing occurs when fishing mortality exceeds the level that has a 50 percent probability to rebuild stock biomass to B_{MSY} in 5 years ($F_{Threshold}$). The stock is in an overfished condition when stock biomass is below $\frac{1}{2} B_{MSY}$ and overfishing occurs when fishing mortality exceeds $F_{Threshold}$. These reference points are thresholds and form the basis for the control rule.

The control rule also specifies risk-averse fishing mortality targets, accounting for the uncertainty in the estimate of F_{MSY} . If stock biomass is equal to or greater than $\frac{1}{2} B_{MSY}$, the target fishing mortality will be the lower level of the 80 percent confidence interval about F_{MSY} . When biomass is below B_{MSY} , the target fishing mortality will be reduced consistent with the five-year rebuilding schedule used to determine $F_{Threshold}$.

Rationale: These definitions have been in place since the FMP was first adopted and the rationale is included in the original Herring FMP (NEFMC 1999, Section 2.6).

4.1.2 Updated Overfishing and Overfished Definitions (Alternative 2) (PREFERRED ALTERNATIVE)

Alternative 2 would update the overfishing and overfished definitions to primarily make it more consistent with the 2018 Atlantic herring stock assessment and Amendment 8, as well as clarify some text to make it more consistent with definitions used for other stocks in the region. Reference points produced in the 2018 stock assessment no longer rely on a poorly estimated stock-recruit relationship; the stock-recruit relationship further deteriorated in the 2018 assessment. Therefore, $F_{40\%}$ was used as a proxy for F_{MSY} and long-term projections were used to derive other MSY biomass reference point proxies. Since the 2018 assessment was not able to estimate B_{MSY} or F_{MSY} , proxies were developed instead. Also, the 2018 assessment reports biomass in term of spawning stock biomass (SSB), not biomass (B), as was

previously reported and used in the current overfishing definition. Spawning stock biomass is a type of biomass, it is total biomass * maturity.

The stock will be considered overfished if stock biomass is less than 1/2 the stock biomass associated with the MSY level or a proxy (e.g., SSB_{MSY} or $SSB_{MSY\ proxy}$). The stock will be considered subject to overfishing if the estimated fishing mortality rate exceeds the fishing mortality rate associated with the MSY level or a proxy (e.g., F_{MSY} or $F_{MSY\ proxy}$).

Rationale: Over time, the parameters used to assess the Atlantic herring stock have changed, as well as the relevant projections completed to evaluate stock status and set catch levels. This definition is consistent with many overfishing and overfished definitions used in the region, as well as the upper biomass threshold of the proposed Amendment 8 ABC control rule. This definition is more flexible, because it would incorporate any estimate of biomass (B, SSB, or relevant proxy), whatever is used in the stock assessment and considered the best available science. The current assessment (2018) defines $F_{MSY\ proxy}$ as F40%, but that may not be the case in future assessments. This definition is also less complex than the existing definition, because it does not include a 5-year projection to define overfishing. Projections beyond three years are generally unreliable for a short- to medium-lived fish like herring.

The Council decided not to define what the parameter is within the definition; instead, the parameter is very general and does not specify the method used to develop the parameter from the last assessment. What that means is a future assessment could use and approve a new parameter and it would be used in the overfishing definition automatically. Under the process described in this alternative, the Council would not need to develop an action to adjust the overfishing/overfished definition, if a new parameter was used and approved in a subsequent assessment. The specific parameters used for MFMT and MSST will be that recommended by the most recent stock assessment. New parameters, or a parameter's numerical estimate, will automatically be adopted in the next fishing year following the assessment. To be clear, the method used to define the parameter (i.e., $F_{MSY\ proxy}$ in Assessment 1 may be based on F40%, and $F_{MSY\ proxy}$ in Assessment 2 may be based on F50%), as well as the parameter value can change automatically under this definition (i.e., $F_{MSY\ proxy}$ in Assessment 1 may be 0.2, but in a subsequent assessment $F_{MSY\ proxy} = 0.3$). The Council identified this alternative as preferred, because it is more consistent with the recent herring assessment and Amendment 8. In addition, it would require no Council action to modify the definition if future stock assessment recommend different parameters for defining stock status.

4.2 2019-2021 ATLANTIC HERRING SPECIFICATIONS WITH ALTERNATIVES

4.2.1 Overfishing Limit and Acceptable Biological Catch

The SSC met in October 2018 and provided OFL and ABC recommendations for this action using the Amendment 8 ABC control rule (in review), (See Appendix II).

Amendment 8 ABC control rule (in review): *The control rule is biomass-based, when biomass is greater than 0.5 for the ratio of SSB/SSB_{MSY} , the maximum fishing mortality allowed is 80% of F_{MSY} , so 20% of F_{MSY} is left for herring predators. Under this policy as biomass declines, fishing mortality declines linearly, and if biomass falls below 0.1 for the ratio of SSB/SSB_{MSY} , then ABC is set to zero, no fishery allocation (Figure 1).*

Amendment 8 also proposes that ABC should be set for three years but with annual application of the control rule. This allows ABC to vary between years within a three-year period, the ABC may not be constant if biomass is projected to change during a specification timeframe.

Figure 1. ABC control rule proposed in Amendment 8, as adopted by the Council in September 2018 (under review).

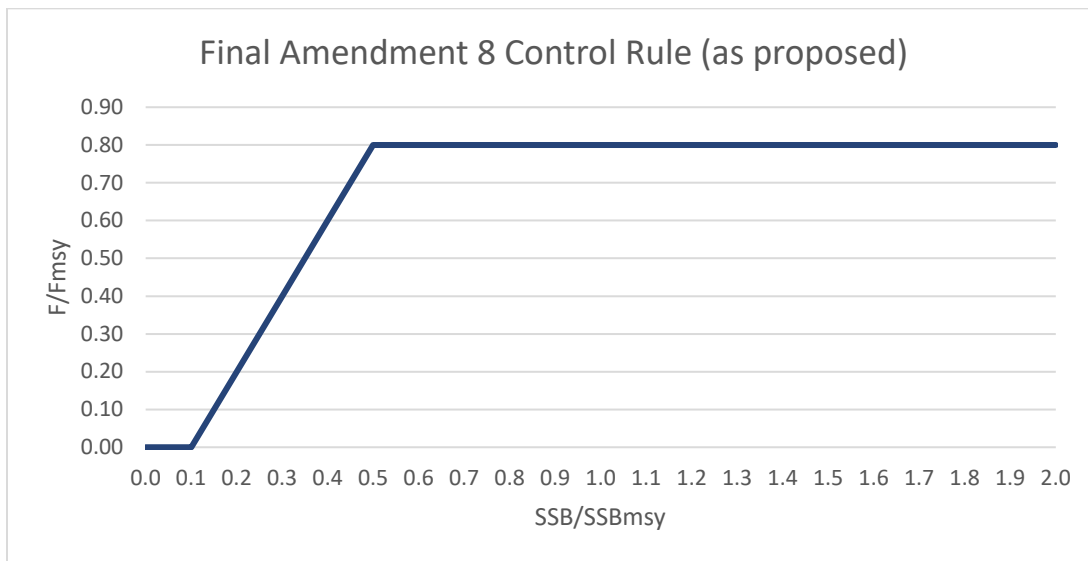


Table 5. SSC recommendations for OFL and ABC for 2019-2021 fishing years

Year	OFL (mt)	ABC (mt)
2019	30,668	21,266
2020	38,878	16,131
2021	59,788	16,131

Note: Subsequent to the SSC meeting, a minor error was detected in the OFL values presented for 2020 and 2021. It was an error in the summary tables, not the projections. Those were corrected and shared with the SSC. The corrected OFL values have been incorporated in the OFL/ABC Alternative 2a (2020 OFL of 41,830 mt and 2021 OFL of 69,064 mt).

Typically, herring projections are done once in the fall for the next three fishing years, but in this case, more time was available to consider updated catch data, because a separate action was taken by NMFS to set 2019 catch levels to prevent overfishing. The PDT therefore prepared another projection with updated 2018 landings (about 5,000 mt higher than the estimate used in the original projection). The Council decided to consider both projections as separate alternatives in this action (Alternative 2a and Alternative 2b below). Framework 6 also includes a No Action Alternative that would maintain the 2019 catch levels for 2020 and 2021 (Alternative 1). Therefore, there are three distinct alternatives in this action for the OFL/ABC specifications for FY2019-2021: Alternative 1, Alternative 2a, and Alternative 2b.

In the future, pending approval of Amendment 8, the Council would likely not have OFL/ABC alternatives in herring specification actions. The ABC control rule would simply be applied to the best estimate of catch for the terminal year, and that would determine the OFL and ABC values for the subsequent three years that would be presented to the SSC for consideration.

4.2.1.1 No Action OFL/ABC (Alternative 1)

No Action (Alternative 1) would maintain the 2019 Atlantic herring fishery specifications that were implemented by the 2019 in-season adjustment for the 2019-2021 fishing years (Table 6). Specification of Atlantic herring ABC would be 21,266 mt for all three fishing years, which is higher than the SSC recommendation for 2020 and 2021 (Table 5).

Table 6. OFL/ABC Alternative 1 (No Action) for 2019-2021 Atlantic herring specifications

	Alternative 1 2019	Alternative 1 2020	Alternative 1 2021
OFL (mt)	30,668	30,668	30,668
ABC (mt)	21,266	21,266	21,266

Rationale: No Action would maintain the same OFL and ABC values implemented in the 2019 in-season action. This would provide more stability for the fishery but would include OFL and ABC values above levels recommended by the SSC for 2020 and 2021.

4.2.1.2 OFL and ABC consistent with the proposed Amendment 8 ABC control rule (Alternative 2a) (*PREFERRED ALTERNATIVE*)

Alternative 2a would implement the OFL and ABC consistent with the ABC control rule that is the preferred alternative in Amendment 8 (Table 7). Amendment 8 is still under review by NMFS and selecting this alternative does not depend on the approval of Amendment 8. If the Council selects this alternative for setting OFL and ABC, it would become the new interim control rule, and replace the previous interim control rule (described in Appendix I).

Table 7. OFL/ABC Alternative 2a (original projections) for 2019-2021 Atlantic herring specifications

	Alternative 2a 2019	Alternative 2a 2020	Alternative 2a 2021
OFL (mt)	30,668	41,830	69,064
ABC (mt)	21,266	16,131	16,131*
* Original projection was 30,659 for 2021 ABC, but the SSC recommended that be reduced to the 2020 ABC to address concerns about scientific uncertainty associated with assumptions of future recruitment in the projections.			

Rationale: Alternative 2a would set OFL and ABC consistent with the ABC control rule proposed in Amendment 8, with additional precaution recommended by the SSC for the 2021 ABC. The OFL and ABC values for this alternative are based on the original projection prepared by the PDT and presented to the SSC that used 49,900 mt as the estimate for 2018 catch. However, the SSC had reservations about the projections for Atlantic herring and was concerned about the assumptions regarding future recruitment. Therefore, the SSC recommended the Council set ABC for 2019 and 2020 based on the proposed Amendment 8 ABC control rule but recommended keeping the ABC for 2021 the same as for 2020 due to the uncertainty in the projections. The original projection of ABC for 2021 was 30,659 mt. The ABC for 2021 in this alternative is substantially lower (16,131 mt) to reflect the SSC concerns about the relatively high scientific uncertainty associated with assumptions of future recruitment in the projections.

The Council recommends this alternative as preferred because it is consistent with SSC advice, and provides additional catch to the fishery compared to Alternative 2b (Alternative 2a has an ABC that is 1,866 mt higher than Alternative 2b ABC), with very minimal increases in associated risk. Alternative 2a has an associated 2% probability of overfishing in 2020, compared to a 1% probability of overfishing for Alternative 2b (Table 33, Table 34).

The Council believes this low level of associated risk is appropriate in this case when the fishery is facing substantial reductions. Overall, herring catch limits have decreased greatly in recent years following the results of the 2018 benchmark assessment. Annual catch limits (ACLs) in 2018 were quickly reduced from over 100,000 mt to just under 50,000 mt, and again reduced to about 15,000 mt in 2019. Therefore, any additional herring catch that is still below the ABC recommended by the SSC is important to reduce the serious socioeconomic impacts expected in the herring and associated lobster fisheries in the Northeast from the relatively large quota reductions implemented to prevent overfishing.

4.2.1.3 OFL and ABC consistent with the proposed Amendment 8 ABC control rule with updated 2018 catch estimates (Alternative 2b)

Alternative 2b would implement the OFL and ABC consistent with the ABC control rule that is the preferred alternative in Amendment 8, as described above under Alternative 2a; however, this alternative would incorporate updated 2018 catch estimates (Table 8). Updated 2018 landings were just over 55,000 mt, about 5,000 mt higher than the estimate used in the original projections (49,900 mt). When the catch assumption is updated, the resulting OFL and ABC calculations for 2019-2021 are slightly lower. The Council reviewed both the original projection (Alternative 2a) and the updated projection (Alternative 2b) and decided to include both as alternatives in this action.

Table 8. OFL/ABC Alternative 2b (updated projections) for 2019-2021 Atlantic herring specifications

	Alternative 2b 2019 Specifications	Alternative 2b 2020 Specifications	Alternative 2b 2021 Specifications
OFL (mt)	30,668	40,574	68,718
ABC (mt)	21,266	14,265	14,265*
* Original projection was 29,835 mt for 2021 ABC, but the Council set it equal to the 2020 ABC to be consistent with SSC recommendations from original projection to address concerns about scientific uncertainty associated with assumptions of future recruitment in the projections.			

Rationale: Alternative 2b includes the same approaches used in Alternative 2a (setting OFL and ABC consistent with the ABC control rule proposed in Amendment 8 and setting ABC for 2021 at the same level as 2020 as recommended by the SSC), but it uses an updated estimate of 2018 catch. The estimate of

2018 catch in this projection was about 5,000 mt higher than the one presented to the SSC. The Council decided to include this as a separate alternative, so that the most recent estimate of 2018 catch could be considered, even though it was not available when the SSC met to make recommendations for the 2019-2021 OFL and ABC recommendations. When the 2018 estimate of catch is increased by about 5,000 mt the OFL and ABC for 2020 and 2021 are lower compared to Alternative 2a, the original projection.

The OFL and ABC values for Alternative 2b are based on the updated projection prepared by the PDT that used 55,285 mt as the estimate for 2018 catch. Note that the ABC for 2021 from this projection was 29,835 mt, but has been reduced to 14,265 mt, the ABC for 2020. This reduction is consistent with the SSC recommendation to reduce ABC in 2021 due to concerns about the assumptions regarding future recruitment. Therefore, this alternative would also set ABC for 2019 and 2020 based on the proposed Amendment 8 ABC control rule but recommended keeping the ABC for 2021 the same as for 2020 due to the uncertainty in the projections. The original projection of ABC for 2021 was 29,835 mt. The ABC for 2021 in this alternative is substantially lower (14,265 mt) to reflect the SSC concerns about the relatively high scientific uncertainty associated with assumptions of future recruitment in the projections.

4.2.2 Management Uncertainty and Annual Catch Limit

The difference between the Atlantic herring acceptable biological catch (ABC) and the stock-wide annual catch limit (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. Management uncertainty is deducted from the ABC to derive a stock-wide ACL, which is the U.S. Atlantic herring optimum yield (OY).

During the 2016-2018 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.

The potential sources of management uncertainty were reviewed for this action and it was determined that the same three sources likely encompass the vast majority of any management uncertainty in this fishery. A separate action set the management uncertainty buffer for FY2019, so these alternatives apply to FY2020 and FY2021 only. After the options are described below the associated triggers for each option are presented, as well as a summary of other measures in the FMP that address management uncertainty (See Section 6.1.3).

4.2.2.1 Management uncertainty options and associated ACLs

4.2.2.1.1 No Action management uncertainty buffer used in FY2019

Under No Action, the management uncertainty buffer used in FY2019 would be implemented again for 2020 and 2021, 6,200 mt. That amount would be subtracted from the ABC to produce the fishery-wide ACL.

Rationale: The No Action alternative for management uncertainty is the allocation used in the previous specifications package. In this case, that is 6,200 mt, the value used for 2016-2018, and was used again in the FY2019 in-season adjustment. That value is larger than the annual NB weir catch from each of the last ten years except for three years (2018, 2013 and 2010).

4.2.2.1.2 3-year average (2016-2018) (Option 1)

The management uncertainty buffer for 2020 and 2021 would be based on the most recent 3-year average (2016-2018) catch totals from the NB weir fishery (Table 29), 5,888 mt. That amount would be subtracted from the ABC to produce the fishery-wide ACL.

Rationale: This alternative is based on the same *method* used to set the management uncertainty buffer in the 2013-2015 specifications package, 3-year average of NB weir catch from the most recent three years available. The value is not the same as the last specification package because the years are different, in this case 2016-2018. Using the same method as the 2013-2015 package the management uncertainty buffer this time would be 5,888 mt, which is very similar to the No Action alternative of 6,200 mt. This buffer is also larger than the annual NB weir catch from each of the last ten years except for three years (2018, 2013 and 2010).

4.2.2.1.3 5-year average (2014-2018) (Option 2)

The management uncertainty buffer for 2020 and 2021 would be based on the most recent 5-year average (2014-2018) catch totals from the NB weir fishery (Table 27), 3,992 mt. That amount would be subtracted from the ABC to produce the fishery-wide ACL.

Rationale: This alternative uses the last five years of NB weir catch to determine a potential management uncertainty buffer. This option was considered in previous action as well but was not selected. This alternative produces the lowest value, but it is still in the same general range. NB weir catch has been very variable over the years with some high catches followed by lower catches. This alternative is larger than the annual NB weir catch for about half of the last ten years, with several years just above 4,000 mt that this buffer would not cover (2018, 2016, 2013, 2010, and 2009).

4.2.2.1.4 10-year average (2009-2018) (Option 3) (PREFERRED ALTERNATIVE)

The management uncertainty buffer for 2020 and 2021 would be based on the most recent 10-year average (2009-2018) catch totals from the NB weir fishery (Table 27), 4,560 mt. That amount would be subtracted from the ABC to produce the fishery-wide ACL.

Rationale: This alternative uses the last ten years of NB weir catch to determine a potential management uncertainty buffer. This alternative produces a value in the middle of other options considered. NB weir catch has been very variable over the years with some high catches followed by lower catches. The Council identified this alternative as preferred because there is no apparent trend in recent NB weir catches; therefore, using more years could better capture the variability. While 2018 catch levels were relatively high for recent years, above 11,000 mt., the Council is not aware of any information to suggest this will happen again in 2019 or 2020. There have been high catches in the past as well that were not followed by high catches in subsequent years. This buffer is larger than all NB weir catch from the last ten years except for three years (2018, 2013 and 2010).

4.2.3 Border Transfer

The Border Transfer (BT) 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 by U.S. vessels 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 last specification package (2016-2018 fishing years). However, in the 2019 in-season adjustment implemented by NMFS BT was set to zero considering the relatively large quota reductions implemented by that action. The Council recommended NMFS set border transfer at 0 mt temporarily to leave as much herring in the U.S. for bait as possible. Several Canadian vessels did apply

for permits in 2018 to transship U.S.-caught herring to be carried to Canadian processing facilities for human consumption, but there ultimately was no activity. BT has decreased from almost 1,000 mt in 2013 to zero in the last few years (2016-2018; Table 24). BT reached over 3,000 mt in 1996, but for many years since has been 0-1,000 mt.

4.2.3.1 No Action – maintain border transfer at 0mt (Alternative 1)

Alternative 1 (No Action) would set border transfer at 0 mt for FY2020 and FY2021, the same value as in 2019. If selected, U.S. vessels would not be permitted to transfer herring to Canadian vessels at-sea.

Rationale: The Council recommended border transfer be set to 0 mt in the 2019 in-season action. Overall quotas were being reduced substantially from about 50,000 mt to 15,000 mt so it was desirable to preserve as much herring as possible for the bait market in the U.S., compared to potentially transferring some herring to Canadian vessels at sea for the food market.

4.2.3.2 Set border transfer at up to 250 mt (Alternative 2) (PREFERRED ALTERNATIVE)

The Council recommends border transfer be set at 100 mt in FY2020 and FY2021. If selected, U.S. vessels would be allowed to transfer herring to Canadian vessels that have a permit for this activity. Vessels would be subject to additional reporting requirements for border transfer.

Rationale: This alternative considered border transfer to be set up to 250 mt. While this specification has traditionally been set at 4,000 mt, the Council felt that level was too high under the current quota levels. The Council selected 100 mt as the preferred alternative. Although this activity has not occurred in recent years (Table 24), it has been a traditional part of the U.S. herring fishery and is important for positive trade relations between several U.S. and Canadian seafood companies. The Council recognizes that this activity may not take place because the incentives to export herring for food may not be strong because of expected high domestic bait prices, but the Council wanted to help maintain positive trade relations between Canada and the U.S. and recognize this historical part of the fishery in some way by setting the limit above 0 mt.

4.3 STATUS QUO MEASURES FOR 2019-2021 ATLANTIC HERRING SPECIFICATIONS

The Council does not always consider alternatives for every element of herring fishery specifications, and in certain cases, some specifications are formulaic and stem directly from the ACL. The specifications in this section are broken out from the overall ACL or are based on the same methods used previously; therefore, the potential impacts have already been accounted for. For example, the specifications for 2019 used the same methods for setting the fixed gear set-aside. The Council did not consider a range of alternative for these specifications, thus, they are considered part of the status quo.

4.3.1 Domestic Annual Harvest

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

$$\text{Stock-wide ACL} = \text{OY} \leq \text{DAH}$$

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 (border transfer or BT).

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

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 was implemented in 2001 and since that time total landings in the U.S. fishery have decreased.

Table 22 summarizes total Atlantic herring catch as a percentage of the total available catch in each year from 2003-2018. Atlantic herring catch has been somewhat consistent over the time period (and in previous years); however, the quota allocated to the fishery (stock-wide ACL/OY) has decreased 50% over the twelve-year period from 2003-2014. Allocations and landings increased after 2014 for several years and decreased dramatically more recently.

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 2019-2021 fishing years would remain equal to the stock-wide Atlantic herring ACL, i.e., the U.S. OY specified by the Council for each of the 2019-2021 fishing years.

4.3.2 Domestic Annual Processing

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 in 2019 since border transfer was 0 mt, and minus 100 mt for BT for 2020-2021 (Section 4.2.3).

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.

Because quotas have been reduced substantially in recent years, it is likely that the U.S. will be able to utilize all the available DAP in 2019-2021. Therefore, the DAP specification for the 2019-2021 fishing years would remain equal to the DAH specification minus the BT specification.

4.3.3 U.S. At-sea Processing

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, it is not a separate allocation but a limit within the domestic catch limit to be used for this purpose.

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

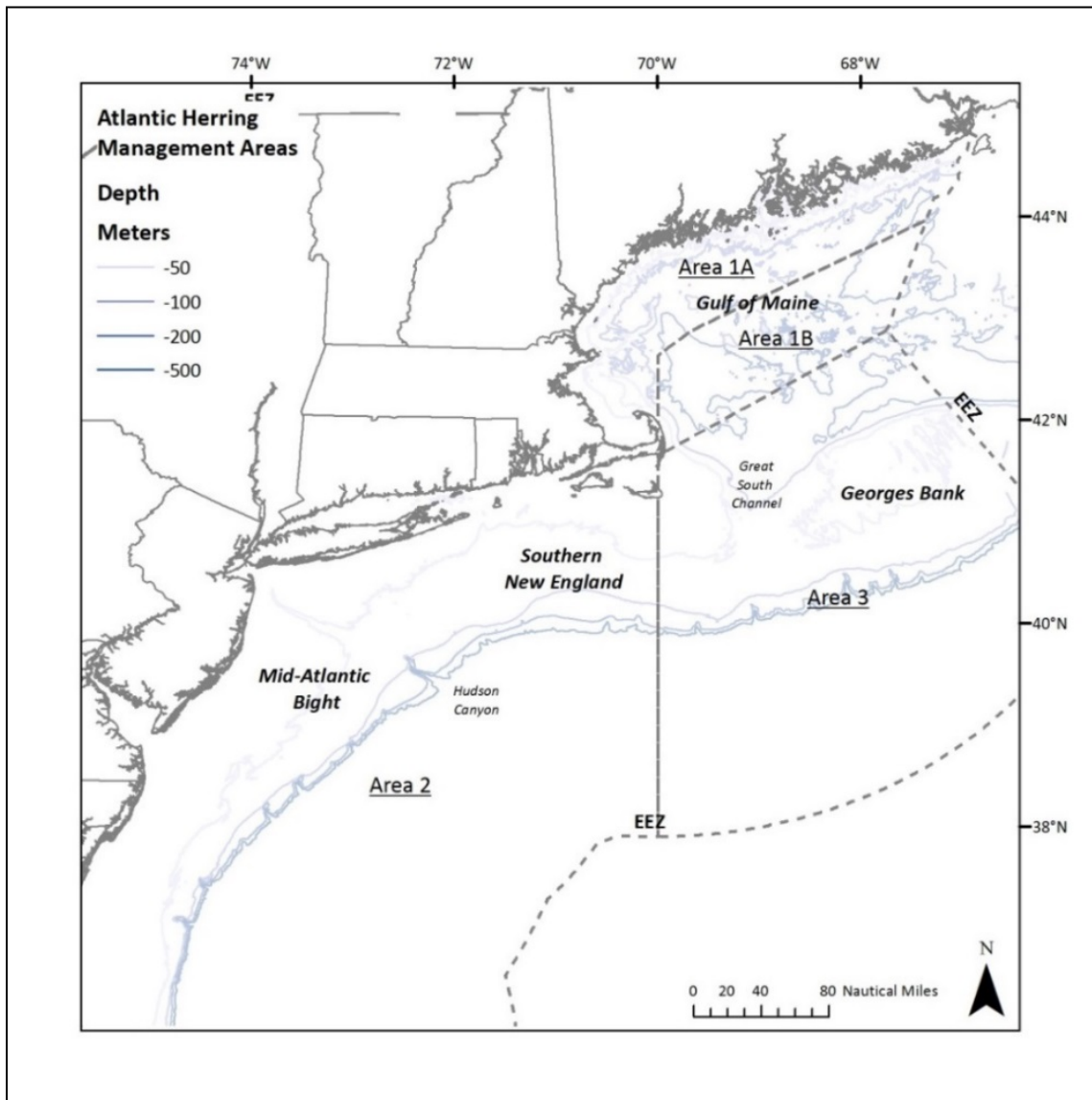
substantial amount of the USAP specification. At that time, landings from Areas 2 and 3 – where USAP is authorized – were considerably lower than allocated sub-ACLs for each of the past several years. Moreover, the specification of 20,000 mt for USAP did not restrict either the operation or the expansion 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, 2013-2015, and 2016-2018 fishing years. The Council has not received any information that would suggest changing this specification for the 2019-2021 fishing years. Therefore, the specification for the 2019-2021 fishing years will remain at 0 mt.

4.3.4 Management Area Sub-ACLs for 2019-2021

The total ACL for Atlantic herring is divided into four separate sub-ACLs intended to minimize risk to individual stock components while maximizing opportunities for the fishery to achieve OY.

Area 1A is the inshore Gulf of Maine, Area 1B is considered offshore Gulf of Maine, Area 3 is primarily an offshore area of Georges Bank, and Area 2 includes all Southern New England and the Mid-Atlantic (Map 1). The current herring management area boundaries have been in place since 2001 (Amendment 1). Since Framework 2, specifications for fishing years 2013-2015, the sub-ACLs have been allocated in the same proportions for the last seven fishing years: 28.9% for Area 1A, 4.3% for Area 1B, 27.8% for Area 2, and 39% for Area 3. The Council has specified that the sub-ACL proportions shall remain the same for 2019-2021 as well.

Map 1. Atlantic herring management areas



4.3.5 Seasonal (monthly) Sub-ACL Divisions

The herring sub-ACL in two of the four management areas is allocated by season, allocating 0% for several months, essentially closing the area to herring fishing during those months. The Council has specified that the seasonal sub-ACL divisions that have been in place since 2013 remain in place for this action as well:

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

4.3.6 Research Set-Aside

The Research Set-Aside (RSA) program 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. In the past, the Council has allocated either 0% or 3% of the sub-ACL for each management area for the RSA program. The regulations allow a set-aside of up to 3% in any or all herring management areas. The most recent specifications, FY2016-2018, deducted a 3% RSA from the ACL for all management areas and identified four research priorities: portside sampling, river herring bycatch avoidance, electronic monitoring, and research to support herring stock assessments.

The Council has specified that RSA for 2019-2021 fishing years be 3% of each herring management area sub-ACL.

4.3.7 Fixed Gear Set-Aside

Amendment 1 to the Atlantic Herring FMP allows up to 500 mt of the Area 1A sub-ACL to be allocated for the fixed gear fisheries in Area 1A (weirs and stop seines) that occur west of 67°16.8' W long. (Cutler, Maine). This Fixed-Gear Set-Aside (FGSA) is available for harvest by fixed gear within the specified area until November 1 of each fishing year. Any portion of this allocation that has not been harvested by November 1 is transferred back to the sub-ACL allocation for Area 1A. Because this set-aside is taken from and returned (if unused) to 1A, it was proportionally reduced relative to the 1A sub-ACL rather than the overall ACL. Table 30 has updated catch estimates from the fixed gear fishery through 2014.

This set-aside acknowledges a historical, state water fishery that has taken place in Maine for many years. The set-aside has been 500 mt some years, was 295 mt from 2013-2018, and some years the Council has recommended it be set to zero. Most recently in 2019 it was set to 39 mt; this value was recommended by the Council as a reduction that would be proportional to the reduction in the Area 1A sub-ACL in the herring fishery. The method of proportional reduction relative to the 1A sub-ACL for the FGSA (as in the in-season action setting 2019 specifications) would be the status quo for this action.

Amendment 2 to the Interstate FMP (ASMFC 2009) 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. That action also modified the date that FGSA reverts to Area 1A to December 31. The state of Maine has also implemented a closure to state permitted fixed gear operators when it is estimated that 92% of the fixed gear set-aside has been harvested. This state regulation coupled with mandatory daily reporting requirements has reduced the level of management uncertainty related to state water catch in the herring plan. The Council has specified that the fixed gear set-aside for 2020 and 2021 should be set at the status quo (level that is proportionally reduced relative to the 2019 1A sub-ACL).

4.3.8 River Herring/Shad (RH/S) Catch Caps

The Council has specified that the RH/S catch caps implemented in the 2019 in-season adjustment implemented by NMFS would be set at the same value for 2020 and 2021; MWT GOM = 76.7 mt, MWT Cape Cod = 32.4 mt, MWT SNE/MA= 129.6 mt, and BT SNE/MA = 122.3 mt (Table 9). These caps were first implemented in the 2016-2018 specifications package and were used again for 2019. These caps would be set based on removals from the reference period, before caps were in place. Since there is no biologically based estimate of RH/S, these caps at least represent a maximum amount of bycatch from a reference period.

During the 2016-2018 specification process these values were derived from the method that was considered the best technical approach for determining recent RH/S catch estimates in support of the goals and objectives of Framework 3, primarily to provide strong incentive for the industry to continue to avoid RH/S and reduce RH/S catch to the extent practicable. When the PDT developed this method, it argued that these years represent a “reference period” before catch caps were adopted (2008-2014). Going forward, the PDT did not recommend including additional years to this reference period. Including the years that the fishery is under a cap may provide incentive for fishermen to increase their RH/S catch, which is in opposition to the goal of the RH/S catch caps.

Table 9. 2019 RH/S catch caps in the herring fishery, implemented by NMFS through in-season adjustment (mt)

	MWT GOM	MWT Cape Cod	MWT SNE/MA	BT SNE/MA
RH/S catch cap	76.7	32.4	129.6	122.3

4.4 SUMMARY OF SPECIFICATIONS ALTERNATIVES UNDER CONSIDERATION

This section is not a separate alternative, it combines several alternatives from above to illustrate the combination of several alternatives together. Table 10 summarizes the potential specifications under consideration for all measure combined, including the total ACL and sub-ACLs for each combination. There are three alternatives for OFL/ABC (Section 4.2.1) and four alternatives for the management uncertainty buffer (Section 4.2.2.1).

The two set-asides have not been removed from the ACL of relevant sub-ACLs yet (FGSA and RSA), but they have been provided in the columns to the right. Before final sub-ACLs are allocated, these set-asides would be removed first. In the case of the FGSA, that amount would be allocated back to Area 1A after November 1 if it is not utilized in-season.

Table 10. Summary of Atlantic herring specifications for all OFL/ABC and management uncertainty buffer alternatives

	Year	OFL	ABC	Management Uncertainty Buffer Options	ACL = DAH	Area Sub ACLs				Set-Asides*	
						Area 1A (28.9%)	Area 1B (4.3%)	Area 2 (27.8%)	Area 3 (39%)	FGSA (Area 1A only)	RSA
OFL / ABC Alternative 1	2019	30,668	21,266	6,200	15,066	4,354	648	4,188	5,876	39	452
				6,200	15,066	4,354	648	4,188	5,876	39	452
				5,888	15,378	4,444	661	4,275	5,997	40	461
				3,992	17,274	4,992	743	4,802	6,737	45	518
	2020	30,668	21,266	4,560	16,706	4,828	718	4,644	6,515	43	501
				6,200	15,066	4,354	648	4,188	5,876	39	452
				5,888	15,378	4,444	661	4,275	5,997	40	461
				3,992	17,274	4,992	743	4,802	6,737	45	518
	2021	30,668	21,266	4,560	16,706	4,828	718	4,644	6,515	43	501
				6,200	15,066	4,354	648	4,188	5,876	39	452
				5,888	15,378	4,444	661	4,275	5,997	40	461
				3,992	17,274	4,992	743	4,802	6,737	45	518
OFL / ABC Alternative 2a	2019	30,668	21,266	6,200	15,066	4,354	648	4,188	5,876	39	452
				6,200	9,931	2,870	427	2,761	3,873	26	298
				5,888	10,243	2,960	440	2,848	3,995	27	307
				3,992	12,139	3,508	522	3,375	4,734	31	364
	2020	41,830	16,131	4,560	11,571	3,344	498	3,217	4,513	30	347
				6,200	9,931	2,870	427	2,761	3,873	26	298
				5,888	10,243	2,960	440	2,848	3,995	27	307
				3,992	12,139	3,508	522	3,375	4,734	31	364
	2021	69,064	16,131	4,560	11,571	3,344	498	3,217	4,513	30	347
				6,200	9,931	2,870	427	2,761	3,873	26	298
				5,888	10,243	2,960	440	2,848	3,995	27	307
				3,992	12,139	3,508	522	3,375	4,734	31	364
OFL / ABC Alternative 2b	2019	30,668	21,266	6,200	15,066	4,354	648	4,188	5,876	39	452
				6,200	8,065	2,331	347	2,242	3,145	21	242
				5,888	8,377	2,421	360	2,329	3,267	22	251
				3,992	10,273	2,969	442	2,856	4,006	27	308
	2020	40,574	14,265	4,560	9,705	2,805	417	2,698	3,785	25	291
				6,200	8,065	2,331	347	2,242	3,145	21	242
				5,888	8,377	2,421	360	2,329	3,267	22	251
				3,992	10,273	2,969	442	2,856	4,006	27	308
	2021	68,718	14,265	4,560	9,705	2,805	417	2,698	3,785	25	291
				6,200	8,065	2,331	347	2,242	3,145	21	242
				5,888	8,377	2,421	360	2,329	3,267	22	251
				3,992	10,273	2,969	442	2,856	4,006	27	308

4.5 CARRYOVER OF UNHARVESTED CATCH

In the herring plan, any unharvested catch in a herring management area in a fishing year (up to 10% of that area's sub-ACL) shall be carried over and added to the sub-ACL for that herring management area for the fishing year following the year when total catch is determined (Framework 2, NEFMC 2012). Section 648.201 of the herring regulations specify the carryover provisions. The Council considered an alternative to temporarily prohibit the automatic carryover of unharvested herring catch in the near term due to concerns about potentially negative unintended consequences on some participants in the fishery.

In practice, quota from year 1 is carried over during year 3. During year 3, an area can be fished up to the year 3 sub-ACL plus year 1 carryover. However, regardless of carryover, the total year 3 ACL cannot be exceeded, even if the sub-ACLs with carryover sum to a value that is larger than the year 3 ACL. In practice, this means that areas opening later (i.e. Area 1A) could be quota limited due to harvest of carryover in other areas earlier in the fishing year. For this reason, Framework 6 included an alternative to temporarily prohibit carryover of unharvested herring catch (Alternative 2) (*PREFERRED ALTERNATIVE*).

4.5.1 No Action – Maintain Current Carryover Provisions (Alternative 1)

No action would maintain the carryover of unharvested catch up to 10% of each sub-ACL. Specifically, up to 10% of each area's sub-ACL in 2018 will automatically rollover and be added to the sub-ACL for each herring management area in 2020; however, the overall ACL would not increase. The numbers are still preliminary, but about 4,990 mt of unharvest quota from 2018 is expected to be available for rollover to 2020.

Rationale: The primary intent is to help optimize yield overall. There are constraints in this fishery that can inhibit the ability for the fishery to harvest the full sub-ACL in each area. Allowing some unharvested catch to rollover gives some flexibility to provide additional access to unharvested catch. Because the total ACL is not also adjusted upwards to account for the rollover, there is no additional risk of the fishery exceeding overall catch limits or causing overfishing. The total fishery would still be closed when 95% of the total ACL is projected to be caught in the year that rollover was granted. Because this measure allows a sub-ACL increase for a management area, but it does not allow a corresponding increase to the stockwide ACL the overall harvest would remain constrained by the stock-wide ACL. Consequently, the fleet would be required to forego harvest in one or more management areas in order to harvest the carryover available in an area. This measure maintains the management uncertainty buffer between ABC and the stock-wide ACL, while giving the fleet some flexibility in choosing where to harvest the stock-wide ACL.

4.5.2 Prohibit Carryover for 2020 and 2021 (Alternative 2) (*PREFERRED ALTERNATIVE*)

Under Alternative 2, unharvested quota from the 2018 herring management area sub-ACLs would *not* automatically rollover to 2020 herring management area sub-ACLs. Similarly, if there is unharvested quota at the end of 2019, it would not rollover to 2021. This alternative is intended to be temporary, for this specifications package only. After 2021, the prohibition would automatically sunset or expire. In addition, if the Council initiates a subsequent action to revise 2021 specifications, this prohibition could be modified, and carryover could be reinstated for 2021.

Rationale: Alternative 2 was considered because the amount of carryover from 2018 (just under 5,000 mt) is a substantial amount relative to the total ACL for 2020 (about 11,500 mt under the preferred alternative, or about 43% of the total 2020 ACL). A rollover of that size could have negative unintended consequences on some participants in the fishery. Specifically, if some areas are fished first including carryover, other areas that typically see herring landings later in the year may have less access if the total ACL is already harvested and directed herring fishing is closed before each sub-ACL is harvested.

The Council is generally supportive of carryover in this fishery to help optimize yield, but when overall quotas are relatively small, and the carryover amounts are relatively large (the full 10% of each area in this case), the unintended consequences and distributional impacts on different vessels from different areas could be problematic. It was also noted that adding carryover could cause a race to fish mentality to gain as much access to the resource before other users if fish are concentrated in one area. Furthermore, if the herring resource is as low as currently estimated, it may not be advantageous to harvest additional catch at this time. While the fishery would still close when 95% of the total ACL is caught, the rollover could enable more fish to be removed from one area compared to total removals being more spread out across all areas. Therefore, the Council is recommending that carryover be prohibited under these circumstances and on a temporary basis.

5.0 ALTERNATIVES CONSIDERED BUT REJECTED

5.1 RIVER HERRING/SHAD CATCH CAPS

5.1.1 Adjust catch caps proportional to Atlantic herring ACL

As herring ACL increases, so does RH/S caps, and when herring ACL decreases, so does RH/S caps. For this alternative, the same ratio used to adjust the Atlantic herring catch limit would be applied to the RH/S catch cap.

Rationale for rejection: The Council does not support consideration of this as an alternative. This is a departure from the rationale used to set the RH/S catch caps, which was intended to limit total bycatch amount to that of a reference period regardless of directed Atlantic herring effort. As such management is on total removals from the river herring resource, not a bycatch rate.

5.1.2 Apply the same method for setting catch caps with updated years of data

For this alternative, the last three years would be used (2016-2018) to develop a RH/S cap for each area.

Rationale for rejection: The Council does not support consideration of this as an alternative. This alternative is inconsistent with Purpose #1 of these measures – to provide incentive for herring vessels to reduce RH/S bycatch. If the RH/S catch cap is based on years when the fleet is under a cap, there will be incentive for the directed herring fishery to catch RH/S to keep caps higher.

5.1.3 Set using a survey index-based cap

RH/S catch caps would be based on trend information from a survey index.

Rationale for rejection: The Council does not support consideration of this as an alternative. There are currently no reliable fishery dependent or independent data sets to inform this approach; the most recent assessment was not able to produce a coast-wide or regional index of RH relative abundance. A few PDT

members have explored several surveys, and to date, there is not a consistent signal across the available survey datasets. For example, the trends from the federal survey are in the opposite direction of the MA state survey. The data are currently insufficient to support this approach, which is the same conclusion as the recent ASMFC assessment.

5.1.4 Use the original catch cap allocations

Table 11 includes the original catch caps implemented in Framework 3, which used an older method that was later determined to be inferior to the one used in 2016-2018 specs. In Framework 3 the same years were used as the baseline (2008-2014) but an updated method was applied.

Table 11. RH/S catch cap allocations from Framework 3.

RH/S Catch Cap Area and Gear	RH/S catch cap allocation (mt)
CC MWT	13
GOM MWT	86
SNE BT	89
SNE MWT	124

Rationale for rejection: The Council does not support consideration of this as an alternative. The method used to calculate these catch caps was found to be inferior to the one used in the 2016-2018 package so there would be no support for applying an inferior method.

5.1.5 Two phase approach that would hold some quota back and release it during the season

This alternative would be like how RH/S catch caps are set in the mackerel plan that allocates a portion of the overall cap at the beginning of the season, and only releases the remaining catch cap when herring catches exceed a certain amount. This could increase incentive to avoid RH/S during the beginning of the fishing year so that more RH/S would be available later in the fishing year.

Rationale for rejection: The Council does not support consideration of this as an alternative. This alternative may help the Atlantic herring fishery catch more of the herring sub-ACL if it helps increase incentive to avoid RH/S and slows bycatch during the season, but the overall impact on RH/S could be the same if the overall cap (in mt) is the same value overall. This approach could be particularly challenging to monitor in the next few years ahead with relatively low herring ACLs and lower observer coverage rates. It will be difficult enough to monitor the four RH/S gear and area caps in the coming years, let alone introducing sub-caps. Because the bycatch rates at the beginning of the year are based on the catch rates of the previous year (until enough observed trips occur), a cap closure could be triggered in an area without any observed trips from that year. That would be more likely to occur if the caps in the early portion of the year were reduced due to a split cap.

6.0 AFFECTED ENVIRONMENT

The Affected Environment is described in this action based on valued ecosystem components (VECs), including target species, non-target species, predator species, physical environment and Essential Fish Habitat (EFH), protected resources, and human communities. VECs represent the resources, areas and human communities that may be affected by the alternatives under consideration in this amendment. VECs are the focus, since they are the “place” where the impacts of management actions occur.

The Council recently completed Amendment 8 to the Atlantic Herring FMP that included a detailed Affected Environment. This action updates several key tables and figures with data through 2018, but for the most part references the information recently included in Amendment 8 (NEFMC, 2018).

6.1 TARGET SPECIES (ATLANTIC HERRING)

This section describes the life history and stock population status for Atlantic herring, as well as herring’s role as forage in the ecosystem. A complete description of the Atlantic herring resource is in the FEIS for Amendment 1 to the Atlantic Herring FMP (NEFMC 2006, Section 7.1). Updated information is in Amendment 5 and Amendment 8 to the Atlantic Herring FMP. Information in this section has been updated through 2018 where possible. Based on the best available science, the Atlantic herring resource is *neither overfished nor subject to overfishing*.

Life history details about the Atlantic herring resource are described in Amendment 8. In summary, Atlantic herring, *Clupea harengus*, is widely distributed in continental shelf waters of the Northeast Atlantic, from Labrador to Cape Hatteras. Spawning occurs in the summer and fall, starting earlier along the eastern Maine coast and southwest Nova Scotia (August – September) than in the southwestern Gulf of Maine (early to mid-October in the Jeffreys Ledge area) and Georges Bank (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.

In the past, the herring resource along the east coast of the United States was divided into the Gulf of Maine and Georges Bank stocks (Anthony & Waring 1978). However, no methods are available to identify stock of origin for fish caught in the mixed stock fishery or during fishery-independent surveys. Consequently, herring from the Gulf of Maine and Georges Bank are combined for assessment and management purposes into a single stock complex, although three spawning stock components occupy three distinct locations: in the Gulf of Maine, southwest Nova Scotia-Bay of Fundy, and Georges Bank. A more detailed description of this stock definition is in Amendment 1.

6.1.1 Stock Status

The Atlantic herring stock was most recently assessed during the 65th Stock Assessment Workshop (SAW; NEFSC 2018). The 2018 assessment used all the same data sources of the previous assessment (NMFS spring, fall and summer shrimp bottom trawl survey) and added an acoustic time series collected during the NMFS fall bottom trawl survey of age 3+ herring abundance. Overall, SSB has 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. In addition, fishing mortality has been relatively stable since the decreases in the 1990s, with a gradual increase in 2009, followed by a general declining fishing mortality since then (Figure 2).

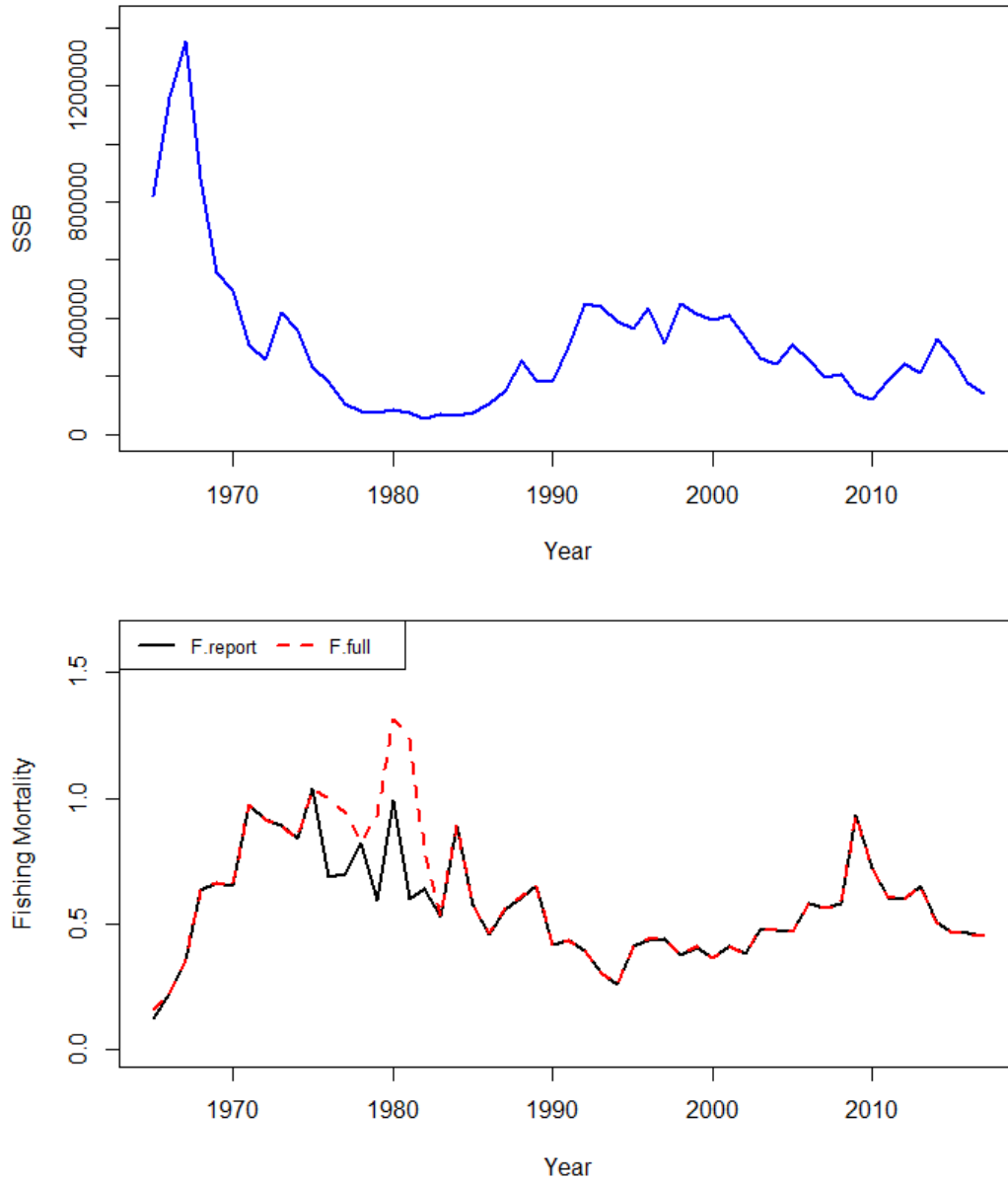
The same overall assessment model was used in both SAW54 and SAW56, an Age Structured Assessment Model (ASAP) with several structural changes approved in 2018. One important change was

the natural mortality (M) rate. Natural mortality was previously thought to vary by time and age, but SAW65 concluded that M should be held constant for all years and ages (set at 0.35).

With model modifications and data updates, the 2017 SSB was estimated to be 141,473 mt (80% probability interval: 114,281-182,138), compared to the full range of estimated biomass of 53,084 mt in 1982 to 1,352,700 mt in 1967 (Figure 2). Total biomass in 2017 was 239,470 mt, compared to the full range of total biomass of 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 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) and ranged from 0.13 in 1965 to 1.04 in 1975 (Figure 2).

Age-1 recruitment has been below average since 2013 (Figure 3). The time series high for recruitment was in 1971 (1.4 billion age-1 fish). The estimates for 2009 and 2012 are of relatively strong cohorts, as in previous assessments. The time series low (1.7 million fish) occurred in 2016, and the second lowest (3.9 million fish) occurred in 2017, although this estimate is highly uncertain. Four of the six lowest annual recruitment estimates have occurred since 2013 (2013, 2015, 2016, and 2017).

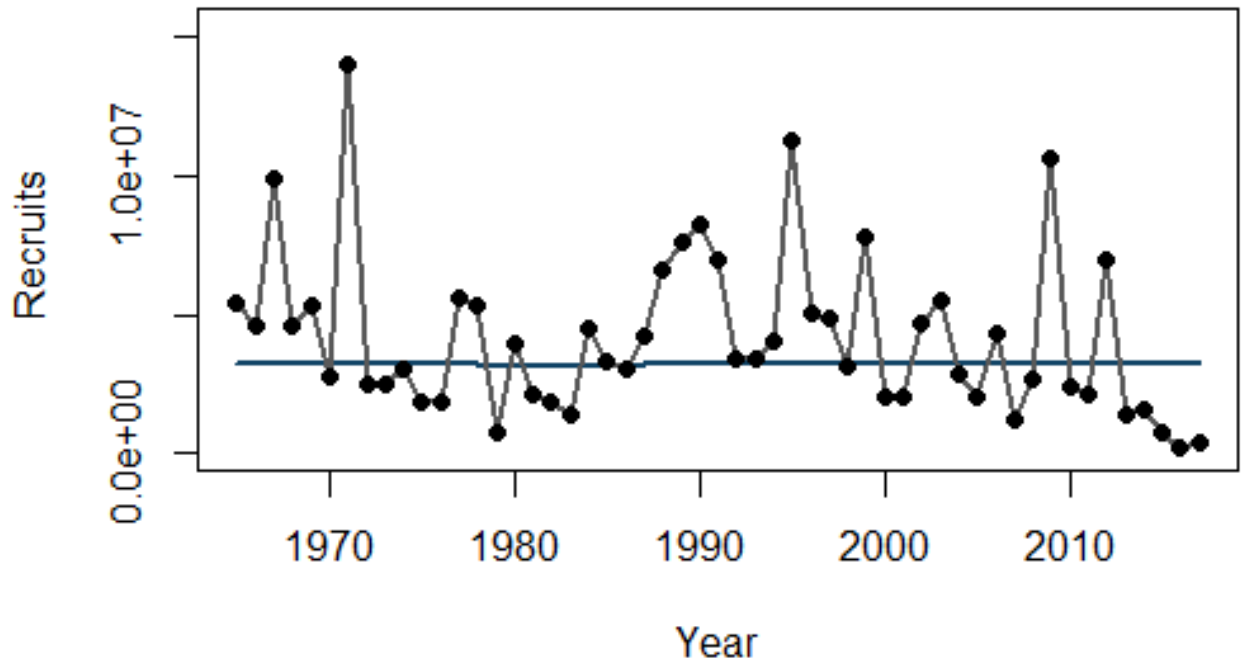
Figure 2. Atlantic herring spawning stock biomass (mt) and fishing mortality, 1965-2017



Note: F.report averaged over ages 7 and 8; F.full is fully selected.

Source: ASAP model (NEFSC 2018).

Figure 3. Atlantic herring annual recruit (000s) time series, 1965-2017.



Note: The horizontal line is the average over the time series.

Source: NEFSC (2018).

The most recent stock assessment estimated the reference points using a proxy of $F_{40\%}$:

$$F_{MSYproxy} = 0.51$$

$$SSB_{MSYproxy} = 189,000 \text{ mt}$$

$$(\frac{1}{2} SSB_{MSYproxy} = 94,500), \text{ and}$$

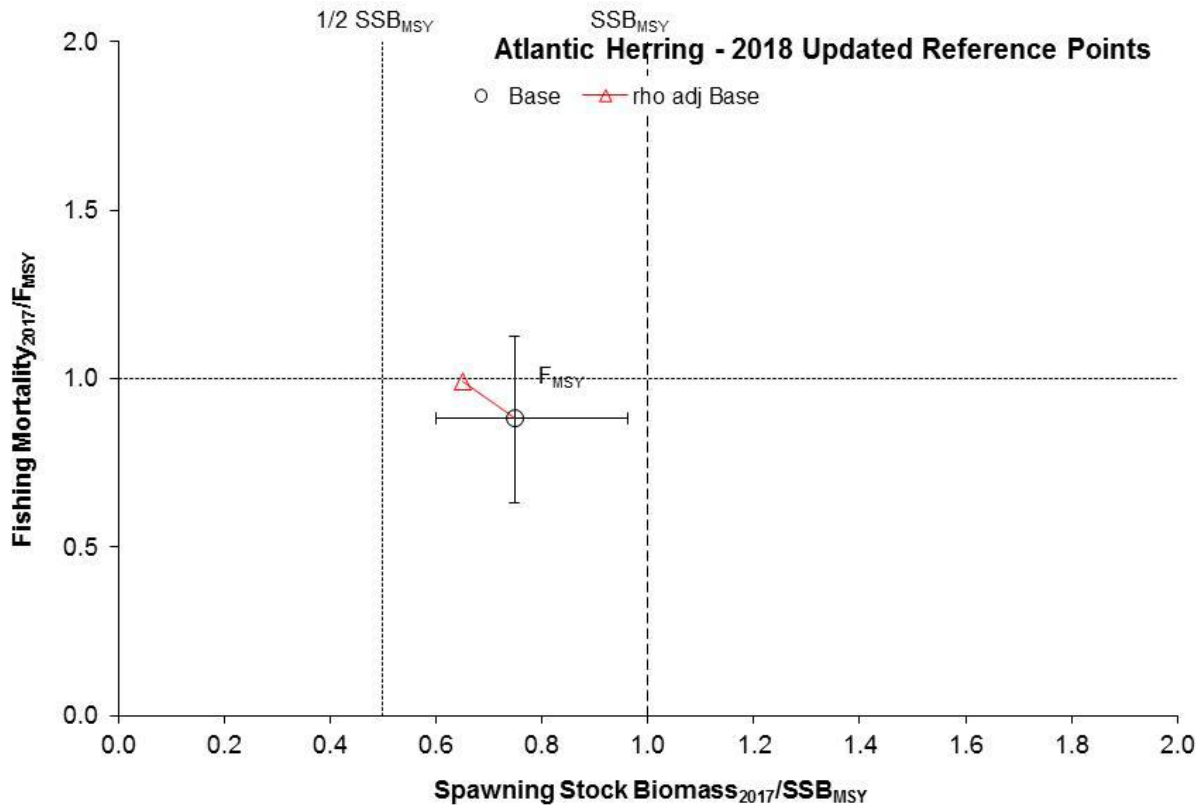
$$MSY_{proxy} = 112,000 \text{ mt}.$$

Therefore, SAW65 concluded that the Atlantic herring resource is above its biomass threshold for overfished (2017 biomass of 141,473 mt is above $\frac{1}{2}$ $SSB_{MSYproxy}$ of 94,500 mt), and fishing mortality is below the F_{MSY} threshold (2017 $F_{7-8} = 0.45$, below $F_{MSYproxy}$ of 0.51). Therefore, Atlantic herring is neither overfished nor subject to overfishing.

The assessment included cautions about stock status. In the short term, the relatively poor recruitments in 2013-2017 is increasing the vulnerability of the stock to becoming overfished. The 2016 and 2017 cohorts were imprecisely estimated, so estimates of these cohorts may change significantly in either direction in future assessments, and decisions should consider this uncertainty. Growth (i.e., weight at age) also continues to be relatively low compared to the 1990s, and this seems to be a longer-term feature of the stock that also reduces production. The stock, however, seems to be capable of producing relatively large and small year classes regardless of growth, and so recruitment is likely the more significant driver of short-term vulnerability.

While biomass in 2017 is above the overfished threshold and is estimated at a ratio of about 0.75 of SSB_{MSY} , the projected biomass levels in near-term years are much lower since recruitment has been relatively poor.

Figure 4. Atlantic herring stock status based on the ASAP model



Notes: Error bars are the 80% probability intervals. The red triangle is the model result if an adjustment were to be made for the retrospective pattern.

Source: NEFSC (2018).

6.1.2 Importance of Herring as Forage

Atlantic herring play an important role as forage in the Northeast U.S. shelf ecosystem. They are eaten by a wide variety of fish, marine mammals, birds, and (historically) by humans in the region. The structure of the Northeast U.S. shelf ecosystem features multiple forage species rather than a single dominant forage species. Herring share the role of forage here with many other species including sand lance, mackerels, squids, and hakes, although herring are distinguished by a high energy density (caloric content) relative to other pelagic prey in the ecosystem. This diversity of forage options leads to a complex and diverse food web supporting many different predators. The relative importance of herring as forage varies by predator group, due to differences in predator life history, foraging style, and bioenergetics. Therefore, predator responses to changing herring populations vary, and depend on the extent to which other forage is available.

Amendment 8 included a detailed discussion of the information available on herring as forage including the species that consume herring in the Northeast, as well as food habits of Atlantic herring (NEFMC, 2018). Similarly, the 2018 assessment updated the estimate of consumption of herring at various life stages (NEFSC, 2018). Total consumption of herring by fish predators has been variable, with lesser total amounts of herring predation earlier in the time series compared to later. Prey length shows that much of the predation is on larger fish, and this is likely due to the design of the bottom trawl survey sampling

design that focuses offshore. It is believed that similar or even greater amounts of predation on juvenile herring is likely occurring in nearshore areas by fish predators, as well as other predators such as birds and marine mammals.

Climate and environmental conditions can be major drivers of pelagic fish dynamics. In the Northeast U.S., Atlantic herring and other pelagics have lower sensitivity to climate risks than other species due to high mobility but have high potential to change distribution. The impact of climate change on Atlantic herring is negative to neutral relative to other Northeast species. All Northeast U.S. species have high or very high exposure to climate change risks, as this ecosystem is changing more rapidly than much of the world ocean (Hare *et al.* 2016).

6.1.3 Details about management uncertainty

Trigger values for reallocation of unused quota to Area 1A

There is a provision in the herring plan that allows NMFS to reallocate 1,000 mt from the management uncertainty buffer to Area 1A if NMFS determines that the New Brunswick weir fishery lands less than a specified amount through October 1. The associated trigger, or specified amount varies based on the management uncertainty buffer option selected. The associated triggers for each option in Section 4.2.2 were calculated using the same ratio as the existing trigger and management uncertainty buffer (4,000 mt / 6,200 mt has a ratio of 0.645). These are not alternatives, the trigger associated with each management uncertainty buffer option is summarized in this section, the trigger values would not mix and match with the various management uncertainty buffer options. If estimated landings in the New Brunswick weir fishery are less than the appropriate trigger before October 1, NMFS will add 1,000 mt to Area 1A available catch through a *Federal Register* notice. The stock-wide ACL and Area 1A sub-ACL would remain in place. The trigger value of the preferred management uncertainty buffer is 2,942 mt.

Table 12. Trigger values associated with each management uncertainty buffer option in this action

	No Action	3-year Option	5-year Option	10-year Option (<i>PREFERRED ALTERNATIVE</i>)
Uncertainty buffer value (mt)	6,200	5,888	3,992	4,560
Trigger (mt)	4,000	3,799	2,575	2,942
Rollback (mt)	1,000	1,000	1,000	1,000

Other measures that address management uncertainty

The Herring FMP also includes other proactive in-season measures to address the management uncertainty of U.S. catch of Atlantic herring. These are not alternatives under consideration in this action, they are described here to clarify that there are additional measures in place to address management uncertainty in this fishery that will not be adjusted by this action, and they will be maintained. Specifically, there are two in-season accountability measures in place that close the directed herring fishery before the full ACL is projected to be harvested to account for the uncertainty around monitoring a high-volume fishery with various sub-ACLs. When 92% of the sub-ACL for a herring management area is projected to be harvested, directed herring trips are prohibited in that area for the remainder of the fishing year, a 2,000 pound possession limit is implemented. That level was adopted due to the high-volume nature of this fishery and reporting system in place.

Furthermore, when 95% of the total ACL is projected to be caught, directed herring fishing is prohibited throughout the range of the fishery (all areas). Again, due to the high-volume nature of this fishery, it was determined that 05% would provide enough buffer for trips to be completed when a closure is announced

and final reports to be submitted. Both are measures are intended to help prevent the fishery from exceeding ACLs and ABC. This is a large volume fishery, so idea is to close an area or the fishery before the full ACL or sub-ACL is projected to be reached.

Finally, the state water catch is accounted for with the fixed gear set-aside, an amount of catch that is removed from the Area 1A sub-ACL and replaced in-season if not harvested by November 1. The only state with historic and consistent state water catch is Maine, and Maine has additional restrictions prohibiting herring landings after the fixed gear set-aside quota is harvested. That set-aside is not technically a federal quota that triggers measures if it is exceeded, but the state of Maine is implementing it as such, directed herring trips are prohibited after that catch level is projected to be harvested.

6.2 NON-TARGET SPECIES (BYCATCH)

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). Most catch by herring vessels on directed trips is Atlantic herring, with extremely low percentages of bycatch (discards). In some cases, Atlantic mackerel is targeted in combination with Atlantic herring during some of the year in the southern New England and Mid-Atlantic areas and is therefore not considered a non-target species because in many cases, vessels are targeting and landings herring and mackerel on the same trip.

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 (NEFMC 2012, 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 used 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. There are accountability measures in place for both haddock and river herring/shad if area and gear specific catch cap is exceeded. Dogfish, squid, butterfish and Atlantic mackerel are also common species encountered in the directed Atlantic herring fishery. However, in some cases (especially Atlantic mackerel), while herring is often the target species, mackerel is also landed and some trips are quite mixed in terms of mackerel and herring landings. Therefore, Atlantic mackerel is not considered a non-target species since there can be substantial landings of that species for various segments of the fishery during certain seasons and in certain areas. 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 and 3.3 of Framework 3 to the Atlantic Herring FMP.

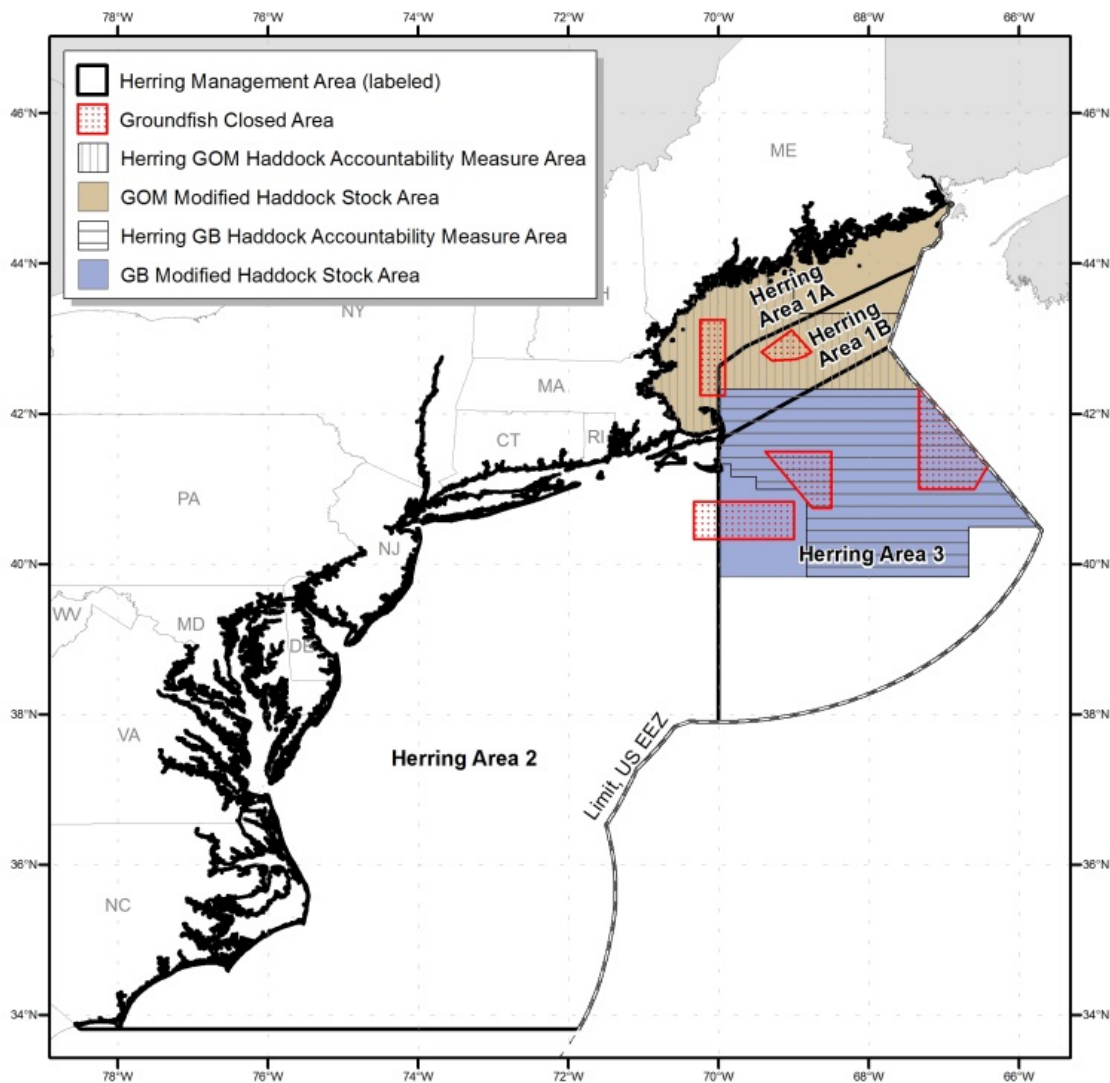
Haddock

Haddock has two stocks, Gulf of Maine and Georges Bank. As of the 2017 groundfish operational assessments, GOM haddock is neither overfished nor subject to overfishing. The population biomass is at an all-time high and overall, the population is experiencing low mortality). The GB haddock stock is also neither overfished nor subject to overfishing. There has been a steady increase in SSB due to the

exceptionally large 2003-year class and several others in following years. While indices support the finding that this stock is at an all-time high, weights at age have been declining since the large 2003 year class, and show further declines with the most recent data (NEFSC 2017).

Haddock is managed by the NEFMC under the Northeast Multispecies FMP. Framework Adjustment 56 to the Northeast Multispecies FMP increased the midwater trawl Atlantic herring fishery sub-ACL for Georges Bank haddock to 1.5% (up from 1%) and maintained the GOM haddock sub-ACL of 1% (NEFMC 2017). When the haddock incidental catch cap for a particular haddock stock (GOM or GB) has been caught, all herring vessels fishing with MWT gear are prohibited from fishing for, possessing, or landing, more than 2,000 lb of herring in the respective haddock accountability measure area for the rest of the multispecies fishing year (Map 2). There is also a pound-for-pound payback for any overages.

Map 2. GOM and GB haddock stock areas (shaded) with herring MWT accountability measures (hatched)



River Herring/Shad

In 2017, there was an updated river herring assessment that concluded, that the coastwide meta-complex of river herring stocks on the U.S. Atlantic coast remains depleted to near historic lows. There is evidence for declines in abundance due to several factors, but their relative importance could not be determined. The overfished and overfishing status is unknown for the coastwide stock complex, as estimates of total biomass, fishing mortality rates and corresponding reference points could not be developed. While status on a coastwide basis remains unchanged, there are some positive signs of improvement for some river systems, with increasing abundance trends for several rivers in the Mid-Atlantic throughout New England region. While abundance in these river systems are still at low levels, dam removals and improvements to fish passage have had a positive impact on run returns (ASMFC 2017).

River herring is primarily managed under Amendment 2 to the ASMFC FMP for Shad and River Herring (ASMFC 2009), which addresses concerns regarding declining river herring populations. Like shad, states and jurisdictions had to develop Sustainable Fishery Management Plans (SFMPs) to maintain a commercial and/or recreational river herring fishery past January 2012.

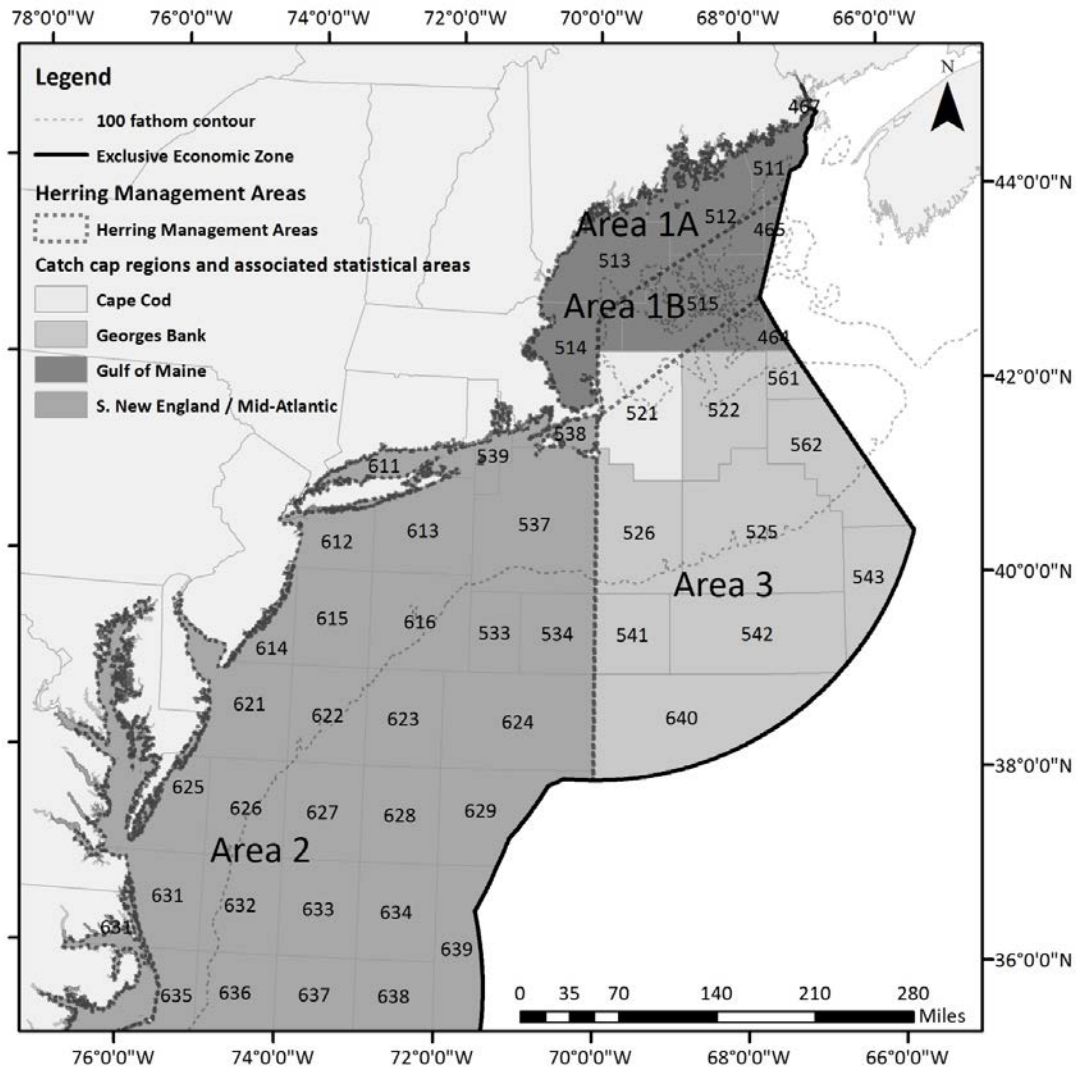
In December 2014, NMFS implemented river herring and shad catch caps for the Atlantic herring fishery for 2014 and 2015 (Map 3). Catch of river herring and shad on fishing trips that land over 6,600 lb of herring count towards the caps. Caps in the herring fishery are area and gear specific. If NMFS determines that 95% of a river herring and shad cap has been harvested, a 2,000 lb herring possession limit for that area and gear will become effective for the rest of the fishing year. This low possession limit essentially turns the area into a closed area for directed herring fishing until the start of the next fishing year. Bycatch is monitored and reported on the GARFO website:

<https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/riverherringshad.html>.

In 2018, the Council developed a white paper to support its consideration of adding river herring and shad as stocks in the Atlantic herring fishery. The white paper reviewed previous decisions on this issue, reviewed the legal requirements, summarized the species and fishery information, described updated actions taken related to RH/S, summarized new research, and identified potential actions for this issue (NEFMC 2018b). The Council discussed the issue at its April and June 2018 meetings and decided to maintain the current management structure for river herring and shad, and not add these as stocks in the Atlantic Herring FMP at this time.

In June 2019 NMFS completed a review of the status of alewife and blueback herring. They determined that listing these species under ESA is not warranted at this time (Federal register notice: <https://deferalregister.gov/d/2019-12908>). The determination found that while river herring have declined from historical numbers, and overutilization remains a risk to these species, recent fisheries management efforts have helped to reduce risks from fishing mortality. NMFS found that while the abundance of river herring in some rivers continues to be depleted, there are robust populations in other areas.

Map 3. Atlantic herring management areas and RH/S catch cap areas



6.2.1 Monitoring of Non-target Species in the Herring Fishery

Fishery bycatch is monitored primarily using Federal fishery observers, though observer rates have varied annually and by fishery. Calculating an observer rate by gear type is difficult due to the overlap with other fisheries (e.g., overlap with squid and whiting in the small mesh bottom trawl (SMBT) fishery). Thus, the data in Table 13 were pulled in a more general approach and included all trips by the three main gear types used in the Atlantic herring fishery. Observed purse seine and midwater trawl trips are predominantly targeting Atlantic herring, while non-herring trips are included in the SMBT coverage rates reported here. Amendment 8 includes detailed analyses of the bycatch species for each gear type used in the herring fishery.

Table 13. Midwater trawl (MWT), purse seine (PS), and small mesh bottom trawl (SMBT) observer coverage rates, SBRM (April-March) years 2012-2018

Gear	2012	2013	2014	2015	2016	2017	2018
MWT	40.5%	24.3%	19.9%	5.3%	20.9%	10.7%	3.8%
PS	5.2%	6.0%	3.7%	2.1%	2.2%	1.7%	1.0%
SMBT	4.3%	8.0%	10.1%	9.1%	10.9%	17.2%	14.2%

Source: DMIS and OBDBS databases as of June 3, 2019.

Notes: MWT includes both single and paired midwater trawl gears; PS excludes tuna purse seine trip; . SMBT includes bottom trawl gear with codend mesh size less than 5.5” excluding bottom otter twin trawl, scallop and shrimp trawl trips.

2018 SMRB year is truncated, because final OBDBS data are unavailable for Feb and Mar 2019, which are NOT included in this table.

Includes observer trips with at least 1 observed haul divided by VTR trips reporting kept catch, and all fisheries using these gear types, not just herring and mackerel fisheries.

6.2.2 Methods used for Monitoring

This section clarifies the existing monitoring program in place for the Atlantic herring fishery, as well as the various reporting requirements. There are currently no additional measures or requirements proposed in this action related to monitoring or reporting. However, NMFS has been communicating with the fishing industry about proactive ways to keep catches within allocated levels.

Quota Monitoring

GARFO's Analysis and Program Support Division (APSD) produces the herring quota monitoring report on a weekly basis in order to track the federally mandated 92% sub-ACL closure triggers for each of the four Herring Management Areas and the quota for the river herring and shad catch caps as well as GB haddock catch caps. The herring quota monitoring report primarily relies on three major data sources: 1) dealer data, 2) vessel trip reports (VTR), and 3) Vessel Monitoring System (VMS) daily herring catch reports. APSD typically updates the quota monitoring reports on Thursday or Friday of each week, which allows them to capture the most complete records of dealer and VTR data, which are not available to be processed until Wednesday. The report includes all commercial herring landings and discards from the four herring management areas excluding Research Set-Aside catch. Catch is assigned to herring management areas based on VMS catch reports. If this data is unavailable, the area is determined by the primary fishing location point reported on the VTR.

Reporting requirements

The following measures apply to vessels issued Limited Access (Categories A, B, C) Atlantic Herring or Areas 2/3 Open Access (Category E) Atlantic Herring Permits on every trip that fishes for Atlantic herring:

- Provide notice and contact information (e.g., contact name and phone number; vessel name; date, time, and port of departure) to the NEFSC Fisheries Sampling Branch prior to beginning any trip.
- Declare that your vessel is participating in the herring fishery via the VMS prior to leaving port by entering the appropriate activity and gear type on the herring declaration screen prior to leaving port.
- For each day that your vessel is on a declared herring trip, you must submit a VMS catch report for each herring management area by 9 a.m. of the following day.

- Your VMS catch report must include all herring caught (kept and discarded) for each herring management area and all fish kept by statistical area during any part of the previous day (0000-2400 hr).
- Notify NMFS Office of Law Enforcement via VMS of the time and place of offloading at least 6 hr prior to landing or, if fishing ends less than 6 hr before landing, as soon as the vessel stops catching fish.
- Submit a VTR for each week (Sunday–Saturday) by midnight on Tuesday of the following week. If no fish are caught during that week, you should submit a VTR reporting zero catch.

Additionally, vessels issued Limited Access Atlantic Herring Permits must also complete and sign a released catch affidavit if fish are released from a codend without being sampled by the observer on board.

Notification windows

Regulations in the Herring Fishery Management plan do not specify the amount of notice NMFS must provide the herring industry prior to a management area or catch cap closure. In the past, NMFS has attempted to provide a 48-72 hour window after the announcement and prior to the closure for vessels to fish and return to port. This notification window was intended to allow vessels to complete an active fishing trip and allow time for return to their chosen port before the closure went into effect. The 48-72 hour notification window was somewhat successful in previous years in limiting overages in management areas with larger quotas (i.e. Areas 1A, 2, and 3) but was less successful with smaller quotas (i.e. Area 1B). This is because the larger quotas provide a greater buffer in catch between 92% and 100% of the sub-ACL. Thus, even if vessels were able to fit an extra trip (in addition to the one they were on when the closure was announced) within the notification window in an area with a large quota, it would only slightly increase catch relative to the quota, and would limit the number of overages and the scope of overages if they were to occur. With smaller quotas, an extra trip within this notification window can and has led to substantial overages of sub-area ACLs.

With relatively low quotas expected in all herring management areas for the near future, NMFS is attempting to reduce the risk and scope of sub-ACL overages. NMFS is intending to reduce the notification window such that vessels will only have time to complete their current trip and return to port to offload. This smaller notification window will be intended to prevent vessels from taking additional trips within the notification window. The amount of time necessary for vessels to complete fishing operations and reach port will vary depending on the Management Area being fished and the distance to their intended port of arrival/offload. When NMFS announces a future closure, they will consider this information in determining an appropriate notification window necessary to allow completion and offload of the current trip while preventing vessels from taking an additional trip.

Modifications under low quotas

- Minimize closure notification windows to prevent vessels from taking additional trips after closure announcement
- GARFO will continue to post herring quota monitoring reports by the end of each week
- Outreach to industry to reiterate importance of accurate and timely reporting of herring landings on VTR and both herring and SMB VMS daily catch reports.
- Cooperation with the herring industry will be paramount in limiting overages. As quotas are approached (especially smaller quotas), real-time outreach with herring fleet representatives during fishing operations may be necessary to avoid overages.

What happens when a sub-ACL is reached?

Trips are reduced to 2,000 lbs herring possession limit once catch has been projected to reach or exceed 92% of the sub-ACL. A 2,000 lb herring possession limit would be implemented for all management areas if catch is projected to reach or exceed 95% of the stockwide ACL.

6.3 PROTECTED SPECIES

Protected species are those afforded protections under the Endangered Species Act (ESA; species listed as threatened or endangered under the ESA) and/or the Marine Mammal Protection Act (MMPA). Table 14 lists protected species that occur in the affected environment of the Atlantic herring FMP and have the potential to be affected by the proposed action (i.e., there have been observed/documentated interactions in the fishery or with gear type(s) similar to those primarily used in the fishery (i.e., midwater trawl and purse seine gear)).

Table 14. Species protected under the ESA and/or MMPA that may occur in the affected environment of the herring FMP.

Species	Status ²	Potential to interact with Atlantic herring fishing gear?
Cetaceans		
North Atlantic right whale (<i>Eubalaena glacialis</i>)	Endangered	No
Humpback whale, West Indies DPS, (<i>Megaptera novaeangliae</i>)	Protected (MMPA)	No
Fin whale (<i>Balaenoptera physalus</i>)	Endangered	No
Sei whale (<i>Balaenoptera borealis</i>)	Endangered	No
Blue whale (<i>Balaenoptera musculus</i>)	Endangered	No
Sperm whale (<i>Physeter macrocephalus</i>)	Endangered	No
Minke whale (<i>Balaenoptera acutorostrata</i>)	Protected (MMPA)	No
Pilot whale (<i>Globicephala</i> spp.) ³	Protected (MMPA)	Yes
Pygmy sperm whale (<i>Kogia breviceps</i>)	Protected (MMPA)	No
Dwarf sperm whale (<i>Kogia sima</i>)	Protected (MMPA)	No
Risso's dolphin (<i>Grampus griseus</i>)	Protected (MMPA)	No
Atlantic white-sided dolphin (<i>Lagenorhynchus acutus</i>)	Protected (MMPA)	No
Short Beaked Common dolphin (<i>Delphinus delphis</i>)	Protected (MMPA)	Yes
Atlantic Spotted dolphin (<i>Stenella frontalis</i>)	Protected (MMPA)	No
Striped dolphin (<i>Stenella coeruleoalba</i>)	Protected (MMPA)	No
Beaked whales (<i>Ziphius and Mesoplodon</i> spp) ⁴	Protected (MMPA)	No
Bottlenose dolphin (<i>Tursiops truncatus</i>)⁵	Protected (MMPA)	No
Harbor porpoise (<i>Phocoena phocoena</i>)	Protected (MMPA)	No
Pinnipeds		
Harbor seal (<i>Phoca vitulina</i>)	Protected (MMPA)	Yes
Gray seal (<i>Halichoerus grypus</i>)	Protected (MMPA)	Yes
Harp seal (<i>Phoca groenlandicus</i>)	Protected (MMPA)	No

Species	Status ²	Potential to interact with Atlantic herring fishing gear?
Hooded seal (<i>Cystophora cristata</i>)	Protected (MMPA)	No
Sea Turtles		
Leatherback sea turtle (<i>Dermochelys coriacea</i>)	Endangered	Yes
Kemp's ridley sea turtle (<i>Lepidochelys kempii</i>)	Endangered	Yes
Green sea turtle, North Atlantic DPS (<i>Chelonia mydas</i>)	Threatened	Yes
Loggerhead sea turtle (<i>Caretta caretta</i>), Northwest Atlantic Ocean DPS	Threatened	Yes
Hawksbill sea turtle (<i>Eretmochelys imbricate</i>)	Endangered	No
Fish		
Cusk (<i>Brosme brosme</i>)	Candidate	No
Atlantic salmon	Endangered	No
Atlantic sturgeon (<i>Acipenser oxyrinchus</i>)		
<i>Gulf of Maine DPS</i>	Threatened	Yes
<i>New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS</i>	Endangered	Yes
Critical Habitat		
Northwest Atlantic DPS of Loggerhead Sea Turtle	ESA (Protected)	No
North Atlantic Right Whale Critical Habitat	ESA (Protected)	No
<p>Notes:</p> <p>Marine mammal species (cetaceans and pinnipeds) italicized and in bold are considered MMPA strategic stocks.¹ Shaded rows indicate species who prefer continental shelf edge/slope waters (i.e., >200 meters).</p> <p>¹ A strategic stock is defined under the MMPA as a marine mammal stock for which: (1) the level of direct human-caused mortality exceeds the potential biological removal level; (2) based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; and/or (3) is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA (Section 3 of the MMPA of 1972).</p> <p>² Status is defined by whether the species is listed under the ESA as endangered (i.e. at risk of extinction), threatened (i.e. at risk of endangerment), or protected under the MMPA. Marine mammals listed under the ESA are also protected under the MMPA. Candidate species are those species for which ESA listing may be warranted.</p> <p>³ There are 2 species of pilot whales: short finned (<i>G. melas melas</i>) and long finned (<i>G. macrorhynchus</i>). Due to the difficulties in identifying the species at sea, they are often referred to as <i>Globicephala spp.</i></p> <p>⁴ There are multiple species of beaked whales in the Northwest Atlantic. They include the cuvier's (<i>Ziphius cavirostris</i>), blainville's (<i>Mesoplodon densirostris</i>), gervais' (<i>Mesoplodon europaeus</i>), sowerbys' (<i>Mesoplodon bidens</i>), and trues' (<i>Mesoplodon mirus</i>) beaked whales. Species of <i>Mesoplodon</i> are difficult to identify at sea, therefore, much of the available characterization for beaked whales is to the genus level only.</p> <p>⁵ This includes the Western North Atlantic Offshore, Northern Migratory Coastal, and Southern Migratory Coastal Stocks of Bottlenose Dolphins.</p>		

Cusk is a NMFS "candidate species" under the ESA. Candidate species are those petitioned species for which NMFS has determined that listing may be warranted under the ESA and those species for which NMFS has initiated an ESA status review through an announcement in the *Federal Register*. If a species is proposed for listing, the conference provisions under Section 7 of the ESA apply (50 CFR 402.10); however, candidate species receive no substantive or procedural protection under the ESA. Thus, cusk will not be discussed further in this and the following sections; however, NMFS recommends that project proponents consider implementing conservation actions to limit the potential for adverse effects on candidate species from any proposed action. Additional information on cusk can be found at: <https://www.greateratlantic.fisheries.noaa.gov/protected/pep/cs/index.html>.

6.3.1 Protected Species and Critical Habitat Not Likely to be Affected (via interactions with gear or destruction of essential features of critical habitat) by the Atlantic herring FMP

Based on available information, it has been determined that this action is not likely to affect (via interactions with gear or destruction of essential features of critical habitat) multiple ESA listed and/or marine mammal protected species or any designated critical habitat (Table 14). This determination has been made because either the occurrence of the species is not known to overlap with the area primarily affected by the action and/or there have never been documented interactions between the species and the primary gear type used to prosecute the Atlantic herring fishery (i.e., purse seine and midwater (including pair) trawl; Hayes *et al.* 2018) <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region>; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html). In the case of critical habitat, this determination has been made because operation of the Atlantic herring fishery will not affect the essential physical and biological features of North Atlantic right whale or loggerhead (NWA DPS) critical habitat and therefore, will not result in the destruction or adverse modification of any species critical habitat (NMFS 2014a; b; 2015).

6.3.2 Protected Species Potentially Affected by the Proposed Action

6.3.2.1 Sea Turtles

Kemp's ridley, leatherback, the North Atlantic DPS of green and the Northwest Atlantic Ocean DPS of loggerhead sea turtle are the four ESA-listed species of sea turtles that occur in the affected environment of the Atlantic herring fishery. A general overview of sea turtle occurrence and distribution in waters of the Northwest Atlantic Ocean is provided below to assist in understanding how the Atlantic herring fishery overlaps in time and space with sea turtles. For additional information on the biology and range wide distribution of listed species of sea turtles, see Amendment 8 (NEFMC 2018a, Volume I, Section 3.4.2.1).

Hard-Shell Sea Turtles. In the Northwest Atlantic, hard-shelled turtles (i.e., green, loggerhead, and Kemp's ridley) commonly occur in continental shelf waters from Florida to the Gulf of Maine, although their presence varies with the seasons due to changes in water temperature (Blumenthal *et al.* 2006; Braun-McNeill & Epperly 2002; Braun-McNeill *et al.* 2008; Braun & Epperly 1996; Epperly *et al.* 1995a; Epperly *et al.* 1995b; 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; Shoop & Kenney 1992; TEWG 2009). Hard-shelled sea turtles occur year-round in waters off Cape Hatteras, North Carolina and south. As coastal water temperatures warm in the spring, hard-shelled sea turtles begin to migrate to inshore waters of the southeast United States and also move up the Atlantic Coast (Braun-McNeill &

Epperly 2002; Epperly *et al.* 1995a; Epperly *et al.* 1995b; Epperly *et al.* 1995c; Griffin *et al.* 2013; Morreale & Standora 2005), occurring in Virginia foraging areas as early as late April and on the most northern foraging grounds in the Gulf of Maine in June (Shoop & Kenney 1992). The trend is reversed in the fall as water temperatures cool. The large majority leave the Gulf of Maine 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 *et al.* 1995b; Griffin *et al.* 2013; Hawkes *et al.* 2011; Shoop & Kenney 1992).

Leatherback Sea Turtles. Leatherbacks, a pelagic species, are known to use coastal waters of the U.S. continental shelf and to have a greater tolerance for colder water than hard-shelled sea turtles (Dodge *et al.* 2014; Eckert *et al.* 2006; James *et al.* 2005; Murphy *et al.* 2006; NMFS & USFWS 2013). Leatherback sea turtles 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). They are found in more northern waters (i.e., Gulf of Maine) later in the year (i.e., similar time frame as hard-shelled sea turtles), with most leaving the Northwest Atlantic shelves by mid-November (Dodge *et al.* 2014; James *et al.* 2005; James *et al.* 2006).

6.3.2.2 Small Cetaceans and Pinnipeds

Table 14 lists the small cetaceans and pinnipeds that may occur in the affected environment of the Atlantic herring fishery. Small cetaceans can be found throughout the year in the Northwest Atlantic Ocean; however, within this range, there are seasonal shifts in species distribution and abundance. Pinnipeds 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). For additional information on the biology and range wide distribution of each species of small cetacean and pinniped in Table 14, see the marine mammal stock assessment reports at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region> and Amendment 8 (NEFMC 2018a, Volume I, Section 3.4.2.3).

6.3.2.3 Atlantic Sturgeon

The marine range of U.S. Atlantic sturgeon extends from Labrador, Canada, to Cape Canaveral, Florida. Atlantic sturgeon from all five DPSs 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.* 2012; Dunton *et al.* 2015; Dunton *et al.* 2010; Erickson *et al.* 2011; Kynard *et al.* 2000; Laney *et al.* 2007; O'Leary *et al.* 2014; Stein *et al.* 2004a; Waldman *et al.* 2013; Wirgin *et al.* 2015a; Wirgin *et al.* 2015b; Wirgin *et al.* 2012). Based on fishery-independent and dependent data, and data collected from tracking and tagging studies, in the marine environment, Atlantic sturgeon appear to primarily occur inshore of the 50 m depth contour (Dunton *et al.* 2010; Erickson *et al.* 2011; Stein *et al.* 2004a; b); 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). 2011). For additional information on the biology and range wide distribution of Atlantic sturgeon, see Amendment 8 (NEFMC 2018a, Volume I, Section 3.4.2.4).

6.3.3 Gear Interactions with Protected Species

As in Section 6.3.4, based on VTR data, the Atlantic herring fishery is primarily prosecuted with purse seine and midwater trawl (single or pair) gears, and to a lesser extent by small mesh bottom trawl gear. Specifically, since 2008, VTR data indicates that small mesh bottom trawl vessels account for under 10% of herring landings. Given that bottom trawl effort in the Atlantic herring fishery is so small, as seen by

the small amount of catches of this specie by this gear type, and because the alternatives described in this document are not expected to result in a notable change in fishing effort using this gear types, there is low likelihood that any protected species interactions with the Atlantic herring fishery will be due to interactions with bottom trawl gear. As a result, the following sections will only focus on interaction risks to protected species associated with purse seine and midwater trawl (single or pair) gears.

6.3.3.1 Gear Interactions with Sea Turtles

Midwater Trawl. NEFOP and ASM observer data from 1989 to 2018 show five leatherback sea turtle interactions with midwater trawl gear; the primary species landed during these interactions was tuna (Hayes *et al.* 2018). These takes were in the early 1990s in an experimental HMS fishery that no longer operates. No takes sea turtles (leatherback or species of hard-shelled sea turtle) have been documented in other midwater trawl fisheries operating in the Greater Atlantic Region. Based on this and the best available information, sea turtle interactions in midwater trawl gear in the Greater Atlantic Region are expected to be rare.

Purse Seine. Sea turtle interactions with this gear type are possible; however, based on available information (Hayes *et al.* 2018), few interactions have been documented. Given this information, the risk of a sea turtle interacting with purse seine is expected to be low. Sea turtles may be captured in the net and could become entangled in the mesh. Captured turtles can be released alive if they are quickly retrieved and removed from the net.

6.3.3.2 Gear Interactions with Atlantic Sturgeon

Midwater Trawl. To date, there have been no observed/documented interactions with Atlantic sturgeon in midwater trawl gear (Hayes *et al.* 2018). Based on this information, midwater trawl gear is not expected to pose an interaction risk to any Atlantic sturgeon and therefore, is not expected to be source of injury or mortality to this species.

Purse Seine. Capture of sturgeon in purse seine gear type is possible; however, interactions have been extremely rare over the past 26 years. NEFOP and ASM observer data from 1989-2018 show two Atlantic sturgeon interactions with purse seine gear targeting Atlantic herring in the Gulf of Maine (Hayes *et al.* 2018); these interactions were recorded in 2004 and 2005, prior to the listing of Atlantic sturgeon under the ESA. Thus, although Atlantic sturgeon interactions with purse seine gear are possible, the risk of an interaction is expected to be low.

6.3.3.3 Gear Interactions with Marine Mammals

Depending on species, marine mammal interactions have been observed in purse seine, and/or midwater trawl gear. 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 (i.e., Category I=frequent; Category II=occasional; Category III=remote likelihood or no known interactions). In the Northwest Atlantic, the 2019 LOF (84 FR 22051 (May 16, 2019)) categorizes the Gulf of Maine herring purse seine fishery as a Category III fishery, and commercial midwater trawl fisheries (Northeast or Mid-Atlantic) as Category II fisheries.

6.3.3.3.1 Small Cetaceans and Pinnipeds

Midwater Trawl Gear. Several species of small cetaceans and pinnipeds are vulnerable to interactions with midwater trawl gear (Hayes *et al.* 2019; 84 FR 22051 (May 16, 2019)).¹ Based on the most recent MMPA LOF issued on May 16, 2019 (84 FR 22051), Table 15 lists species that have been observed (incidentally) seriously injured and/or killed by List of Fisheries Category II midwater trawl fisheries that operate in the affected environment of the Atlantic herring fishery.

Table 15. Small cetacean and pinniped species observed seriously injured and/or killed by Category II midwater trawl fisheries in the affected environment of the Atlantic herring fishery.

Fishery	Category	Species Observed or reported Injured/Killed
Mid-Atlantic Midwater Trawl (including Pair Trawl)	II	Harbor seal
Northeast Midwater Trawl (including Pair Trawl)	II	Long-finned pilot whale
		Short-beaked common dolphin
		Gray seal
		Harbor seal
<i>Sources:</i> MMPA LOF 84 FR 22051 (May 16, 2019).		

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 New England 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,² it was determined 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 that the ATGTRT believes are necessary to provide the basis for decreasing mortalities and serious injuries of marine mammals to insignificant levels approaching zero. The ATGTRS also identifies several voluntary measures that can be adopted by certain trawl fishing sectors to potentially reduce the incidental capture of marine mammals.³

Purse Seine. There have been no observed small cetacean interactions with purse seines used to prosecute any Greater Atlantic Region fishery (primarily Gulf of Maine Atlantic herring). As a result, this gear type is not expected to pose an interaction risk with small cetacean species, and therefore, is not expected to be source of serious injury or mortality to any small cetacean.

Purse seines; however, specifically those operating in the Gulf of Maine targeting Atlantic herring, are known to interact with pinniped species. Since 2004, pinniped species have been observed in purse seine gear; none of these interactions have resulted in mortality or confirmed serious injury to the seal (Table 18) (Hayes *et al.* 2019; Josephson *et al.* 2019). As a result, although interactions are possible with seals,

¹ For additional, prior information on small cetacean and pinniped interactions, see: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region>

² Category I fisheries have frequent incidental mortality and serious injury of marine mammals.

³ For additional details on the ATGTRS, visit: <http://www.greateratlantic.fisheries.noaa.gov/Protected/mmp/atgtrp/>

we do not expect purse seines to pose a serious injury or mortality risk to these species. This conclusion is further supported by the fact that the List of Fisheries 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 16. 2004-2016 Observed gray and harbor seal interactions with the Gulf of Maine Atlantic herring purse seine fishery.

Seal Species	Number of Observed Interactions	Released Alive (No Serious Injury or Mortality)
Unknown	19	Yes
Harbor Seal	21	Yes
Gray Seal	119	Yes

6.3.4 Seabirds

Section 3.4.4 of Amendment 8 includes detailed information on seabirds of the North Atlantic. Over 20 species of seabirds in the northeast rely on herring as prey during parts of their lifecycle, and some of these species are identified as species of Greatest Conservation Need (NEFMC 2018a, Table 19). Some of these species are also known to be caught incidentally during herring fishing operations (Hatch 2018; Hatch *et al.* 2016). The United States Fish and Wildlife Service (USFWS) is responsible for the conservation and management of seabirds and works with state agencies and NGO's to manage seabird colonies along the entire eastern seaboard.

6.4 PHYSICAL ENVIRONMENT AND ESSENTIAL FISH HABITAT

The Atlantic herring fishery occurs in four areas defined as Areas 1A, 1B, 2, and 3 (Map 1). 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). 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. Amendment 5 to the Atlantic Herring FMP includes a detailed characterization of these areas.

The current EFH designation for Atlantic herring was developed through Omnibus Habitat Amendment 2 (OHA2). The designations for adults and juveniles identify nearly the entire Gulf of Maine as EFH and designate additional areas on the southern half of Georges Bank and throughout the Mid-Atlantic Bight. The larval designation includes scattered locations throughout the Gulf of Maine and Georges Bank. The egg designation includes shallower waters of the Gulf of Maine and Georges Bank. Interactive maps of EFH for each species and life stage are on the NOAA EFH Mapper:

<http://www.habitat.noaa.gov/protection/efh/efhmapper/index.html>. Details are in OHA2 Volume 2 (designations), Appendix A (designation methods), and Appendix B (supplementary information; <http://www.nefmc.org/library/omnibus-habitat-amendment-2>).

The environment that may be affected by the Proposed Action has been identified as EFH for the benthic life stages of several species (Table 17). Additional information is in the FMP document that most recently updated each species' EFH designation and NOAA the EFH mapper referenced above.

Table 17. Current EFH designation information sources

Species	Authority	Plan Managed Under	Most recent update
Monkfish	NEFMC, MAFMC	Monkfish	OHA2
Atlantic herring	NEFMC	Atlantic Herring	OHA2
Atlantic salmon	NEFMC	Atlantic salmon	OHA2
Atlantic sea scallop	NEFMC	Atlantic Sea Scallop	OHA2
American plaice	NEFMC	NE Multispecies	OHA2
Atlantic cod	NEFMC	NE Multispecies	OHA2
Atlantic halibut	NEFMC	NE Multispecies	OHA2
Atlantic wolffish	NEFMC	NE Multispecies	OHA2
Haddock	NEFMC	NE Multispecies	OHA2
Ocean pout	NEFMC	NE Multispecies	OHA2
Offshore hake	NEFMC	NE Multispecies	OHA2
Pollock	NEFMC	NE Multispecies	OHA2
Red hake	NEFMC	NE Multispecies	OHA2
Redfish	NEFMC	NE Multispecies	OHA2
Silver hake	NEFMC	NE Multispecies	OHA2
White hake	NEFMC	NE Multispecies	OHA2
Windowpane flounder	NEFMC	NE Multispecies	OHA2
Winter flounder	NEFMC	NE Multispecies	OHA2
Witch flounder	NEFMC	NE Multispecies	OHA2
Yellowtail flounder	NEFMC	NE Multispecies	OHA2
Barndoor skate	NEFMC	NE Skate Complex	OHA2
Clearnose skate	NEFMC	NE Skate Complex	OHA2
Little skate	NEFMC	NE Skate Complex	OHA2
Rosette skate	NEFMC	NE Skate Complex	OHA2
Smooth skate	NEFMC	NE Skate Complex	OHA2
Thorny skate	NEFMC	NE Skate Complex	OHA2
Winter skate	NEFMC	NE Skate Complex	OHA2
Red crab	NEFMC	Red Crab	OHA2
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 (<i>Illex</i>)	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
<i>Note:</i> OHA2 = Omnibus Habitat Amendment 2			

6.5 HUMAN COMMUNITIES

This action evaluates the effect management alternatives may have on the economy, way of life, and traditions of human communities. These social and economic impacts may be driven by changes in fishery flexibility, opportunity, stability, certainty, safety, and/or other factors. While social and economic impacts could be solely experienced by individuals, it is more likely that impacts would be experienced across communities, gear types, and/or vessel size classes.

Summarized here are the fisheries and human communities most likely to be impacted by the Alternatives under Consideration. Social, economic and fishery information herein helps describe the response of the fishery to past management actions and predicting how the Framework 6 alternatives may affect human communities. Also, this section establishes a descriptive baseline to compare predicted and actual changes resulting from management. Additional information is contained in Amendment 8 (NEFMC 2018a, Volume I, Section 3.6).

MSA Section 402(b), 16 U.S.C. 1881a(b) states that no information gathered in compliance with the Act can be disclosed, unless aggregated to a level that obfuscates the identity of individual submitters. The fishery data in this amendment are thus aggregated to at least three reporting units, to preserve confidentiality. Additional standards are applied to reporting the fishing activity of specific states or fishing communities. To report landings activity to a specific geographic location, the landings have been attributed to at least three fishing permit numbers and the landings must be sold to three dealer numbers. However, the dealers do not necessarily have to be in the same specific geographic location.

6.5.1 Herring Fishery

The U.S. Atlantic herring fishery occurs in the Northwest Atlantic shelf region from Cape Hatteras to Maine, including an active fishery in the inshore Gulf of Maine and seasonally on Georges Bank (Map 1, p. 30). Atlantic herring is managed as one stock complex, but this stock likely has 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 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).

The Atlantic herring fishery generally occurs south of New England in Area 2 during the winter (January-April), and oftentimes as part of the directed mackerel fishery. There is overlap of 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) generally occurs 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 Area 1A) that is effective June-September. A sub-ACL split for Area 1B (0% January – April, 100% May – December) has been effective for all vessels since 2014.

Autumn and winter fishing (September-December) tends to be more variable and dependent on fish availability; the Area 1A sub-ACL is almost always fully used (except in 2017 and 2018), and the inshore GOM fishery usually closes 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 caught in state waters and in the New Brunswick weir fishery.

6.5.1.1 Atlantic Herring Permits and Vessels

Amendment 1 to the Atlantic Herring FMP established a limited access program in the herring fishery with three limited access (A, B, C) and one open access (D) permit categories (Table 18). The vessels that have not been issued a limited access herring permit but have been issued a limited access mackerel permit, are eligible for a Category E permit, a category established through Amendment 5 (implemented March 2014).

Table 18. Atlantic herring permit categories.

	Category	Description
Limited Access	A	Limited access in all management areas.
	B	Limited access in Areas 2 and 3 only.
	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	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.
	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.

Active Vessels in the Atlantic Herring Fishery

The following describes the vessels recently participating in the Atlantic herring fishery, including nominal revenues for herring trips. Here, an active herring trip is defined liberally as any trip in which at least one pound of Atlantic herring is retained.

Since 2008, the number of vessels with an Atlantic herring permit has generally decreased (Table 19) (NEFMC 2018a, Section 3.6.1.4). This includes a decrease in the limited access directed fishery vessels (Categories A and B), with 36 permitted in 2019. In 2018, 44% of the limited access vessels were active.

Many of the Category A, B, and C vessels are also active in the Atlantic mackerel fishery (managed by the MAFMC). For the open access vessels, just 2-4% of the Category D permits have been active since 2008 (Table 19). The Category E permit was implemented during permit year 2013 (May-April) and about 50-55 E permits have been issued annually since, mostly to vessels with a D permit as well; about 4-10% of the E permits have been active.

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 (Table 20).

Table 19. Fishing vessels with federal Atlantic herring permits, permit years 2011-2019 (May-April).

Atlantic Herring Permit Year (May-April)										
Permit Category	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Limited Access	A	42 (59.5%)	42 (57.1%)	39 (66.7%)	40 (62.5%)	42 (50%)	39 (56.4%)	39 (59.0%)	39 (56.4%)	33
	BC	4*	4*	4 (75%)	4*	4*	4*	4*	4*	3*
	C	47 (23.4%)	47 (31.9%)	44 (29.5%)	42 (23.8%)	41 (26.8%)	41 (24.4%)	45 (33.3%)	46 (30.4%)	43
	Total	93 (40.9%)	93 (44.1%)	87 (48.3%)	86 (43%)	87 (39.1%)	84 (40.5%)	88 (46.6%)	89 (43.8%)	79
Open Access	D	2,147 (3.9%)	2,065 (3.5%)	1,957 (3.3%)	1,838 (3.6%)	1,762 (3.4%)	1,776 (2.9%)	1,815 (2.3%)	1,797 (2.1%)	1,543
	DE			6*	52 (9.6%)	54 (5.6%)	53 (5.7%)	55 (9.1%)	51 (3.9%)	50
	E			0	1*	1*	1*			
	Total	2,147 (3.9%)	2,065 (3.5%)	1,963 (3.3%)	1,891 (3.8%)	1,817 (3.5%)	1,830 (3%)	1,870 (2.5%)	1,848 (2.1%)	1,593

Source: GARFO Permit database and DMIS as of May 2019. () = Percent of vessels in the category that are active.
*Confidential vessel activity data

Table 20. Contribution of herring vessels by permit category to total landings, 2013-2016 (Jan.-Dec.).

Permit Category	Fishing Year (Jan-Dec)							
	2013	2014	2015	2016	2017	2018	2019	
Limited Access	A and BC	96.9%	98.0%	99.0%	98.7%	98.3%	99.0%	99.7%
	C	2.6%	1.7%	0.9%	1.0%	1.2%	0.8%	0.2%
	D, DE, and E	0.1%	0.1%	0.1%	0.2%	0.5%	0.2%	0.1%

Source: GARFO Permit database and DMIS as of May 2019.

6.5.1.2 Effort in the Herring Fishery

Atlantic herring vessels primarily use purse seines or single or paired midwater trawls. The MWT fleet has harvested most landings since 2008 (Table 21) (NEFMC 2018a, Section 3.6.1.5). 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. Single MWT vessels have been most active in Area 3. Small mesh bottom trawl vessels compose 5% of herring landings since 2008; other gear types (e.g., pots, traps, shrimp trawls, hand lines) are under 0.5% of the fishery. In more recent years, 2016-2018, total bottom trawl catch has decreased compared to several years ago, now less than 5% of the total. Purse seine catch is a larger percentage of total landings, under 30% of the total in 2012-2014 compared to just over 40% of total landings for 2016-2018 (Table 21).

Table 21. Atlantic herring landings by fishing gear type and area, 2016-2018.

Gear Type	Area 1A	Area 1B	Area 2	Area 3	Total
Bottom Trawl	569	18	6,070	4	6,660
<i>% per area</i>	<i>1%</i>	<i>0%</i>	<i>27%</i>	<i>0%</i>	<i>4%</i>
Single, Paired Midwater	13,659	8,625	16,048	40,723	79,055
<i>% per area</i>	<i>18%</i>	<i>98%</i>	<i>73%</i>	<i>100%</i>	<i>53%</i>
Purse Seine	63,081	133			63,214
<i>% per area</i>	<i>82%</i>	<i>2%</i>			<i>42%</i>
Other	6				6
<i>% per area</i>	<i>0%</i>				<i>0%</i>
Total	77,315	8,776	22,118	40,728	148,936

Source: VTR database. August 2019.
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.

6.5.1.3 Atlantic Herring Catch

The Atlantic herring stock-wide ACL and management area sub-ACLs are tracked/monitored based on the total catch, – landings and discards, which is provided and required by herring 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.

Table 23 summarizes recent Atlantic herring catch estimates by year and management area from 2009-2018. Amendment 8 contains catch data back to 2004 (Section 3.6.1.2). 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 (NEFMC 2014a; b).

Atlantic herring catch estimate methods:

2004-2006: 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: based on IVR data supplemented with dealer data. Reported herring discards are included in the totals.

2010-current: based on a comprehensive method developed by NMFS in response to Amendment 4 provisions and the need to better monitor sub-ACLs. Estimates are based on landings data in dealer reports (Federal and State), supplemented with VTRs and VMS catch reports (Federal and Maine) and discard data from extrapolated observer data.

Atlantic herring catch was somewhat consistent from 2003-2015, averaging about 91,000 mt, but has declined in more recent years (43,789 mt in 2018; Table 22). While the total ACL has never been exceeded, sub-ACLs have been exceeded in most years, particularly in Area 1B, but not since 2016 (Table 23).

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 (NEFMC 2014a, Section 3.5.1.2.3).

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 in Section 6.5.1.7.2.

Table 22. Total annual Atlantic herring catch, 2003-2018.

Year	Total Quota Allocated (mt)	Total Herring Catch (mt)	% Caught
2003	180,000	101,607	57%
2004	180,000	93,205	52%
2005	150,000	96,116	64%
2006	150,000	98,714	66%
2007	145,000	85,819	59%
2008	143,350	83,240	58%
2009	143,350	103,943	73%
2010	91,200	72,852	80%
2011	93,905	86,245	92%
2012	90,683	90,561	100%
2013	106,375	97,680	90%
2014	104,088	95,037	92%
2015	104,566	80,766	77%
2016	107,360	64,801	60%
2017	102,656	49,072	48%
2018	49,900	43,789	88%

Source: NMFS GARFO.

Table 23. Atlantic herring sub-ACLs and catch by year and management area, 2009-2018.

Year	Sub-Area	sub-ACL (mt)	Catch (mt)	% Harvested
2009	1A	43,650	44,088	101%
	1B	9,700	1,799	19%
	2	30,000	28,032	93%
	3	60,000	30,024	50%
2010	1A	26,546	28,424	107%
	1B	4,362	6,001	138%
	2	22,146	20,831	94%
	3	38,146	17,596	46%
2011	1A	29,251	30,676	105%
	1B	4,362	3,530	81%
	2	22,146	15,001	68%
	3	38,146	37,038	97%
2012	1A	27,668	24,302	88%
	1B	2,723	4,307	158%
	2	22,146	22,482	102%
	3	38,146	39,471	103%
2013	1A	29,775	29,820	100%
	1B	4,600	2,458	53%
	2	30,000	27,569	92%
	3	42,000	37,833	90%
2014	1A	33,031	32,898	100%
	1B	2,878	4,399	153%
	2	28,764	19,626	68%
	3	39,415	36,323	92%
2015	1A	30,580	29,406	96%
	1B	4,922	2,889	59%
	2	32,100	15,214	47%
	3	44,910	33,256	74%
2016	1A	30,524	27,831	91%
	1B	2,844	3,657	129%
	2	31,227	13,463	43%
	3	42,765	18,631	44%
2017	1A	32,115	28,685	89%
	1B	4,825	2,639	55%
	2	31,227	3,617	12%
	3	43,873	14,134	32%
2018	1A	27,743	24,815	89%
	1B	2,639	2,156	82%
	2	8,200	7,056	86%
	3	11,318	9,762	86%

Note: Shaded rows are sub-ACL overages. Source: GARFO

6.5.1.4 Border Transfer

“Border Transfer” (BT) is U.S.-caught herring shipped 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 use through a separate dealer code. Specification of BT has remained at 4,000 mt since the implementation of the Atlantic Herring FMP. However, in the 2019 in-season adjustment BT was set to zero considering the large quota reductions implemented by that action. Border transfer generally decreased from 1994-2013, with 838 mt used in 2013 (21% of 4,000 mt; Table 24). No BT was used from 2008-2010, some in 2011-2015, and no BT occurred in 2016-2018.

Table 24. Use of border transfer, 2013-2018.

Year	Herring (mt)
2013	838
2014	796
2015	45
2016	0
2017	0
2018	0

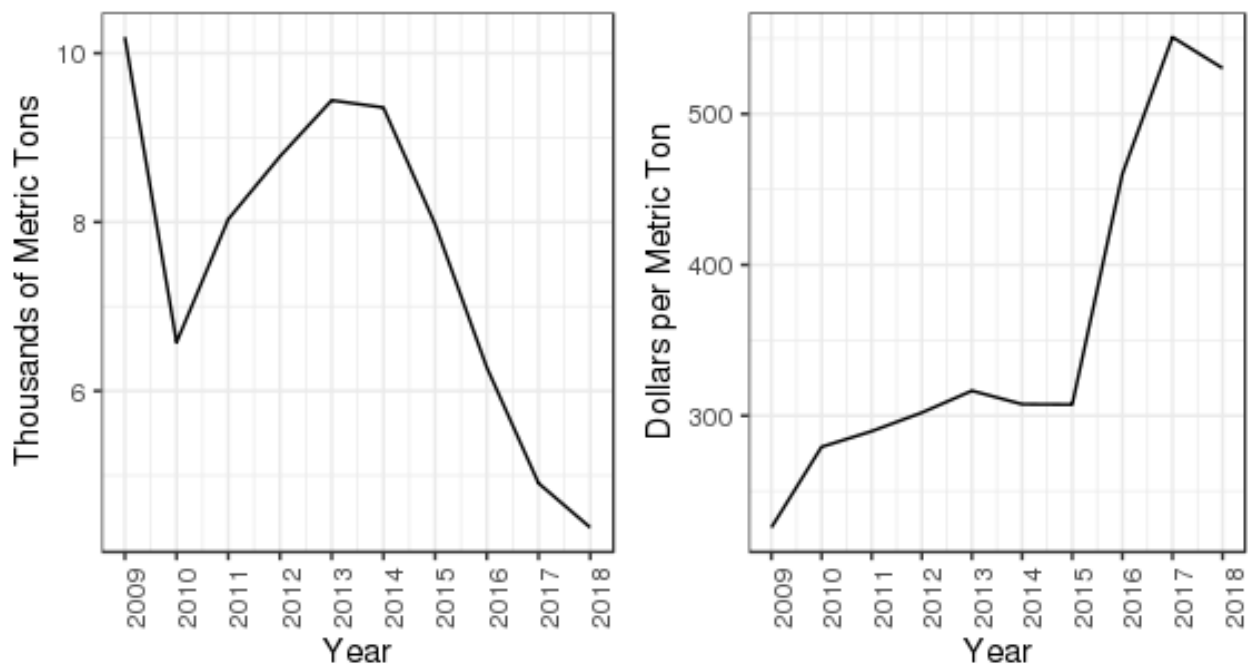
Source: CFDEERS dealer reported landings as of May 14, 2019.

6.5.1.5 Fishery Economics

Price of herring. From 2007 to 2018, the annual average price of Atlantic herring has ranged from \$226 - \$550 per metric ton, generally increasing through time (NEFMC 2018a, Section 3.6.1.7). Atlantic herring caught in the Northeast U.S. is primarily used as bait in the lobster fishery. During 2009-2018, the price of herring was lowest in January-March (about \$260-\$315/mt) and highest in July and August (about \$410) fishery. During 2007-2016, the price of herring was lowest in January-March (about \$230-260/mt) and highest in July and August (about \$340/mt).

Fishery revenue. From 2009-2018, 2018 had the lowest annual landings of Atlantic herring, but nominal value was relatively high (second highest in this 10-year period; Figure 5). Fishery value peaked in 2013 at about \$30M and has been above \$20M per year since 2011.

Figure 5. Total herring landings and value of herring, 2009-2018



Source: NMFS dealer data.

6.5.1.6 Market and Substitute Goods

Used as bait. A large proportion of herring catch is used as bait. Since 2001, over 50% of herring landings are sold for bait, and the amount used for bait has generally increased over time. Ports in Maine (61%) and Massachusetts (36%) landed 97% of all herring used for bait.

Herring is used as bait for many fisheries, such as lobster, tuna, and recreational fisheries. 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. Generally, the herring used for bait goes through a large wholesale dealer to smaller dealers and lobster wharfs along the coast. The wholesale dealers generally have facilities where they sort, barrel, freeze and store bait for redistribution. The locations and processing and selling techniques also vary. Amendments 1, 5 and 8 further describe the ways in which herring is processed and sold.

Substitutes. The ability of lobstermen to obtain substitute baits for Atlantic herring is constrained by state regulations, storage capacity of bait dealers, and economics. Use of menhaden for bait has increased in importance relative to fish meal and oil. From 2001 to 2016, the percent of total menhaden landings that were used for bait rose from 13% to a high of 28% in 2012 (63,540 mt) but has recently declined to 23% (43,100 mt in 2016). Menhaden landings for bait have recently dipped due to reductions in allowable catch as a result of ASMFC Amendment 3 to the Atlantic menhaden FMP. During 2018, *ex-vessel* menhaden prices averaged \$551 per mt in the State of Maine.⁴ This was about 4% higher than average *ex-vessel* herring prices that year (\$530/mt). If the quantity of Atlantic herring supplied into the bait market declines dramatically, more menhaden will likely be used as bait, moderating the increases in herring prices. This has likely already started to occur as menhaden landings to the State of Maine has increased

⁴ <https://www.maine.gov/dmr/commercial-fishing/landings/documents/14-18LandingsBySpecies.Table.pdf>

to >6,000 mt in 2018. 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. Additionally, Alewife is another potential substitute. Landings from Maine sustainable rivers (as outlined by ASMFC) rose from about 588 mt in 2015 to 890 mt. The price of alewife in 2018 was \$760/mt, making them a more expensive alternative for use as lobster bait. An ASMFC work group on lobster bait is currently surveying lobstermen and herring dealers to help determine how demand for herring and use of substitute baits may be changing, given recently low herring catch limits.

Other uses. 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. Other uses of herring include aquaculture feed, canned pet food, livestock food, and industrial and biomedical purposes.

6.5.1.7 Management uncertainty

This section updates information about the primary sources of management uncertainty in this FMP, namely Canadian catch of Atlantic herring, catch in state waters, and the estimate of discard mortality.

6.5.1.7.1 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 are from the SW Nova Scotia stock complex (Area 4WX).

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 stock-wide Atlantic herring ACL, which is OY for the U.S. fishery.

The overall trend in Canadian herring landings since 1990 has been downward (Figure 6) with a long-term average of 20,000 mt. Catches are variable over time; total catch dropped below 1,000 mt in 2013 and 2015 but was above 30,000 in 2007. The number of weirs has declined from almost 50 in 2013 to just over 10 in 2017 (Table 25). The most recent five-year average of NB weir landings (2013-2017) is about 5,000 mt, and even lower for the last 3 years (2015-2017), about 1,500 mt (Table 26).

There was a dramatic increase in landings from shut offs in New Brunswick in 2018. Shut offs operate in the same areas, target the same schools of herring but they are mobile and can move from cove to cove (Personal communication, Rabindra Singh DFO). In most years they make up a small fraction of total landings, but in 2018 it seems to have exceeded weir landings.

The fishery occurs primarily during the late summer and autumn (June-October), with highest landings in July and August (Table 28); however, dependent on many factors including weather, fish migration patterns, and environmental conditions. Catch from this fishery after October has averaged under 4% of the yearly total.

Figure 6. Herring landings in New Brunswick, Canada (weir and shutoff)

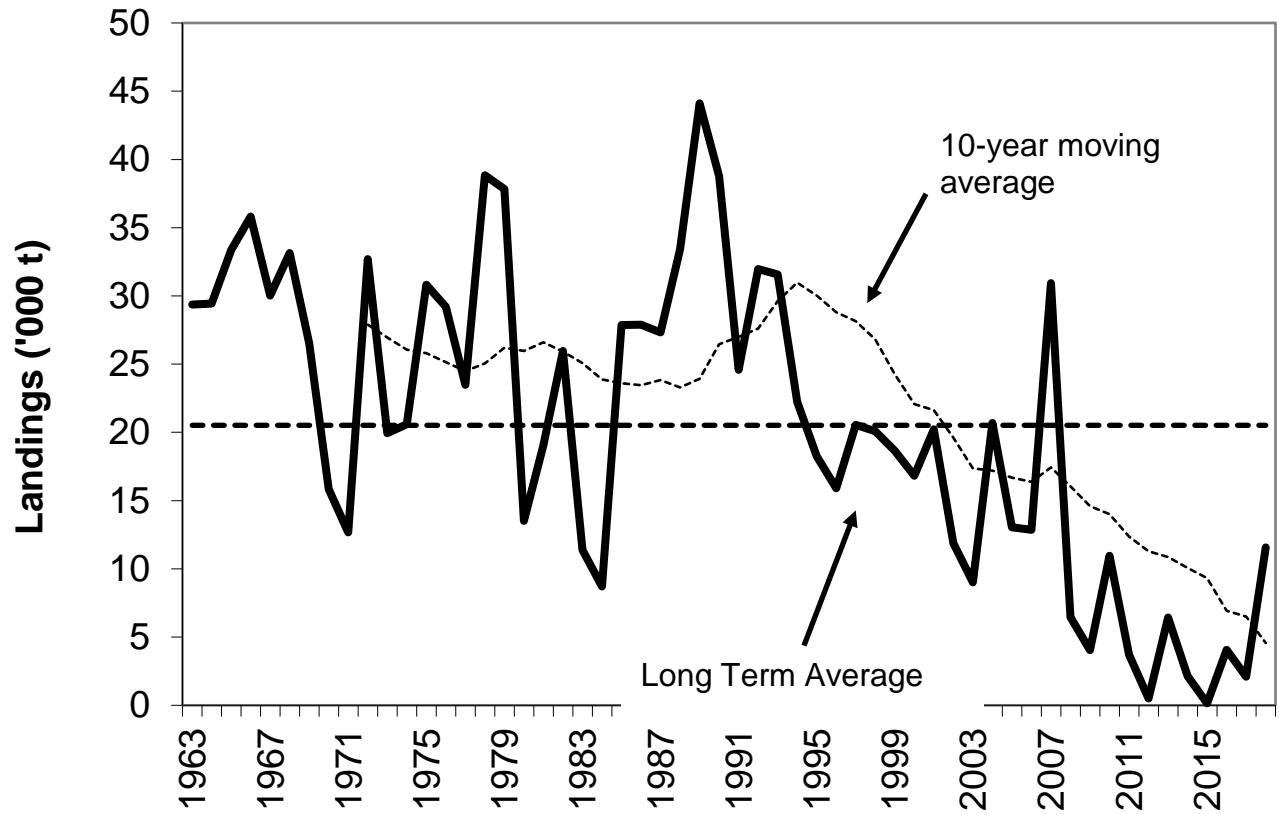


Table 25. Active weirs and the catch per weir in the New Brunswick, Canada fishery, 1978-2018.

Year	Annual Catch (t) NB	No. Active Weirs NB	Catch per weir (t) NB
1978	33,599	208	162
1979	32,579	210	155
1980	11,066	120	92
1981	14,968	147	102
1982	22,181	159	140
1983	12,568	143	88
1984	8,353	116	72
1985	26,718	156	171
1986	27,516	105	262
1987	26,621	123	216
1988	38,235	191	200
1989	43,520	171	255
1990	39,808	154	258
1991	23,717	143	166
1992	31,981	151	212
1993	31,328	145	216
1994	20,618	129	160
1995	18,228	106	172
1996	15,781	101	156
1997	20,396	102	200
1998	19,529	108	181
1999	19,063	100	191
2000	16,376	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
2015	146	11	13
2016	2,777	26	107
2017	1,732	11	157
2018	5,382	26	207
Average	17,357	101	159
<i>Note: does not include shut offs. 2018 is preliminary.</i>			

Table 26. Monthly weir landings (mt) for weirs in New Brunswick, 1978-2018

YEAR	MONTH												Year Total
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
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
2015	0	0	0	0	12	32	28	36	5	33	0	0	146
2016	0	0	0	0	3	0	102	1,034	1,153	485	0	0	2,777
2017	0	0	0	0	0	0	35	220	1,478	0	0	0	1,732
2018	0	0	0	0	0	166	2,129	1,798	767	506	15	0	5,382
NB Average Catch (t)	20	4	1	7	94	326	2,969	6,615	4,489	2,348	450	35	17,357
NB Minimum Catch (t)	0	0	0	0	0	0	5	5	5	0	0	0	146
NB Maximum Catch (t)	535	96	20	95	690	1,912	8,315	15,093	12,207	8,457	2,638	462	43,520

1. These data do not include the landings reported as shut off or beach seine; that is why these totals are different than totals in Table 29.

2. The 2018 data are preliminary.

For this action, the PDT calculated 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 27). These are the same options considered in the previous specifications package for 2016-2018.

Table 27. Canadian weir and shut-off landings from 2009-2018 (preliminary) with possible deductions for management uncertainty based on 3-year, 5-year and 10-year averages.

Year	Canadian Landings (mt)
2009	4,031
2010	10,958
2011	3,711
2012	504
2013	6,431
2014	2,149
2015	146
2016	4,060
2017	2,103
2018	11,502*
3-year (2016-2018)	
	5,888
5-year (2014-2018)	
	3,992
10-year (2009-2018)	
	4,560
<i>Buffer used in 2016-2018</i>	
	<i>6,200</i>
<i>Buffer used in 2019</i>	
	<i>6,200</i>
<i>* Preliminary</i>	

6.5.1.7.2 State water catch

Most of the Atlantic herring landings are harvested in Federal waters. Catch by Federal permit holders that occurs in state waters is reported and counted in-season 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 state-only vessels fishing in state waters was about 41,000 lbs. (19 mt) in 2015, increased slightly in 2016 (20 mt) and 2017 (33 mt), and reduced again in 2018 to 11 mt.

The state-only permitted landings of Atlantic herring are exclusively by fishermen from Maine, primarily using fixed gear and a small number of seines. Table 30 has updated catch estimates from the fixed gear fishery through 2013. The Council specifies a set-aside for West of Cutler fixed gear fishermen (FGSA); it was 295 mt in 2016-2018 and was reduced to 39 mt in the 2019 in-season adjustment). 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. Therefore, while state-only permitted landings of Atlantic herring is a potential source of management uncertainty, there is a set-aside for it in the federal plan, and to date landings from this segment of the fishery have been very low.

Table 28. 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
2015	11/02/2015	30,290	29,406*	15	0
2016	10/18/2016	30,397	27,806*	20	0
2017	NA	31,115	28,682*	33	0
2018	NA	27,743	24,814*	11	0

Source: ASMFC.

Note: "C" denotes that the value cannot be reported due to confidentiality. * via Garfo quota monitoring page. **Adjusted August 22, 2018 from 31,962 mt to 27,743 mt

6.5.1.7.3 Atlantic herring discards

The 2012 benchmark assessment for Atlantic herring incorporated Atlantic herring discards from Vessel Trip Report (VTR) data. Discard estimates have been available since 1996 and are generally under 1% of the landings and do not represent a substantial source of mortality. However, this is not 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 2019-2021 Atlantic herring fishery specifications. It is anticipated that when the IFM Amendment is fully implemented catch monitoring and the accuracy of herring discard estimates will continue to improve.

Table 29 gives Atlantic herring discard estimates for 2010-2017 using the observer extrapolated data from the year-end summary reports. Atlantic herring discards represent a very small fraction of total catch. For example, total Atlantic herring catch in 2013 was 95,764 mt (Table 35), so discards were 0.02% of the

total 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 (2019-2021).

Table 29. Atlantic herring discards, 2010-2017

Year	Discards (mt)
2010	137
2011	210
2012	87
2013	18
2014	10
2015	12
2016	62
2017	14

Source: Atlantic herring year-end reports:
<https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/atlanticherring.html>.

6.5.2 Other Managed Resources and Fisheries

In addition to Atlantic herring, many other fisheries could be impacted by the Alternatives under Consideration. The mackerel and herring fisheries are often prosecuted in conjunction, and the lobster fishery is highly dependent on herring as bait. Herring is either a fishery bait source and/or a natural prey item for bluefin tuna, groundfish, and striped bass, which have commercial and recreational fisheries associated with them. Herring is also a prey for whales, other marine mammals, and sea birds, which have ecotourism industries associated with them. Amendment 8 (NEFMC 2018a, Section 3.6.2) contains extensive descriptions of the population status, management and fisheries and ecotourism for these species, and is incorporated herein by reference.

6.5.3 Fishing Communities

Consideration of the economic and social impacts on fishing communities from proposed fishery regulations is required by the National Environmental Policy Act (NEPA 1970) and the Magnuson-Stevens Fishery Conservation and Management Act, particularly National Standard 8 (MSFCMA 2007).

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. Some of the communities identified in this section may not fit the strict interpretation of the National Standard 8 (NS 8) 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 impractical to identify every community with substantial involvement in the lobster fishery (and consequently some dependence on the herring fishery) for assessment in this document. Instead, some of the communities of interest are selected, in part, because of their involvement in or dependence on the lobster fishery; assessment of the impacts of 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.

Atlantic Herring Fishery

The primary ports for the Atlantic herring fishery, as defined in Amendment 8 (NEFMC 2018a, Section 3.6.3.2) meet at least one of the following criteria:

1. A ranking of medium-high or high for engagement in or reliance on the Atlantic herring fishery on average in 2011-2015, according to the NMFS Community Vulnerability Indicators (Jepson & Colburn 2013).
2. Atlantic herring landings of at least 10M pounds (4,536 mt) per year from 2007-2016, or anticipated landings above this level based on interviews and documented fishery-related developments (Table 30).
3. Port infrastructure dependent in part or whole on Atlantic herring (e.g., herring dealers, pump stations).
4. Dependence on herring as bait (e.g., for lobster and/or tuna fisheries).
5. Geographic isolation in combination with some dependence on the Atlantic herring fishery.
6. Use of Atlantic herring for value-added production.

Based on the above criteria, there are 17 primary ports for the Atlantic herring fishery (Table 30). During the period 2007-2016, Atlantic herring was landed in over eight states, mostly in Maine (82M lbs. (37K mt)/year) and Massachusetts (79M lbs. (36K mt)/year;), and in 130 ports. Gloucester and Portland were the top two landing ports during that time. Primary ports are further described in Amendments 5 and 8. Community profiles are available from the NEFSC Social Sciences Branch website (Clay *et al.* 2007).

Other Fisheries/Ecotourism

There are several other fisheries, as well as the ecotourism industry, that are potentially impacted by this action. Many ports have coexisting fisheries, including the Atlantic herring fishery. In all, about 140 communities have been identified as potentially impacted (NEFMC 2018a, Section 3.6.3.2.2).

Table 30. Annualized Atlantic herring landings to states and primary ports, 2007-2016

State/Port	Top port ranking	2007-2016 Avg. landings (mt)	Herring permits ^a	Herring dealers ^a
Maine		37,278	62	103
Portland	#2	16,986	33	80
Rockland	#4	13,319	20	67
Stonington	#6	2,359	12	33
Vinalhaven	#10	928	8	7
Jonesport	#12	763	8	13
S. Bristol	#19	231	6	4
Other (n=35)*		2,692	39	72
New Hampshire		829	26	32
Massachusetts		35,988	66	97
Gloucester	#1	19,892	39	83
New Bedford	#3	14,694	28	63
Other (n=11)		1,402	29	45
Rhode Island		5,326	58	35
Point Judith	#5	3,227	171	29
Newport	#13	612	12	8
Other (n=8)		1,487	9	7
Connecticut		6	11	6
New York		40	73	30
Montauk	#39	10	45	16
Hampton Bays/ Shinnecock	#37	13	29	16
Other (n=12)		17	14	13
New Jersey		2,150	56	12
Maryland		5	11	3
Confidential state(s)		307	9	7
Total	130	81,930	291	190

^a Totals may not equal the sum of the parts, because permits can land in multiple ports/states.

*Prospect Harbor, Maine is the ninth port for landings during this time (12Kmt total), but it is not a primary port.

Source: Dealer data, accessed July 2017.

7.0 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

The impacts of the alternatives under consideration are evaluated herein relative to the valued ecosystem components (VECs) described in the Affected Environment (Section 6.0) and to each other. This action evaluates the potential impacts using the criteria in Table 31.

Table 31. Terms used to summarize impacts on VECs.

VEC	Direction		
	Positive (+)	Negative (-)	Negligible/Neutral
Allocated target species, other landed species, and protected species	Actions that increase stock/population size for stocks in rebuilding. For stocks that are rebuilt, actions that maintain stock population sizes at rebuilt levels. For protected species, actions that increase the population size, or decrease gear interactions.	Actions that decrease stock/population sizes for overfished stocks. Actions that would cause a rebuilt stock to become overfished. For protected resources, actions that decrease the population size, or increase or maintain gear interactions.	Actions that have little or no positive or negative impacts to stocks or 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
Human Communities	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:			
All VECs: Mixed	both positive and negative		
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)		
Likely	Some degree of uncertainty associated with the impact		
	Negative (-)	Negligible (NEGL)	Positive (+)
	← High	Low	Low High →

7.1 IMPACTS ON TARGET SPECIES (A. HERRING)

7.1.1 Overfishing/Overfished Definition

Alternative 1 would keep the current overfishing definition for the Herring FMP. Alternative 2 (*PREFERRED ALTERNATIVE*) would update the overfishing definition to be more consistent with the 2018 assessment and Amendment 8. Both alternatives are primarily administrative; therefore, *no direct impacts* on the resource are expected. However, Alternative 2 may be more flexible and responsive to updated assessment information, so there may be *indirect low positive impacts* on the resource relative to Alternative 1 (No Action).

7.1.2 OFL/ABC Alternatives

The biological impacts of the alternatives for the 2019-2021 Atlantic herring fishery specifications were primarily 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 $F_{MSY\ PROXY}$ in the 2018 Atlantic herring operational assessment, and the terminal year estimates of F and SSB for 2018. A simulation of 1,000 projections was then run to capture possible outcomes of SSB and F for 2019-2021. However, the catch was set for FY2019 since that has been set in a prior action. The projections assume that the ABC allocated in 2019 will be the catch for that year, a typical assumption for a bridge year like this. The projection results are in Table 32 to Table 34 and discussed below relative to each alternative under consideration for the 2019-2021 fishery specifications. The major focus of these analyses is on FY2020, since this action for the most part is a one-year action. Measures will be set for FY2021 as well, but a subsequent action will likely replace those specifications after a 2020 herring assessment is completed.

Table 32 is a projection for Alternative 1 (No Action) for OFL/ABC; if the 2019 OFL/ABC values were maintained for 2020 and 2021. Under No Action, the estimate of F in 2020 is higher than the other alternatives under consideration ($F=0.35$), but all three alternatives are well under F_{MSY} (0.51). Similarly, the associated probability of overfishing in 2020 is higher for this alternative than the other alternatives (0.07 or 7%), but all three alternatives are very low. The probability of the stock being overfished is still high (0.83), since biomass is estimated to be at such low levels. Biomass is estimated to improve in 2021 if recruitment levels return to more average levels; they have been well below average in recent years.

Table 33 is the original projection reviewed by the SSC in October 2018. The SSC did not have confidence in the projected increase in biomass in 2021 and was concerned about setting ABC based on this uncertain value. Following an extensive discussion on this topic, the SSC resolved to make ABC recommendations for 2019 and 2020 based on the ABC control rule but recommended keeping ABC in 2021 the same as 2020 due to the uncertainty in the projections – Alternative 2a (*PREFERRED ALTERNATIVE*). The estimate of F and P(overfishing) are both lower for Alternative 2a relative to No Action (Alternative 1), but the differences are insubstantial since the ABC is only about 4,000 mt lower. Note these projections are not directly comparable, because Table 25 uses a previous estimate of 2018 catch (49,900 mt) and the projections for Alternative 1 and Alternative 2b use a more updated estimate of 2018 catch (55,286 mt), so the initial conditions are not the same. The PDT did more comparable projections; the differences were very minor.

Table 34 was developed by the PDT in spring 2019 to incorporate updated catch information for FY2018 as well as final catch limits for FY2019. The effects of updated data can be evaluated by comparing these runs (Alternative 2b vs. Alternative 2a). Specifically, with about 5,000 mt higher catch in 2018 in the updated run (Alternative 2b) compared to the original run (Alternative 2a), the starting biomass in 2019

for the updated projection is lower, so the fishing mortality (F) associated with maintaining the same 2019 ABC (21,266 mt) is slightly higher (F of 0.35 compared to F of 0.33 from the original projection). The probability of overfishing in 2019 for the updated projection is slightly higher, about 20% versus 15%, and the probability of the stock being overfished is essentially the same under both runs (87% or 88%). The updated projection suggests that FY2020 ABC should be almost 2,000 mt lower to maintain similarly low levels of probability of overfishing (1-2%) and probability of overfished (83-84%).

Overall, the projections show that under each of the OFL/ABC alternatives, Atlantic herring SSB and F resulting from fully utilizing ABC fall within a similar range, Alternative 1 has lower SSB and higher F compared to Alternatives 2a and 2b, but the differences are relatively minor. All three alternatives have relatively high probabilities of the stock becoming overfished if the full ABC is harvested (over 80% in 2020). Therefore, it will be helpful to have an updated assessment in 2020 and another opportunity to adjust specifications in 2021 if updated biomass estimates are lower when updated data are incorporated.

All three alternatives have very low probabilities of overfishing (7% for Alternative 1, 2% for Alternative 2a, and 1% for Alternative 2b). Therefore, all three alternatives under consideration are expected to have a *low positive impact* on the Atlantic herring resource, because the probability of overfishing from these fishing levels is low. However, the probability of overfished is still relatively high for all three alternatives, but that is primarily driven by very low recruitment and overall low herring biomass. The estimate of fishing mortality in 2018 is above F_{MSY} (0.58 for updated 2018 projections compared to a F_{MSY} of 0.51). Therefore, fishing levels should be reduced to bring the plan back to a level that would maintain low positive impacts on the resource by keeping fishing mortality below F_{MSY} . For all three alternatives, the projection of F for 2020 is less than F_{MSY} (range of 0.16 to 0.25). The probability of overfished is still high because the biomass is relatively low (ratio of SSB to SSB_{MSY} is about 30% in 2020), and the stock will need some time to recover. Herring biomass is estimated to increase as soon as 2021 if recruitment returns to more average levels, as assumed in the projections.

The differential impacts between the alternatives relate to the size of the buffer between OFL/ABC and the specification of the stock-wide Atlantic herring ACL/OY, i.e., the maximum amount of total annual removals from the U.S. fishery under each of the alternatives. Lower OFL/ABC values likely translates into lower potential impacts on herring biomass from fishing, but the difference between these alternatives is not very large. Therefore, there are likely *negligible* differences between the OFL/ABC alternatives with respect to potential impacts on herring biomass since ABC values differ by less than 10,000 mt (Alternative 1 ABC for 2020 is about 21,000, and Alternative 2b 2020 ABC is about 14,000 mt).

The Atlantic herring ABC specifications under consideration in this action are substantially lower than in 2016-2018 (over 100,000 mt), as well as the NMFS in-season 2018 and 2019 actions (2018 ACL of 49,900 mt and 2019 ABC of 21,266 mt). The reductions considered in this action are expected to prevent overfishing and help the stock recover compared to maintaining recent fishing levels.

There are several specifications in this action that will remain at status quo levels, many of which stem directly from the ACL or are based on applying status quo methods used in previous specification, specifically DAH, DAP, USAP, sub-ACL allocations by herring management area, seasonal sub-ACL allocations, RSA, FGSA, and RH/S catch caps (See Section 4.3). These measures are *not expected to have any measurable impacts* individually on the herring resource, and for the most part have had generally *low positive impacts* on the herring resource to date in terms of helping to prevent overfishing and support goals and objective in the FMP. The potential impacts of these specifications have been analyzed in previous actions and no additional impacts are expected.

Table 32. 2019-2021 OFL and ABC projections for No Action OFL/ABC alternative (Alt. 1) (mt)

	2018	2019	2020	2021
ABC	55,286*	21,266	21,266	21,266
F(ages 7-8)	0.58	0.35	0.25	0.15
SSB	75,488	49,182	53,809	124,738
P(overfishing)	0.69	0.20	0.07	0.01
P(overfished)	0.76	0.87	0.83	0.31
OFL	-	30,668	30,668	30,668
SSB/SSB_{MSY}	0.40	0.28	0.28	0.28

* For 2018, this value is estimated landings, not ABC. Estimated catch from the terminal year is used to calculate OFL and ABC projections for 2019-2021. Note the updated estimate of 2018 catch was used for Alternative 1 and Alternative 2b only, Alternative 2a uses the original estimate of 2018 catch (49,900 mt).

Table 33. Original 2019-2021 OFL and ABC projections reviewed by the SSC in October 2018 (mt)

	2018	2019	2020	2021
ABC	49,900*	21,266	16,131	30,659** 16,131
F(ages 7-8)	0.51	0.33	0.18	0.21
SSB	79,673	52,874	58,617	126,394
P(overfishing)	0.50	0.15	0.02	0.03
P(overfished)	0.72	0.88	0.84	0.26
OFL	49,900	30,668	38,878	59,788
SSB/SSB_{MSY}	0.42	0.28	0.31	0.67

* For 2018, this value is estimated landings, not ABC. Estimated catch from the terminal year is used to calculate OFL and ABC projections for 2019-2021. ** For 2021, the SSC recommended that ABC remain at the 2020 level (16,131 mt) and not increase due to concerns about the assumptions regarding future recruitment. The projected ABC from the model has strike through text (~~30,659 mt~~).

Table 34. Updated 2019-2021 OFL and ABC projections (mt)

	2018	2019	2020	2021
ABC	55,286*	21,266	14,265	29,835*** 14,265
F (ages 7-8)	0.58	0.35	0.16	0.21
SSB	75,488	49,182	56,801	126,054
P(overfishing)	0.69	0.20	0.01	0.03
P(overfished)	0.76	0.87	0.83	0.27
OFL	-	29,024 ** 30,668	40,574	68,718
SSB/SSB_{MSY}	0.40	0.26	0.30	0.67

* This is 2018 estimated landings, not ABC. Terminal year (2018) estimated catch is used to calculate OFL and ABC projections for 2019-2021. **The updated estimate of OFL for 2019 from the projections is 29,024 mt, but the OFL adopted in the 2019 in-season action was based on the original projection that had an OFL estimate of 30,668 mt. Therefore, the OFL in 2019 is 30,668 mt, but for this projection the OFL associated with applying F_{MSY} to SSB is 29,024 mt. This is a relatively small difference with essentially no difference in probability of overfished. *** For 2021, the PDT recommends that ABC equal the 2020 level (14,265 mt) consistent with previous SSC advice not to increase ABC in 2021. The projected ABC from the model has strikethrough text (~~29,835 mt~~), but the PDT recommends reducing 2021 ABC to equal the 2020 ABC.

7.1.3 Management Uncertainty Buffer Alternatives

The range of alternatives under consideration for management uncertainty in this specification package is between about 4,000 mt (Option 2) to just over 6,000 mt (No Action), Option 3 the (*PREFERRED ALTERNATIVE*) is 4,560 mt (Section 4.2.2.1). This buffer reduces the risk of exceeding the ABC from sources of uncertainty within the management plan (i.e., uncertain NB weir or state water catch). Section 6.1.3 includes updated information on the sources of management uncertainty in this fishery: Canadian catch from the New Brunswick weir fishery, state water catch, and estimates of mortality from herring discards.

In general, the larger the buffer the lower the risk for potentially negative impacts on the resource if ABC is exceeded. Because total catch is expected to decrease substantially in this action compared to status quo levels, this buffer is now a larger percentage of total catch. NB weir catch was relatively high in 2018, over 11,000 mt; therefore, a buffer of 4,000-6,000 mt may not be enough to account for that mortality. However, NB weir catch has been highly variable and uncertain, and catches are equally likely to be lower again in 2019-2021. Overall, the range of options under consideration are expected to have *low positive impacts* on the resource, because they all help reduce the risk of exceeding the ABC. Lower herring fishing levels likely translates into lower potential impacts on herring biomass, but the difference between these alternatives is not very large. Therefore, there are likely *negligible* differences between the management uncertainty alternatives with respect to potential impacts on herring biomass since the management uncertainty buffer alternatives differ by just over 2,000 mt.

7.1.4 Border Transfer Alternatives

This action is considering a range of 0 mt (No Action) to up to 250 mt (Alternative 2) (*PREFERRED ALTERNATIVE*) for border transfer, fish allowed to be harvested by U.S. vessels and transferred to Canadian vessels at sea to be used for human consumption (cannery fish). These alternatives have *no direct impact* on the herring resource; this catch is accounted for in the overall ABC, whether this fish is transferred at sea or landed and later transferred by truck has no direct impact on the resource.

7.1.5 Carryover Provisions

This action considered an alternative to temporarily prohibit carryover of unharvested herring catch (Alternative 2) (*PREFERRED ALTERNATIVE*), which is currently an automatic measure allowed in this FMP. In the herring plan any unharvested catch in a herring management area in a fishing year (up to 10% of that area's sub-ACL) shall be carried over and added to the sub-ACL for that herring management area for the fishing year following the year when total catch is determined. Sub-ACLs increase from carryover; however, the regulations specify that the total ACL shall not be increased by carryover.

The 2018 catch estimates are not officially final yet but will likely be very close to final estimates available on the GARFO monitoring website. None of the sub-ACLs were fully harvested in FY2018, each area reached between 80-90% of their sub-ACLs from the 2018 in-season action that reduced initial allocations (Table 35). The regulations specify that all herring landed from a herring management area shall count against that area's sub-ACL, as increased by carryover. For example, if 500 mt of herring is added as carryover to a 5,000 mt sub-ACL, catch in that management area would be tracked against a total sub-ACL of 5,500 mt. NMFS shall add sub-ACL carryover only if the ACL for the fishing year in which there is unharvested herring, is not exceeded. The total ACL for 2018 was not exceeded either, about 88% of the total ACL is the current estimate for total catch.

However, the regulations specify that the ACL shall not be increased by carryover. Also, the fishery is closed in-season in all areas when 95% of the total ACL is projected to be caught. Therefore, if sub-

ACLs increase from carryover from a previous fishing year, but the total ACL does not increase, in-season fishing in some areas could potentially reduce access to other areas if the total ACL is projected to be caught and the fishery is closed in all areas. This could be particularly problematic when total ACL is relatively small and carryover values are a sizeable fraction of the total ACL.

For example, if all unharvested quota from FY2018 is added to the sub-ACLs of each management area in FY2020 that is about 5,000 mt (Table 35). However, the total ACL for 2020 (ranging from 8-16,000 mt depending on the alternative selected in this action) would not increase by the same amount. During FY2020, if higher sub-ACLs are harvested in some areas, there is potential that 95% of the original ACL could be harvested before some areas usually have more intense fishing effort, especially when quotas are relatively low.

Table 35. Estimate of 2018 catch by area and potential underage available for FY2020

Area	Quota (mt)	Cumulative Catch (mt)	Percent Quota Caught	2018 Underage	Carryover to 2020 (10% of Quota*)
1A	27,743	24,814.6	89.40%	2,928.4	2,774.3
1B	2,639	2,156.4	81.70%	482.6	263.9
2	8,200	7,056.2	86.10%	1,143.8	820
3	11,318	9,761.6	86.20%	1,556.4	1,131.8
Total	49,900	43,788.8	87.80%	6,111.2	4,990

Table 35 shows that none of the sub-ACLs were fully harvested in FY2018, each area reached between 80-90% of their sub-ACLs; therefore, about 5,000 mt would automatically carryover to the FY2020 sub-ACLs. Because the total ACL would not increase by carryover there are *no direct impacts* on the resource expected from No Action. There may be low negative impacts on some sub-components of the stock if higher fishing levels are concentrated in fewer areas, and not as spread out as normal fishing patterns in all four herring management areas. However, it is uncertain if the fishery would be able to harvest carryover in some areas before fishing takes place across all herring management areas. Table 36 was developed to evaluate the “worst case” scenario in terms of fishing effort being concentrated in some herring management areas before other areas. For example, Area 1A does not open until June each year, so it is possible that the other three areas (Areas 1B, 2 and 3) could harvest their full 2020 sub-ACL plus all carryover from 2018 before Area 1A opens to the fishery. The total estimate of 2018 carryover for Areas 1B, 2 and 3 combined was 2,215.7 mt, which is more than the 2020 Area 1A sub-ACL.

If all the carryover is harvested in Areas 1B, 2 and 3, and not Area 1A, there may be differential biological impacts on the sub-components of this overall stock. Specifically, if more of the total allocation is harvested on GB and the Mid-Atlantic, there may be low negative impacts on those sub-components, and low positive impacts on the GOM sub-component if that area is closed to fishing due to a closure of the entire directed herring fishery when 95% of the total 2020 ACL is projected to be harvested. However, because carryover is limited to 10% any potential impacts are minimal in nature and not expected to have measurable impacts on the herring resource overall.

Alternative 2 is expected to have *low positive to neutral impacts* on the resource compared to No Action because if carryover is prohibited any impacts on the herring resource will be spatially distributed based on proportions developed in previous actions that were intended to prevent overfishing on one sub-component of the overall herring stock. Any potential impacts are low because carryover is limited to 10%, and it is uncertain if the fishery will ultimately fish more in one area than another, or fishing

patterns could end up being like overall spatial proportions by herring management area. Therefore, any potential impacts are minimal in nature and not expected to have measures impacts on the herring resource overall.

Table 36. Summary of herring management area allocations under the preferred alternative for 2020 specifications with and without carryover allowed (both in green)

FY 2020	OFL	ABC	MU (Opt. 3) (Pref)	ACL	1A	1B	2	3	2018 underage	2018 carryover (10% limit)
Area % allocations					28.9%	4.3%	27.8%	39.0%		
OFL/ABC Alt. 2a	41,830	16,131	4,560	11,571	3,344	498	3,217	4,513	6,111	4,990
0.95 of total ACL				10,992						
0.92 of each sub-ACL					3,076	458	2,960	4,152		
						Area 1A (mt)		Area 1A 2020 sub-ACL %		
No Action (Alt. 1) (2020 Area 1A sub-ACL - carryover from 2018 for Areas 1B, 2, and 3)								1,128		9.8%
Alt 2 - prohibit carryover in 2020 and 2021								3,344		28.9%

7.2 IMPACTS ON NON-TARGET SPECIES (BYCATCH)

Non-target species refers to species other than Atlantic herring which are caught/landed by federally permitted vessels while fishing for herring. Most 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 part of the year in the southern New England and Mid-Atlantic areas and is therefore not considered a 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. There are accountability measures in place for both haddock and river herring/shad if area and gear specific catch cap is exceeded. Dogfish, squid, butterfish and Atlantic mackerel are also common species encountered in the directed Atlantic herring fishery. However, in some cases (especially Atlantic mackerel), while herring is often the target species, mackerel is also landed and some trips are quite mixed in terms of mackerel and herring landings. Therefore, Atlantic mackerel is not considered a non-target species since there can be substantial landings of that species for various segments of the fishery during certain seasons and in certain areas, Section 6.2 has more information about non-target species in the herring fishery.

Different gear types and seasonal fishing activity have different potential impacts on non-target species. This section focuses on the biological impacts on species caught incidentally in the herring fishery; these analyses are largely qualitative and based on whether alternatives under consideration are expected to shift effort to areas that may have increased interactions or change gear types that can have differential impacts on bycatch rates.

7.2.1 Overfishing/Overfished Definition

Alternative 1 would keep the current overfishing definition for the Herring FMP. Alternative 2 (*PREFERRED ALTERNATIVE*) would update the overfishing definition to be more consistent with the 2018 assessment and Amendment 8. Both alternatives are primarily administrative; therefore, *no direct impacts* on non-target species.

7.2.2 OFL/ABC Alternatives

Overall, all three alternatives, including Alternative 2a (*PREFERRED ALTERNATIVE*) are expected to have *low positive to neutral impacts* on non-target species compared to recent fishing levels because all three have substantially lower OFL and ABC values than recent years (FY2016-2018). Under this action herring fishing in general is expected to decline compared to recent years, thus overall impacts on non-target species should be low positive since interaction risks will likely be lower. However, less effort does not always translate directly into less bycatch since bycatch rates vary by area and season. The bycatch caps in place are what directly limit bycatch in the fishery, and because the bycatch caps are proposed to stay the same under this action it is possible that the fishery will catch the same amount of haddock and RH/S even under lower herring quotas; therefore more neutral impacts are possible as well.

There are likely *negligible* differences between the OFL/ABC alternatives with respect to potential impacts on non-target species since ABC values differ by less than 10,000 mt (Alternative 1 ABC for 2020 is about 21,000, and Alternative 2b 2020 ABC is about 14,000 mt). However, Alternatives 2a and 2b would be more positive than the status quo (At.1) because these alternatives would likely result in effort/catch that is lessened by one-third to one-half of that expected for Alternative 1.

There are several specifications in this action that will remain at status quo levels, many of which stem directly from the ACL or are based on applying status quo methods used in previous specification, specifically DAH, DAP, USAP, sub-ACL allocations by herring management area, seasonal sub-ACL allocations, RSA, FGSA, and RH/S catch caps (See Section 4.3). Overall, these measures are *not expected to have any measurable impacts* on non-target species and the potential impacts of these specifications have been analyzed in previous actions and no additional impacts are expected.

The river herring/shad catch caps are expected to have *positive impacts* on non-target species by reducing bycatch. These caps are in place to provide incentive for the fishery to avoid and reduce RH/S bycatch. While these caps have remained at the same level, while the herring fishery allocations have declined, these caps are still expected to provide enough incentive for the fishery to continue to reduce RH/S bycatch to the extent practicable. Many herring vessels also participate in the mackerel fishery that has a separate RH/S catch cap that was reached in 2018 and 2019 closing the directed mackerel fishery. There are positive signals from some river systems that some RH/S populations are improving. Therefore, these caps should continue to help reduce bycatch, especially if bycatch rates increase as RH/S populations recover and potential interactions with the herring/mackerel fisheries potentially increase.

7.2.3 Management Uncertainty Buffer Alternatives

The range of alternatives under consideration for management uncertainty in this specification package is between about 4,000 mt (Option 2) to just over 6,000 mt (No Action), and Option 3 is 4,560 mt (*PREFERRED ALTERNATIVE*) (Section 4.2.2.1). The impacts of these buffer options are already accounted for in the impacts of the overall ABC, and are similar to the impacts discussed in that section, *low positive to neutral* (7.2.2). The overall reduction is removed across the entire fishery allocation, and a relatively small proportion is returned after October 1 if the NB weir fishery is not estimated to catch the full set-aside. There are *negligible* differences between the management uncertainty buffer alternatives with respect to potential impacts on non-target species; a difference of 2,000 mt is a relatively small amount compared to the full OFL/ABC, thus minimal differences in terms of impacts on non-target species between the alternatives.

7.2.4 Border Transfer Alternatives

This action is considering a range of 0 mt (No Action) to up to 250 mt (Alternative 2) (*PREFERRED ALTERNATIVE*) for border transfer, fish allowed to be harvested by U.S. vessels and transferred to Canadian vessels at sea to be used for human consumption (cannery fish). These alternatives have *no direct impact* on non-target species because these alternatives are related to whether fish is transferred at sea or landed and later transferred by truck; therefore, no differential impacts on non-target species.

7.2.5 Carryover Provisions

This action considered an alternative to temporarily prohibit the current allowance for up to 10% of unharvested herring catch per area to carryover to a future fishing year (Alternative 2). In general, allowing carryover (No Action) has a range of *neutral to low positive* impacts on non-target species depending on what it is compared to. If carryover was prohibited and the fishery was not able to harvest the full allocation in a given fishing year, there may be low positive impacts on non-target species from lower effort levels overall. In this plan – carryover is limited to 10% of unused quota per area. Under Alternative 2, carryover would be prohibited, which could have *low positive* impacts on non-target species if the fishery does not harvest their full allocation in a given fishing year.

One complication is that Area 1A does not open until June each year, so it is possible that the other three areas (Areas 1B, 2 and 3) could harvest their full 2020 sub-ACL plus all carryover from 2018 before Area 1A opens to the fishery in 2020. If all the carryover is harvested in Areas 1B, 2 and 3, and not Area 1A, there may be very small differential spatial impacts on non-target species on GB and the Mid-Atlantic compared to the GOM (reduced potential impacts for GOM if little or no fishing occurs in that area in 2020 if the overall fishery is closed before that area opens). However, overall herring fishing levels are expected to be much lower in 2020 and 2021 compared to levels approved in the previous specification package (2016-2018) and changes in fishing patterns are uncertain.

7.3 IMPACTS ON PROTECTED SPECIES

Protected species are those afforded protections under the Endangered Species Act (ESA; species listed as threatened or endangered under the ESA) and/or the Marine Mammal Protection Act (MMPA). Section 6.3 lists protected species that occur in the affected environment of the Atlantic herring FMP and the potential for the fishery to impact the species, specifically via interactions with fishing gear predominantly used in the Atlantic herring fishery (i.e. midwater trawl and purse seine gear). Some species of seabirds are protected under the ESA, and others are not but are predator species of Atlantic herring. The protected species potentially affected by this action are sea turtles, small cetaceans, pinnipeds, Atlantic sturgeon, and some species of seabirds.

The most predominant gear types used in the herring fishery are purse seines and midwater trawls. To evaluate the impacts on protected species and seabirds, it is important to note that most landings is by the midwater trawl fishery, but most activity in terms of trips and permits is to purse seine vessels. Section 6.5.1 characterizes the fishing days, number of trips, and pounds landed by area and gear type. Although herring fishing is a year-round activity, takes of protected species and seabirds are more likely to occur in specific seasons, not throughout the year. In addition to the potential impacts from incidental takes, this section also assesses the potential impacts on protected species and seabirds in terms of forage impacts. Some protected species and seabirds in this region prey on Atlantic herring.

NMFS, relatively recently, concluded that the Atlantic Herring FMP will not adversely affect or jeopardize the continued existence of any ESA listed species of cetacean, sea turtle, or fish (NMFS 2014a). With respect to this action, there will not be major changes in the amount or areas that herring

vessels fish from most of the alternatives under consideration. The alternatives under consideration that may impact herring fishing patterns directly are identified, and potential impacts are described. Discussions regarding potential interactions with protected species and seabirds as well as impacts on prey availability are largely qualitative. The alternatives under consideration are evaluated below in terms of whether they are expected to greatly change the availability of herring as prey, as well as whether they will change fishing effort in time and space, such that, relative to current operating conditions, interaction risks to protected species change.

7.3.1 Overfishing/Overfished Definition

Alternative 1 would keep the current overfishing definition for the Herring FMP. Alternative 2 (*PREFERRED ALTERNATIVE*) would update the overfishing definition to be more consistent with the 2018 assessment and Amendment 8. Both alternatives are primarily administrative; therefore, *no direct or indirect impacts* on protected species are expected.

7.3.2 OFL/ABC Alternatives

All three alternatives, including Option 2a (*PREFERRED ALTERNATIVE*) have substantially lower OFL and ABC values compared to status quo fishing levels from the last few specifications packages, 2013-2015 and 2016-2018. As a result, herring fishing, in general, is expected to decline compared to recent years. Interaction risks with protected species are strongly associated with the amount of gear in the water, gear soak or tow time, as well as the area of overlap, either in space or time, of the gear and a protected species (with risk of an interaction increasing with increases in any or all of these factors). All three alternatives are not expected to result in elevated effort - increased interaction risks with protected species are not expected. Given this information, and the fact that effort may decline under all three alternatives, interaction risks have the potential to decrease compared to status quo fishing levels. While this may provide some benefit to protected species, because interactions can still occur, even under a reduced effort scenario, impacts to protected species from any of the three alternatives are expected to be low negative.

Regarding foraging impacts, as all three alternatives are expected to result in a reduction in fishery removals, which would potentially provide more herring in the ecosystem compared to status quo levels. As a result, there may be more forage available for protected species that prey on herring. Given this, impacts to protected species from any of the three alternatives are expected to be low positive in regards to foraging.

Given the above information, overall, impacts to protected species from all three alternatives are expected to range from *low negative (related to fishing interaction risk)* to *low positive (related to potential forage impacts)*. Relative to each other, the impacts to protected species from all three alternatives are neutral since the difference of ABC between the alternatives is less than 10,000 mt.

There are several specifications in this action that will remain at status quo levels, many of which stem directly from the ACL or are based on applying status quo methods used in previous specification, specifically DAH, DAP, USAP, sub-ACL allocations by herring management area, seasonal sub-ACL allocations, RSA, FGSA, and RH/S catch caps (See Section 4.3). Overall, these measures are *not expected to have any measurable impacts* on protected species and are primarily administrative. Overall, the potential impacts of these specifications have been analyzed in previous specification packages and no additional impacts are expected. Given this, these measures are expected to result in no direct or indirect impact on protected species.

7.3.3 Management Uncertainty Buffer Alternatives

The range of alternatives under consideration for management uncertainty in this specification package is between about 4,000 mt (Option 2) to just over 6,000 mt (No Action), and Option 3 (*PREFERRED ALTERNATIVE*) is 4,560 mt (Section 4.2.2.1). The impacts of these buffer options are already accounted for in the impacts of the overall ABC, and are similar to the impacts discussed in that section (7.3.2). Overall, the impacts of these measures on protected species is expected to be similar to current operating conditions meaning there are still interaction risks to protected species from herring fishing activity, but no greater than what has been observed in the fishery; therefore, *low negative* impacts are expected for all options. A relatively small proportion (1,000 mt) of this management uncertainty buffer is returned to the fishery after October 1 if the NB weir fishery is not estimated to catch the full amount set-aside. There are *negligible* differences between the management uncertainty buffer alternatives with respect to potential impacts on protected species because the difference between the options is very small, under 2,000 mt.

7.3.4 Border Transfer Alternatives

This action is considering a range of 0 mt (No Action) to up to 250 mt (Alternative 2) (*PREFERRED ALTERNATIVE*) for border transfer, fish allowed to be harvested by U.S. vessels and transferred to Canadian vessels at sea to be used for human consumption (cannery fish). These alternatives have *no direct or indirect impact* on protected species because these alternatives are related to whether fish is transferred at sea or landed and later transferred by truck; therefore, no differential impacts on protected species. This is essentially an administrative action that allows for some level of this activity within the overall ABC for the fishery, it is not additional catch.

7.3.5 Carryover Provisions

This action considered an alternative to temporarily prohibit the current allowance for up to 10% of unharvested herring catch per area to carryover to a future fishing year (Alternative 2) (*PREFERRED ALTERNATIVE*). Under the No Action (allowing carryover), changes in fishing behavior and effort are not expected to greatly differ from current operating conditions in the fishery. Interaction risks with protected species are strongly associated with the amount of gear in the water, gear soak or tow time, as well as the area of overlap, either in space or time, of the gear and a protected species (with risk of an interaction increasing with increases in any or all of these factors). As the No action alternative is not expected to change any of these operating conditions, increased interaction risks with protected species are not expected. Given this information, the No Action alternative is expected to result in *low negative* impacts to protected species. However, relative to Alternative 2, Alternative 1 is expected to result in negative impacts to protected species.

Under Alternative 2, carryover would be prohibited. If carryover was prohibited and the fishery was not able to harvest the full allocation in a given fishing year, overall effort levels could decrease in the fishery.

One complication under this alternative is that Area 1A does not open until June each year, so it is possible that the other three areas (Areas 1B, 2 and 3) could harvest their full 2020 sub-ACL plus all carryover from 2018 before Area 1A opens to the fishery in 2020. If all the carryover is harvested in Areas 1B, 2 and 3, and not Area 1A, there may be very small differential spatial impacts on protected species on GB and the Mid-Atlantic compared to the GOM (reduced potential impacts for GOM if little or no fishing occurs in that area in 2020 if the overall fishery is closed before that area opens). However, overall herring fishing levels are expected to be much lower in 2020 and 2021 compared to levels approved in the previous specification package (2016-2018) and changes in fishing patterns are uncertain. Given the above information, specifically the high likelihood that effort will be lower in 2020 and 2021,

interactions risks to protected species may decrease under Alternative 2. While this may provide some benefit to protected species, as interactions can still occur, even under a reduced effort scenario, impacts to protected species are expected to be *low negative*. Based on this, relative to Alternative 1, Alternative 2 is expected to result low positive impacts to protected species given the likelihood that effort, and thus, risk of interacting with a protected species will decline.

7.4 IMPACTS ON PHYSICAL ENVIRONMENT AND ESSENTIAL FISH HABITAT

Since 1996, the MSA has included a requirement to evaluate the potential adverse effects of fisheries, including the Atlantic herring fishery, on the essential fish habitat (EFH) of Atlantic herring and other species. A general description of the physical environment and EFH is in the Affected Environment (Section 6.4). The EFH regulations specify 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 fishing 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 management 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 an 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 described for each alternative under consideration. However, changes in the magnitude of fishing effort resulting from 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 (described below) have concluded that adverse effect to EFH that result from operation of the herring fishery do not exceed the more than minimal or 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 Northeastern 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 used by 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 due to 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.

Atlantic herring vessels primarily use purse seines, single midwater trawls or midwater pair trawls, and bottom trawls to direct on herring, with the MWT fleet harvesting most landings since 2008. Bottom trawls are the only gear in this fishery that has adverse impacts on EFH, and those vessels have only represented about 5% of total herring landings since 2008 and are primarily concentrated in SNE (See Section 6.5.1.2 for more details). There are also smaller scale operations that land herring with bottom trawls under a Category C permit, mostly in the GOM.

7.4.1 Overfishing/Overfished Definition

Alternative 1 would keep the current overfishing definition for the Herring FMP. Alternative 2 (*PREFERRED ALTERNATIVE*) would update the overfishing definition to be more consistent with the 2018 assessment and Amendment 8. Both alternatives are primarily administrative; therefore, *no direct impacts* on EFH are expected.

7.4.2 OFL/ABC Alternatives

Overall, the three alternatives evaluated in Framework 6 will lead to substantially lower OFL and ABC values compared to status quo fishing levels from the last few specifications packages, 2013-2015 and 2016-2018. Thus, herring fishing is expected to decline regardless of the alternative selected, and thus overall impacts on EFH are also expected to decline. The EFH impacts assessment described above found that the impacts of the fishery on EFH are minimal and/or temporary and, pursuant to MSA, do not need to be minimized. While in general herring fishing gear has the potential to occasionally contact the seafloor and have negative impacts on EFH (bottom trawl gear in particular), as noted above, bottom trawl gear use is very limited (See Section 6.5.1.2 for more details). Furthermore, this action considers alternatives with lower catch levels, so any potential impacts would be lower than status quo levels; therefore, *neutral* impacts on the physical environment and EFH are expected relative to No Action alternative. With any of the Framework 6 OFL/ABC alternatives in place, the impacts of the herring fishery on EFH are expected to be at worst low negative, not exceeding minimal and temporary thresholds.

The gears used to prosecute the herring fishery and the general locations fished have not changed since the 2005 assessment was completed, nor has our understanding of how herring fishing gear might interact with seafloor habitats. In particular, we continue to assume that midwater herring gear does not have substantial contact with the seafloor while fishing. Furthermore, the specifications evaluated in Framework 6 will result in a smaller magnitude of effort compared to previous years, which further reduces the likelihood of adverse effects resulting from the fishery. While gear switching could occur under the localized depletion midwater trawl closures recommended in Amendment 8 to the fishery management plan, altering the magnitude of the fishery's impacts to EFH, Amendment 8 is pending approval so no particular outcome is assumed for the purpose of this analysis.

There are small, but likely negligible differences between the OFL/ABC alternatives with respect to potential impacts on EFH since ABC values differ by less than 10,000 mt (Alternative 1 ABC for 2020 is about 21,000, and Alternative 2b (*PREFERRED ALTERNATIVE*) 2020 ABC is about 14,000 mt). Despite possible variations in fishing effort between the OFL/ABC alternatives, given the minimal and temporary nature of adverse effects on EFH in the Atlantic herring fishery, these alternatives are expected to have *neutral* impacts relative to one another on the physical environment and EFH.

There are several specifications in this action that will remain at status quo levels, many of which stem directly from the ACL or are based on applying status quo methods used in previous specification, specifically DAH, DAP, USAP, sub-ACL allocations by herring management area, seasonal sub-ACL allocations, RSA, FGSA, and RH/S catch caps (See Section 4.3). Overall, these measures are primarily administrative and are *not expected to have any measurable impacts* on EFH. Overall, the potential impacts of these specifications have been analyzed in previous specification packages and no additional impacts are expected. Given this, these measures are expected to result in no direct or indirect impact on EFH.

7.4.3 Management Uncertainty Buffer Alternatives

The range of alternatives under consideration for management uncertainty in this specification package is between about 4,000 mt (Option 2) to just over 6,000 mt (No Action); the *PREFERRED ALTERNATIVE* is 4,560 mt (Option 3) (Section 4.2.2.1). The impacts of these buffer options are already accounted for in the impacts of the overall ABC, and are similar to the impacts discussed in that section (7.4.2). Overall, the impacts of these measures on the physical environment and EFH are expected to be similar to current operating conditions meaning there are occasional risks that herring gear comes into contact with the bottom, but given the minimal and temporary nature of adverse effects on EFH in the Atlantic herring fishery, and the minor differences between 4,000 and 6,000 mt at the scale of the fishery overall, these alternatives are expected to have *neutral* impacts on the physical environment and EFH.

A relatively small proportion (1,000 mt) of this management uncertainty buffer is returned to the fishery after October 1 if the NB weir fishery is not estimated to catch the full amount set-aside. There are *negligible* differences between the management uncertainty buffer alternatives with respect to potential impacts on protected species because the difference between the options is very small, under 2,000 mt.

7.4.4 Border Transfer Alternatives

This action is considering a range of 0 mt (No Action) up to 250 mt (Alternative 2) (*PREFERRED ALTERNATIVE*) for border transfer, i.e. fish allowed to be harvested by U.S. vessels and transferred to Canadian vessels at sea to be used for human consumption. These alternatives have *no direct impact* on EFH because they are related to whether fish is transferred at sea or landed and later transferred by truck.

7.4.5 Carryover Provisions

No Action (Alternative 1) allows up to 10% of an area's sub-ACL to carryover, increasing the area's sub-ACL in a later year. In practice, quota from year 1 is carried over during year 3. During year 3, an area can be fished up to the year 3 sub-ACL plus year 1 carryover. However, regardless of carryover, the total year 3 ACL cannot be exceeded, even if the sub-ACLs with carryover sum to a value that is larger than the year 3 ACL. In practice, this means that areas opening later (i.e. Area 1A) could be quota limited due to harvest of carryover in other areas earlier in the fishing year. For this reason, Framework 6 included an alternative to temporarily prohibit carryover of unharvested herring catch (Alternative 2) (*PREFERRED ALTERNATIVE*). Under No Action, carryover values for FY 2020 would be large relative to the ACL, and therefore there could be no or little ACL remaining by the time Area 1A opens on June 1. Thus, No Action could lead to a greater proportion of fishing occurring on Georges Bank and in the Mid-Atlantic, if there is a race to harvest the sub-ACLs for those areas, including carryover. Under Alternative 2 without carryover, the current allocations by herring management area would be preserved, thus, fishing would occur in proportion to the 2020 sub-ACLs, subject to resource availability and other constraints.

Because ultimately the total ACL is constraining, fishing effort levels are expected to be similar under No Action and Alternative 2. Less effort might occur in Area 1A under No Action with carryover than would be expected under Alternative 2 without carryover. Alternatively, especially in the case where a river herring/shad catch cap causes the closure of a given area, less effort and catch could occur overall under Alternative 2 (without carryover). Despite possible variations in spatial fishing effort between the two alternatives, given the minimal and temporary nature of adverse effects on EFH in the Atlantic herring fishery, choice about carryover is expected to have a *negligible* impact on the physical environment and EFH.

7.5 IMPACTS ON HUMAN COMMUNITIES

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); dealers and processors; final users of fish products; 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.

Economic impacts. 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 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 would include participants in the mackerel and lobster fisheries.

Social impacts. The social impact factors outlined below help describe the 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 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).

General impacts of Atlantic herring fishery specifications on human communities

Human communities are impacted by Atlantic herring fishery specifications as they set harvest levels for the fishery. Lowering the Atlantic herring ABC (and associated catch limits) could result in short-term revenue reductions, which may, in turn, have negative impacts on employment and the size of the Atlantic herring fishery within fishing communities, with ripple effects on the communities involved in the Atlantic mackerel and American lobster fisheries. Likewise, increasing allowable harvests would likely have positive short-term impacts on fishing communities. In the long term, ensuring continued, sustainable harvest of the resource not only benefits the directed herring fishery and its communities, but indirect fisheries that rely on herring as prey in the ecosystem.

The specific communities that may be impacted by this action are identified in Section 6.5. This includes 17 primary ports in the Atlantic herring fishery (e.g., Gloucester, Portland, New Bedford, Rockland; Table 30) within a list of about 140 key communities from Maine to New Jersey that are important to the

Atlantic herring, Atlantic mackerel, American lobster, bluefin tuna, groundfish, and recreational fisheries, and to ecotourism (NEFMC 2018a, Section 3.6.3.2.2). Many of these fisheries and ecotourism coexist within a given port. The communities more involved in the Atlantic herring fishery are likely to experience more direct impacts of this action, though indirect impacts may be experienced across all the key communities. As these specifications largely affect stock-wide harvest levels, impacts would likely occur across the communities that participate in the Atlantic herring and other potentially affected fisheries, proportional to their degree of participation in the fisheries.

This analysis assumes that the directed Atlantic herring fishery will not get shut down by the RH/S catch caps (Section 4.3.8), the negative consequences of which are described in the 2016-2018 specifications document (NEFMC 2016a, Section 7.5.2).

7.5.1 Overfishing/Overfished Definition

Alternative 1 would keep the current overfishing definition for the Herring FMP. Alternative 2 (*PREFERRED ALTERNATIVE*) would update the overfishing definition for the Herring FMP. Both alternatives are administrative and would have no direct impacts on human communities, positive or negative. Since Alternative 1 does not encompass other possible scenarios resulting from a future stock assessment, it may not reflect the best available science, leading to an *indirect low negative* impact on the attitudes and beliefs of fishermen and other stakeholders towards management. Alternative 2 does encompass other possible scenarios resulting from a stock assessment, so the impacts of Alternative 2 would be *indirect and low positive* relative to Alternative 1. Alternative 2 would also be a more streamlined approach, which may contribute to more positive attitudes towards management if administrative efficiencies are gained.

7.5.2 OFL/ABC Alternatives

Alternatives. Under No Action (Alternative 1), the 2019 Atlantic herring OFL and ABC implemented by the 2019 in-season adjustment would be maintained (Table 6). Atlantic herring ABC would be 21,266 mt for 2019-2021, which is higher than the SSC recommendation for 2020 and 2021. Under Alternative 2a (*PREFERRED ALTERNATIVE*), Atlantic herring ABC would be set for 2019 and 2020 based on the ABC control rule recommended through Amendment 8 (21,266 mt and 16,131 mt, respectively; Table 7). ABC for 2021 would be the same as for 2020 accounting for the uncertainty in the projections, rather than the higher value that would be set using the control rule alone (30,659 mt). Under Alternative 2B, Atlantic herring ABC would be set as for Alternative 2a but using updated 2018 catch estimates. The ABC for 2019 would be 21,266 mt and for 2020 and 2021 would be 14,265 mt (Table 8).

Overall impacts. Each alternative would continue substantially reduced catch limits and revenue relative to recent years, but there would be a degree of predictability for fishing industry operations provided by a three-year specifications process. The social and economic impacts of Alternative 1 on herring fishery-related businesses and communities are expected to be *negative*. With no change in the ABC from what was already implemented in 2019, there would be a degree of constancy and predictability for fishing industry operations and a steady supply to the market. While it is possible that the size and demographic characteristics of the fishery-related workforce would remain unchanged relative likely be unchanged, as would the dependence on and participation in the fishery – relative to the conditions currently expected for 2019.

The social and economic impacts of Alternatives 2a and 2b on herring fishery-related businesses and communities are expected to be negative and low negative relative to Alternative 1. While the ABC for 2019 would be unchanged from what was already implemented in 2019, the ABC for 2020 and 2021 would be lower by about 24% and 33%, respectively, relative to Alternative 1. The size and demographic

characteristics of the fishery-related workforce and the dependence on and participation in the fishery – would remain unchanged relative to the conditions currently expected for 2019, it is also possible that continuing the vast reductions implemented in 2019 for additional years would result in negative economic consequences, including further reductions to the size of the herring fishing fleet/industry.

Short term. In the short term, each alternative may prevent a viable herring fishery such that businesses may fail. Each business’s dependence on herring as a percentage of total entity revenue varies. A decrease in ABC, under Alternatives 2a and 2b, may adversely affect permitted entities with larger percentages of annual revenue from herring. As of 2017, there were about 36 small businesses and 3 large businesses actively fishing for herring. The 17 small businesses with Category A permits derived an average of 50% of their annual revenue from herring in 2017, while those small businesses with B and C permits derived only 3.4% of their annual revenue from herring. It is difficult to forecast the market price for herring but declines in herring catch in recent years have been associated with increases in 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 relative to 2018 and prior. Expected annual landings revenue would be highest under Alternative 1 (\$7.741M-\$8.875M), and lowest for Alternative 2b (\$4.044M-\$5.278M) for 2020 and 2021, depending upon the chosen management uncertainty buffer (Table 37). The expected revenue under each alternative is substantially lower than that of recent years, generally above \$20M per year (Section 6.5.1.5).

Table 37. Expected annual revenue from herring landings under each alternative, 2020 and 2021.

	2020	2021
Alternative 1	\$7.741M	\$8.875M
Alternative 2a	\$5.103M	\$6.237M
Alternative 2b	\$4.044M	\$5.278M

Notes: used average annual price metric ton of herring for 2016-2018 (Section 6.5.1.5).

Long term. In the long term, the impacts of each alternative are expected to be *mixed*. Because the ABC (and ACL) would be substantially below the overfishing limit, they would likely result in greater herring biomass available for future years and contribute to rebounding of the stock. Alternative 1 has more long-term risk relative to Alternatives 2a and 2b, because the OFL and ABC in 2020 and 2021 would exceed the SSC recommendations (Alternative 2b has the least long-term risk). However, if businesses fail in the short term, they would receive no long-term benefit from these restrictions and the benefits would accrue to the businesses that remain viable.

Status Quo measures. There are several specifications in this action that will remain at status quo levels, many of which stem directly from the ACL or are based on applying status quo methods used in previous specification, specifically DAH, DAP, USAP, sub-ACL allocations by herring management area, seasonal sub-ACL allocations, RSA, FGSA, and RH/S catch caps (See Section 4.3).

The formulas for many of these specifications would remain unchanged from 2016-2018 specifications. Thus, the impacts of these specifications are unlikely to differ from what was considered in prior actions. For example, the impacts of the FGSA on the herring fishery-related businesses and communities are expected to be *negligible*. There is a historic fixed gear fishery in eastern Maine that would be allowed to continue, albeit at a reduced level. Setting the FGSA proportional to the decreases in catch limits would likely be considered fair to the rest of the fishery, a positive impact to the attitudes and beliefs of herring fishermen.

7.5.3 Management Uncertainty Buffer Alternatives

The alternatives for the management uncertainty buffer in this action are between about 4,000 mt (Option 2) to just over 6,000 mt (No Action). This buffer reduces the risk of exceeding the ABC from sources of uncertainty within the management plan (i.e., uncertain NB weir or state water catch). There is no overage deduction in future years for U.S. vessels if the Canadian harvest exceeds the management uncertainty buffer. However, exceeding the ABC may have negative biological impacts, which may lead to negative social and economic impacts in the future if lower catch limits are required to ensure sustainable harvests. Since the New Brunswick weir fishery caught about 11,502 mt in 2018 alone (Table 27), there is a chance that each alternative may result in exceeding the ABC, which would have long-term negative consequences for the U.S. fishery if lower catch levels are necessary in the future. The NB weir catch is very variable with no apparent trends; thus, impacts are somewhat uncertain.

No Action. The social and economic impacts of No Action on herring fishery-related businesses and communities are expected to be uncertain (catches from state and Canadian weir fishery vary) but generally *low positive* because this measure helps prevent the fishery from exceeding the ABC. A buffer of 6,200 mt may be more conservative than necessary to account for the sources of uncertainty included in the buffer; therefore, less positive for the fishery compared to Options 1-3 that have lower buffers.

Option 1. The social and economic impacts of Option 1 on herring fishery-related businesses and communities are expected to be *uncertain but potentially low positive*, as above. Impacts would be slightly low positive relative to No Action, as 312 mt more herring would be available to the U.S. fishery (a slightly higher ACL).

Option 2. The social and economic impacts of Option 2 on herring fishery-related businesses and communities are expected to be *uncertain but potentially low positive*, as above. Impacts would be slightly low positive relative to No Action and Option 1, as 2,208 mt and 1,896 mt more herring, respectively, would be available to the fishery (a slightly higher ACL).

Option 3 (PREFERRED ALTERNATIVE). The social and economic impacts of Option 3 on herring fishery-related businesses and communities are expected to be *uncertain but potentially low positive*, as above. Impacts would be slightly low positive relative to No Action and Option 1, as 1,640 mt and 1,328 mt more herring, respectively, would be available to the fishery (a slightly higher ACL). Impacts would be low negative relative to Option 2, as 568 mt less herring would be available.

7.5.4 Border Transfer Alternatives

The alternatives would set at-sea border transfer at 0 mt for FY2020 and FY2021 (No Action) or at a value up to 250 mt (Alternative 2). The value selected would determine how much herring U.S. vessels would be permitted to transfer at-sea to Canadian vessels. If permitted, vessels would be subject to additional reporting requirements for border transfer and the herring could only be used for human consumption (processed in Canadian canneries). The Council selected Alternative 2 as the **PREFERRED ALTERNATIVE** at a value of 100 mt.

The impacts on the Atlantic herring fishery of setting BT at 0 mt are expected to be *negligible to low negative*. Setting BT at a value above 0 would have *low positive* impacts relative to No Action (i.e., 100 mt). Given that the ABCs for 2019-2021 will be much lower than in recent years, the demand for the use of herring as bait is expected to be high. It is expected that the revenue to herring vessels for selling herring as bait would be higher than if the catch was transferred to Canadian vessels and ultimately sold for human consumption. Thus, it is likely that even if border transfer is set at 250 mt, it would not be used due to economics. However, there are close and long-standing trading partnerships between U.S. and Canadian fisheries, importing or exporting bait for lobster fisheries as supply and demand necessitate. If

border transfer is set at 0 mt, business relationships with Canadian partners may sour if Canadians perceived this as an effort to tamp down on trade.

Herring vessels based in Maine have traditionally been most involved in border transfer activity, so the ports therein would likely benefit the most from any transfer activity. However, should trade relations with Canada deteriorate, negative impacts may be felt by ports throughout the herring fishery (export declines) as well as the lobster fishery (bait import declines).

Impacts on the U.S. American lobster fishery are expected to be negligible under No Action and Alternative 2. If border transfer was set at 0 mt, herring could still be sold to Canadian buyers via terrestrial shipment (i.e., on trucks), however, even if some amount of at-sea border transfer was allowed, it is most likely that it would not be used due to the high demand for bait in the U.S. lobster fishery.

7.5.5 Carryover Provisions

Alternative 1/No action would allow carryover of unharvested catch in up to 10% of each sub-ACL, while not increasing the overall ACL. The numbers are still preliminary, but about 4,990 mt of unharvested quota from 2018 would be available for rollover to FY2020 under No Action. Under Alternative 2, unharvested quota from the 2018 herring management area sub-ACLs would *not* automatically rollover to FY2020 herring management area sub-ACLs. Similarly, if there is unharvested quota at the end of FY2019, it would not rollover to FY2021. This alternative is intended to be temporary, for this specifications package only.

The social and economic impacts of Alternative 1 are expected to be *low negative*. The carryover provision is meant to help achieve optimize yield, by giving flexibility to access unharvested catch from an earlier year. However, the amount of carryover from 2018 (just under 5,000 mt) is a substantial amount (43%) relative to the 2020 total ACL (about 11,500 mt under the preferred alternative). There could be negative impacts for some members of the herring fishery if certain areas close before herring is typically harvested there because the overall ACL has been reached. For example, the purse seiners might not have access to Area 1A in the summer if fishing in Areas 2 and 3 earlier in the year reached the ACL.

The social and economic impacts of Alternative 2 are *low positive* relative to Alternative 1. While the fishery would not have access to the unharvested catch from 2018 (and potentially from 2019), there is less chance that fishing in certain areas would preclude fishing in others under the present circumstances. There would be less incentive under Alternative 2 to race to fish and there would be fewer negative distributional impacts across vessels that traditionally harvest in specific areas. Conflicts within the fishery may be lower under Alternative 2, a positive impact on the attitudes, beliefs and values of fishermen. As Alternative 2 includes a sunset, these impacts would be short-term.

7.6 CUMULATIVE EFFECTS

7.6.1 Introduction

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 policy and procedures for NEPA, found in NOAA Administrative Order 216-6A (Companion Manual, January 13, 2017). 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 but 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 in this action together with past, present, and reasonably foreseeable

future actions that affect the human environment. The predictions of potential synergistic effects from multiple actions, past, present and/or future are generally qualitative.

Valued Ecosystem Components (VEC)

The valued ecosystem components for the Atlantic herring fishery are generally the “place” where the impacts of management actions occur, and are identified as in Section 6.0:

1. Target species (Atlantic herring);
2. Non-target species;
3. Protected species;
4. Physical environment and essential fish habitat; and
5. Human communities.

The CEA identifies and characterizes the impact on the VECs by the alternatives under consideration when analyzed in the context of other past, present, and reasonably foreseeable future actions. To enhance clarity and maintain consistency, terms are as defined in Table 31.

Temporal Scope of the VECs

While the effects of historical fisheries are considered, the temporal scope of past and present actions for herring stocks, non-target species, habitat and the human environment is primarily focused on actions that have taken place since implementation of the initial FMP in 2001. An assessment using this timeframe demonstrates the changes to resources and the human environment that have resulted through management under the Council process and through U.S. prosecution of the fishery, rather than foreign fleets. For protected species, the context is largely focused on the 1980s and 1990s, when NMFS began generating stock assessments for marine mammals and turtles that inhabit waters of the U.S. EEZ.

The temporal scope of future actions for all VECs extends about five years (2024) into the future beyond the analyzed time frame of the alternatives described in this document. The dynamic nature of resource management for this 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 this section are focused on the cumulative effects of the proposed action (i.e., the suite of preferred alternatives) in combination with the relevant past, present, and reasonably foreseeable future actions over these time scales.

Geographic Scope of the VECs

The geographic scope of the impacts to species is the range each in the western Atlantic Ocean, as described in the Affected Environment (Section 6.0). The physical environment, including habitat and EFH, is bounded by the range of the herring fishery, from the GOM 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 Northwest Atlantic Ocean. The geographic range for human communities focuses on the Northeast U.S.

Analysis of Total Cumulative Effects

A cumulative effects assessment ideally makes effect determinations based on the combination of: 1) impacts from past, present and reasonably foreseeable future actions; 2) the baseline condition of the VECs (the combined effects from past, present and reasonably foreseeable future actions plus the present condition of the VEC; and 3) impacts of the alternatives under consideration for this action.

7.6.2 Past, Present, and Reasonably Foreseeable Future Actions

A synopsis of the most applicable past, present, and reasonably foreseeable future actions that have the potential to interact with the current action is in Table 38. The detailed past, present, and reasonably foreseeable future actions for each VEC are described in more detail in Section 4.9.3.1 of Amendment 8 to the Herring FMP. In summary, there have been numerous actions taken in the past, present, and likely in the near future as well that have had a range of impacts on the Atlantic herring resource, other biological aspects of the ecosystem, as well as human communities that rely on herring directly or as prey. In general, the actions taken by NMFS and ASMFC are designed to prevent overfishing and optimize yield. Amendment 8 to the federal FMP is expected to further those goals by implementing a long-term harvest control rule and implement gear prohibitions in near shore areas to address potential impacts of localized depletion from concentrated removals of herring from mid-water trawl gear (under review). Catch caps are in place for the two stocks that are primarily caught as bycatch in this fishery – GB haddock and river herring/shad. These catch caps are expected to continue to control and minimize impacts on bycatch. Monitoring in both the herring and potentially the groundfish fishery (through development and approval of Amendment 23 to the Groundfish FMP) are expected to improve the reliability and accountability of catch reporting. Similarly, there are measures in place to minimize the impacts of this fishery on protected resources and EFH.

Finally, herring catches have been reduced dramatically in recent years, which has had negative impacts on human communities that rely on the herring fishery. However, these reductions are an effort to help rebuild the biomass so the stock can recover to higher levels more quickly to again supply herring to numerous fishing communities in this region. Section 6.0 of this document summarizes the current state of the Atlantic herring resource and fishery, and provides additional information about habitat, protected resources, and non-target species that may be affected by the alternatives under consideration. The impacts of non-fishing activities are also considered.

Most of the actions affecting the VECs come from fishery-related activities (e.g., Federal fishery management actions), which have 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 reauthorized Magnuson-Stevens Act (SFA 1996). That legislation was enacted to promote long-term positive impacts on the environment in the context of fisheries activities. More specifically, the MSA 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 socioeconomic impacts on 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. Generally, these actions have had low negative impacts on habitat due to continued fishing operations; 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 low negative impacts on ESA-listed species, and a range of impacts on non-ESA listed marine mammals from low negative to low positive, depending on the species.

Non-fishing activities that occur in the marine nearshore and offshore environments and connected watersheds can cause the loss or degradation of habitat and/or affect the species that reside in those areas. The impacts of most nearshore human-induced non-fishing activities tend to be localized in the nearshore areas and marine project areas where they occur. The following discussion of impacts is based on past assessments of activities and assume these activities will likely continue as projects are proposed.

Examples of these activities include point and non-point source pollution, shipping, dredging, storm events, wind energy development, oil and gas development, construction, and other activities. The impacts from these non-fishing activities primarily stem from habitat loss due to human interaction and alteration or natural disturbances. These activities are widespread and can have localized impacts on habitat related to the accretion of sediments from at-sea disposal areas, oil and mineral resource exploration, aquaculture, construction of at-sea windfarms, bulk transportation of petrochemicals, and significant storm events. 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. Direct negative impacts that have been observed to target, non-target, and protected species resulting from non-fishing activities include shifting distributions, decreased reproductive ability and success, disrupted or modified food web interactions, and increased disease. The overall impact on the affected species and their habitats on a population level is unknown, but likely to have no impact to low negative impacts.

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). NMFS and the eight regional fishery management councils engage in this review process by making comments and recommendations on federal and state actions that may affect habitat for their managed species and by commenting on actions likely to adversely impact EFH. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on resources under NMFS' jurisdiction. In addition to guidelines mandated by the MSA, NMFS reviews some non-fishing effects during the review process required by Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act for certain activities that are regulated by Federal, state, and local authority.

In recent years, offshore wind energy and oil and gas exploration have become more relevant activities in the Greater Atlantic region. They are expected to impact all VECs, as described below. Construction activities may have both direct and indirect impacts on marine resources, ranging from temporary changes in availability to injury or mortality. 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. Wind turbines and cables may influence water currents and electromagnetic fields, respectively, which can affect patterns of movement, spawning and recruitment success, and prey availability 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 the 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 resources.

While there is only currently one small operational wind farm in New England waters, potential wind energy sites have been identified off of Massachusetts, Rhode Island, Connecticut, and into Mid-Atlantic waters. There are also several proposals to develop wind farms both in nearshore and offshore waters. In New England, offshore wind project construction south of Massachusetts/Rhode Island may begin as early as 2020 (three projects including Vineyard Wind, Bay State Wind, and South Fork Wind Farm are currently in the environmental review and permitting process). Additional areas have been leased and site assessment activities will take place in the next few years.

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 uncertain. If marine resources are affected by seismic surveys, then 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 impacts 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 will affect all components of marine ecosystems, including human communities. Physical changes that are occurring and will 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 suggests that these physical changes may have direct and indirect ecological responses within marine ecosystems which may alter the fundamental production characteristics of marine systems (Stenseth & Myrsetrud 2002). Climate change could potentially worsen 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 (Hare *et al.* 2016) indicate that climate change could have overall directional impacts on all VECs that range from negative to positive depending on the species, their climate vulnerability, potential for distribution change, and other factors. However, future mitigation and adaptation strategies to climate change may mitigate some of these impacts as more information becomes available to predict, evaluate, monitor, and categorize these changes.

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 due to effort displacement or making fishing more difficult or expensive near the turbines or cables.

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 uncertain. If marine resources are affected by seismic, 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.

Table 38. Summary of effects from 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
	A	B	C	A+B+C
Atlantic Herring	Positive Controlled effort and provided a sustainable fishery on a rebuilt resource	Positive Current regulations continue to manage for a sustainable stock	Positive Future actions will likely strive to maintain a sustainable stock	Positive Stock are being managed for sustainability
Non-Target Species	Low Positive Decreased effort and reduced bycatch; bycatch concerns remain for RH/S	Low Positive Current regulations continue to decrease effort and reduce bycatch; bycatch	Positive Future actions will likely improve monitoring and further address	Low Positive Decreased effort and reduced bycatch continue

		concerns remain for RH/S	bycatch issues	
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 actions will likely control effort and thus protected species interactions	Positive Continued effort controls along with past regulations will likely help stabilize protected species interactions
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. Fishing activities and non-fishing activities continue to reduce habitat quality	Positive Future actions are likely to continue rebuilding a healthy environment and increase habitat quality	Positive Continued management of physical environment and EFH for an increased quality of habitat
Human 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

7.6.3 Baseline Conditions for Resources and Human Communities

The CEA baseline conditions for resources and human communities is the combined effects of the past, present, and reasonably foreseeable future actions plus the present condition of the VECs (i.e., status/trends from Section 0; Table 38). 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, and described in Sections 7.4 and 7.5., respectively.

Table 39. Baseline conditions of the VECs

VEC		Status/Trends	Effects of Past, Present Reasonably Foreseeable Future Actions (Table 33)	Combined CEA Baseline Conditions
		A	B	A+B
Target species		Not overfished, not subject to overfishing, but high probability that could change if recruitment does not improve	Positive Stocks are being managed for sustainability	Positive Stocks are being managed for sustainability and adjustments are being made to help prevent overfishing
Non-target	Haddock	Not overfished, not subject to overfishing	Low Positive Decreased effort and	Low positive Decreased effort and

species	River Herring/ Shad	Depleted; overfished/overfishing status not determined due to many other sources of mortality	reduced bycatch continue	controlled bycatch through caps; some stocks in poor status (RH/S) and some stocks healthy (haddock)
Protected resources	Sea Turtles	Endangered or threatened	Positive Continued effort controls along with past regulations will likely help stabilize protected species interactions	Mixed Stocks are being managed for sustainability, but some in poor status. Reduced gear encounters through effort reductions and additional management actions taken under the ESA and MMPA.
	Large Whales	Endangered or protected		
	Small Cetaceans and Pinnipeds	Protected		
	Atlantic Sturgeon	Endangered or threatened		
	Atlantic Salmon	Endangered		
	Seabirds	Low-high conservation concern		
Physical Environment and EFH	Fishing impacts are complex/variable and typically adverse; Non-fishing activities have had negative but site-specific habitat effects		Mixed Continued managment. of EFH for an increased quality of habitat, but non-fishing impacts expected to increase	Mixed Reduced habitat disturbance by fishing gear; impacts from non-fishing activities, could increase and have negative impact.
Human Communities	Complex/variable. Herring revenues have been variable and may decrease substantially in the near future under low catch limits.		Mixed Continued fisheries management will likely control effort for a sustainable fishery and thus fishery and non-fishery related activities will continue, but near terms negative impacts expected for directed herring fishery.	Mixed Lower revenues for stocks yet to rebuild; sustainable resources should support viable communities and economies.

7.6.4 Impacts from Framework 6 Alternatives

The Framework 6 alternatives would modify the Atlantic herring FMP by: 1) proposing a new overfishing/overfished definition; 2) implementing fishery specifications for FY2019-2021; and 3) prohibiting carryover of unharvested catch for FY2020 and FY2021. The measures are designed to maintain the sustainability of the herring resource. The impacts of the alternatives under consideration are in Section 7.1 through 7.5. Table 40 summarizes those potential impacts.

Table 40. Summary of Framework 6 impacts expected on each VEC (preferred alternatives shaded).

FW6 Alternatives		Herring Resource	Non-target species	Protected Resources	Physical Env. (EFH)	Human Communities
Overfishing/ overfished definition	No Action (Alt. 1)	No direct impacts	No direct impacts	No direct or indirect impacts	No direct impacts	No direct impacts, indirect low - impacts
	Update OFD (Alt. 2)	No direct impacts, indirect low +	No direct impacts	No direct or indirect impacts	No direct impacts	No direct impacts, indirect low + impacts
OFL/ABC	No Action (Alt.1)	Low +	Low + to Neutral	Low – to Low +	Neutral	Negative (least)
	Alt. 2a	Low +	Low + to Neutral	Low – to Low +	Neutral	Negative
	Alt. 2b	Low +	Low + to Neutral	Low – to Low +	Neutral	Negative (most)
Management Uncertainty	No Action	Low +	Low + to Neutral	Low –	Neutral	Uncertain, Low + (least)
	Option 1	Low +	Low + to Neutral	Low –	Neutral	Uncertain, Low +
	Option 2	Low +	Low + to Neutral	Low –	Neutral	Uncertain, Low + (most)
	Option 3	Low +	Low + to Neutral	Low –	Neutral	Uncertain, Low +
Border Transfer	No Action (Alt. 1 – 0 mt)	No direct impacts	No direct impacts	No direct or indirect impacts	No direct impacts	Neutral to Low -
	Alt. 2 (up to 250 mt)	No direct impacts	No direct impacts	No direct or indirect impacts	No direct impacts	Low +
Carryover provisions	No Action (Alt. 1)	No direct impacts	Neutral to low +	Low –	Neutral	Low –
	Alt 2. Prohibit carryover in 2020 and 2021	Low + to neutral	Low +	Low –	Neutral	Low +

7.6.5 Cumulative Effects Analysis

To determine the magnitude and extent of cumulative impacts of the alternatives, the incremental impacts of the direct and indirect impacts should be considered, on a VEC-by-VEC basis, in addition to the effects of all actions (those effects identified and described relative to the past, present, and reasonably foreseeable future actions of both fishing and non-fishing actions). Table 40 summarizes likely effects of the groups of management alternatives contained in this action. The CEA baseline (Table 38), represents the sum of the past, present, and reasonably foreseeable future (identified hereafter as “other”) actions and conditions of each VEC. 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.

Target Species Resource

Past fishery management actions taken through the Atlantic herring FMP and the annual specifications process (e.g. catch limits and commercial quotas) ensure that stocks are managed sustainably and that measures are consistent with the objectives of the FMP under the guidance of the MSA. 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 (e.g. Area sub-ACL closures, AMs, catch caps) are effective. These actions have generally had a positive cumulative effect on Atlantic herring. It is anticipated that the future management actions described in Section 7.6.2 will have additional indirect positive effects on the managed resources by reducing and monitoring bycatch, protecting habitat, and protecting the ecosystem on which the productivity of Atlantic herring depends. Overall, the past, present, and reasonably foreseeable future actions in the Atlantic herring fishery have had positive cumulative effects.

As noted previously in Section 7.1, none of the preferred alternatives are expected to result in significantly increased levels of fishing effort, and both alternatives 2a and 2b are likely to result in lessened effort relative to current conditions. Therefore, impacts of the fisheries on Atlantic herring are not expected to change relative to current conditions under the preferred alternative (i.e., generally positive for Atlantic herring). The proposed actions described in this document would positively reinforce the past and anticipated positive cumulative effects on Atlantic herring by achieving the objectives specified in the FMP.

When the direct and indirect effects of the alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant positive impacts on the herring resource.*

Non-Target Species (Bycatch)

The combined impacts of past federal fishery management actions on non-target species have been mixed, as decreased effort and reduced catch of non-target species continue, though some stocks are in poor status (Table 38). Current regulations continue to manage for sustainable stocks, thus controlling effort on direct and discard/bycatch species. As noted in Section 7.6.4, the actions proposed by Framework 6 would likely continue this trend. Future actions are anticipated to continue rebuilding non-target species stocks and limit the take of incidental catch/bycatch in the herring fishery,

particularly through ACL management with AMs. The other measures proposed in this action would likely have primarily neutral impacts on non-target species. Continued management of directed stocks will also control catch of non-target species. In addition, the effects of non-fishing activities on bycatch are potentially negative.

When the direct and indirect effects of the Framework 6 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant low-positive to neutral impacts on non-target species.*

Protected Species

Because of the life history dynamics of protected species, coupled with large changes in their abundance over long time periods and the multiple and wide-ranging fisheries management actions that have affected them, 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, the overall trend of long-term stock conditions for protected resources has improved due to reductions in the number of interactions, among other things (e.g. habitat protections). Past annual specifications and fishery management actions taken through the herring FMP 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 7.6.2 will result in additional indirect positive effects on protected species. These impacts could be broad in scope.

The preferred alternatives would likely reduce current levels of fishing effort in terms of the overall amount of effort, timing, and location. As described in Section 7.3, the proposed action is expected to have impacts on protected species that range from low negative to low positive, depending on the species.

When the direct and indirect effects of the Framework 6 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant low negative impacts (related to interaction risk) to potentially low positive impacts (related to beneficial forage impacts for protected species that rely on herring).*

Physical Environment and EFH

Past fishery management actions taken through the Atlantic Herring FMP and the annual specifications process have had positive cumulative effects on habitat. 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 7.6.4.1 will result in additional direct or indirect positive effects on habitat through actions which protect EFH and protect ecosystem services on which Atlantic herring productivity depends.

Many additional non-fishing activities, as described above in Section 7.6.2, are concentrated near-shore and likely work either additively or synergistically to decrease habitat quality. The effects of these actions, combined with impacts resulting from years of commercial fishing activity, have negatively affected habitat. 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. 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. Reductions in overall fishing effort and protection of sensitive habitats have mitigated some negative effects.

As described in Section 7.4, the preferred alternatives are expected to have neutral impacts since overall it has been determined that any adverse effects on EFH in the Atlantic herring fishery are minimal and temporary in nature. The preferred alternatives are expected to decrease fishing effort compared to status quo levels. *Impacted areas have been fished for many years with many different gear types; therefore, continued fishing effort will continue to impact these areas.* Thus it is likely that fishing and non-fishing activities will continue to degrade habitat quality. When the direct and indirect effects of the alternatives are considered in combination with all other actions (*i.e.*, past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant low negative impacts on the physical environment and EFH.*

Human Communities

Past fishery management actions taken through the FMP and annual specifications process such as catch limits and commercial quotas have had both positive and negative cumulative effects. They have benefitted domestic fisheries through implementing sustainable fishery management practices, but can also reduce participation in fisheries. The impacts from annual specification of management measures are largely dependent on how effective those measures are in meeting their intended objectives and the extent to which mitigating measures (e.g. Area sub-ACL closures, AMs, catch caps) are effective. Quota overages may alter the timing of commercial fishery revenues such that revenues can be realized earlier. Fishermen may be impacted by reduced revenues in years when overages are deducted. It is anticipated that the future management actions described in Section 7.6.2 will result in positive effects for human communities due to sustainable management practices, although additional direct negative effects on some human communities could occur if management actions result in reduced revenues. The same tradeoffs exist for many non-fishing activities, resulting in overall indirect negative impacts on human communities by reducing marine resource availability; however, this effect is not quantifiable. Despite the potential for negative short-term effects on human communities due to reduced revenue, positive long-term effects are expected due to long-term sustainability of managed stocks.

By providing revenues and contributing to the overall functioning of and employment in coastal communities, the Atlantic herring fishery has both direct and indirect social impacts. As previously described, the preferred alternatives are unlikely to result in a substantial increase to levels of fishing effort or the character of that effort relative to the current conditions. Through implementation of this action, the Council seeks to achieve the primary objective of the MSA, which is to achieve OY from the managed fisheries.

When the direct and indirect effects of the alternatives are considered in combination with all other actions (*i.e.*, past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant low positive impacts on human communities overall if reduced catch limits help the stock recover.*

7.6.5.1 Summary of cumulative effects analysis of the proposed action

The Council's preferred alternatives (*i.e.*, the proposed action) are described in Section 4.0. The direct and indirect impacts of the proposed action 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 7.6.5).

When considered in conjunction with all other pressures placed on 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 action for updating the overfishing/overfished definition is expected to have indirect low positive impacts on the herring resource and human communities, and no direct impacts on non-target species, protected resources, and the physical environment. The preferred action for setting the OFL/ABC is expected to have low positive impacts on the herring resource, low positive to neutral impacts on non-target species, low negative to low positive impacts on protected resources, neutral impacts on the physical environment, and negative impacts on human communities. For management uncertainty, the preferred alternative is expected to have low positive impacts on the herring resource and human communities and low positive to neutral impacts on non-target species, low negative impacts on protected resources, and neutral impacts on the physical environment. For border transfer, the preferred action has no direct impacts on the herring resource, non-target species, protected resources, and the physical environment, and low positive impacts on human communities. Lastly, the preferred alternative for the carryover provision is expected to have low positive to neutral impacts on the herring resource, low positive impacts on non-target species and human communities, low negative impacts on protected resources, and neutral impacts on the physical environment.

The preferred alternatives are consistent with other management measures that have been implemented in the past for this fishery. These measures are part of a broader management scheme for the Atlantic herring fishery. This management scheme has helped to rebuild stocks and 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 been generally 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 when considered as a whole and as a result of the management measures implemented in this fishery, 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 (7.6.2). Cumulatively, through 2024, it is anticipated that the preferred alternatives will result in non-significant impacts on all VECs, ranging from low negative to positive.

8.0 APPLICABLE LAWS/EXECUTIVE ORDERS

8.1 MAGNUSON-STEVENSON FISHERY CONSERVATION AND MANAGEMENT ACT – NATIONAL STANDARDS

Section 301 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires that regulations implementing any fishery management plan or amendment be consistent with ten national standards. Below is a summary of how this action is consistent with the National Standards and other required provisions of the Magnuson-Stevens Act.

The Council 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 optimum yield for managed species and the U.S. fishing industry on a continuing basis. The primary goal of managing the Atlantic herring fishery is to maintain long-term sustainable catch levels and 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 in order to manage by annual catch limits (ACLs) and prevent overfishing. The measures implemented through this action should further achieve the goals/objectives and reduce the possibility of overfishing the Atlantic herring resource. The herring resource is currently not overfished, and overfishing is not occurring (Section 6.1).

The Council uses the best scientific information available (National Standard 2). Specifically, this action was informed by fisheries-independent data from several surveys, commercial fishery landings data, stock assessments, and other scientific data sources. The 2019-2021 Atlantic herring specifications are supported by the best available scientific information, and recommendations for Atlantic herring catch during 2019-2021 are based on advice from the Council's Scientific and Statistical Committee (SSC). The supporting science and analyses, upon which the proposed action is based, are summarized and described in Section 6.0 and 7.0 of this document.

The Council manages Atlantic herring throughout their range (National Standard 3). While most herring are landed in Maine, Massachusetts, and Rhode Island, Atlantic herring landings have been reported in every state from Maine through Virginia. 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. In order 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. 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. For this action, estimates of the Canadian catch are deducted from the ABC to account for management uncertainty from Canadian catch. Furthermore, the management measures proposed in this action do not discriminate among residents of different states (National Standard 4); the measures are intended to be applied equally to Atlantic herring permit holders of the same category, regardless of homeport or location.

The proposed 2019-2021 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. The specifications proposed in this document 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, and they do not have economic allocation as their sole purpose (National Standard 5).

The measures proposed account for variations in the fishery (National Standard 6). The 2018 benchmark stock assessment for herring noted marked declines in stocks and in recruitment from previous assessments. There are a number of factors which could introduce variations into the Atlantic herring fishery, and there is some uncertainty in the estimate of current stock size and in recruitment. Furthermore, 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 2019-2021 Atlantic herring fishery specifications represent substantial reductions in allowable catch from recent years. However, these specifications intend to balance the needs of the Atlantic herring fishery while accounting for the documented decrease in herring stocks and recruitment.

As always, the Council considered the costs and benefits associated with the proposed 2019-2021 Atlantic herring fishery specifications and RH/S catch caps. Any costs incurred as a result of the management action proposed in this document are considered to be necessary in order 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. Consistent with National Standard 7, 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.

The proposed 2019-2021 Atlantic herring fishery specifications take into account the importance of fishery resources to fishing communities (National Standard 8). A complete description of the fishing communities participating in and dependent on the Atlantic herring fishery is provided in Section 6.5. Relative to the no action alternative, the measures proposed are expected to have negative impacts on communities engaged in and dependent on the Atlantic herring fishery. Given the depleted state of the resource and the uncertainty in recruitment, a precautionary approach is required to ensure long-term sustainability of Atlantic herring. Thus, in the long-term, communities dependent on the Atlantic herring resource are expected to be sustained by this action by managing the Atlantic herring resource in a precautionary manner to ensure long-term sustainable catch.

This action also considers National Standard 9; Section 6.2 of this document has comprehensive information related to bycatch in the Atlantic herring fishery. The primary non-target species in this fishery are GB haddock and river herring/shad, which both have catch caps. The proposed 2019-2021 RH/S catch caps promote the concept of reducing bycatch to the extent practicable by providing an incentive to avoid incidental catch of river herring and shad while still allowing an opportunity to achieve OY. When a cap trigger is reached, it implements a minimal Atlantic herring possession limit (area closure) that is expected to end directed fishing effort for herring in the corresponding closure area for the rest of that fishing year.

Finally, this action is consistent with National Standard 10 to promote the safety of human life at sea. 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 2019-2021 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.

8.1.1 Other MSA Requirements

This action is also consistent with the fourteen additional required provisions for FMPs. Section 303 (a) of MSA contains required provisions for FMPs.

1. *Contain the conservation and management measures, applicable to foreign fishing ...*
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. None of the measures proposed in this action apply to foreign fishing vessels; the domestic herring fleet has been shown to have the capacity to fully utilize the available catch.
2. *Contain a description of the fishery ...*
All the information required by this provision can be found in the Final EIS for Amendment 8 to Atlantic Herring FMP submitted in May 2019 and Section 6.0 of this action.
3. *Assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from the fishery ...*

The present and probable future condition of the Atlantic herring resource and estimates of MSY were updated through the most recent Atlantic herring benchmark stock assessment in June 2018 (SAW 65). Information related to the Atlantic herring stock assessment and updated biological reference points are summarized in Section 6.1 of this document.

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); etc.*

This MSA 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 provided in Section 4.0.

5. *Specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter fishing in the fishery ...*

Data regarding the type and quantity of fishing gear used, catch by species, areas fished, season, sea sampling hauls, and domestic harvesting/processing capacity are updated in the Affected Environment (Section 6.5.1) of this document.

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 ...*

The Proposed Action does 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 safety aboard fishing vessels. Therefore, consultation with the U.S. Coast Guard was not 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 Amendment 8 to this FMP (May 2019).

7. *Describe and identify essential fish habitat for the fishery ...*

Essential fish habitat has been identified for Atlantic herring in the Atlantic Herring FMP and has been addressed through all subsequent related management actions in a manner consistent with the MSA. Amendment 8 updated the description of the physical environment and EFH (Section 3.5.2) and evaluated the impacts on EFH of the Proposed Action and other alternatives (Section 7.4). Nothing in this action changes those descriptions and evaluations.

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) assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan;*

Amendment 8 (under review) provides an updated list of data and research needs with respect to the Atlantic herring fishery and its management program, currently under review. In October 2018, the SSC reviewed the herring benchmark 65th stock assessment workshop for Atlantic herring. This assessment represents the best available information regarding the status of the Atlantic herring resource at this time. No new data is required for the implementation of this action.

9. *Include a fishery impact statement for the plan or amendment*

Any additional impacts from measures proposed in this action are evaluated in Section 7.0 of this document.

10. *Specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished ...*

The status determination criteria for Atlantic herring were established in the Atlantic Herring FMP and were revised through Amendment 4. This action proposes an update to the overfishing

and overfished definitions incorporating results from the most recent stock assessment. The assessment concluded that Atlantic herring is not overfished and overfishing is not occurring (See Section 6.1) and the proposed overfishing/overfished definition is summarized in Section 4.1.

11. Establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery ...

In 2015, NMFS approved a Standardized Bycatch Reporting Methodology (SBRM) amendment submitted by the Councils. 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 Atlantic Herring FMP). The amendment's final measures were only recently published in April 2018 and are not effective yet.

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 ...

The Atlantic Herring FMP does not include a catch and release recreational fishery management program because there is no recreational fishery for herring although sometimes recreational fishermen catch herring to use as bait.

13. Include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery ...

Aside from the importance of herring as a forage species in the Northeast U.S. and the use of herring as bait, there is no specific recreational interest in the fishery (Amendment 8, Section 3.6).

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 Proposed Action would not change the allocation of catch between the commercial, recreational and charter fisheries. The ABC rule is applied stock-wide, so limits would be distributed across the fishery proportionally. The proposed action does include reductions in the overall harvest that have minimal associated risk of overfishing and are unlikely to result in an overfished condition in the final year (2021). A rebuilding plan and/or other conservation and management measures to reduce the overall harvest in the fishery are not necessary at this time.

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.

The Atlantic Herring FMP includes a multi-year specifications process for the herring fishery that complies with the ACL/AM provisions of the MSA. Future Council actions for this FMP will continue to address the mechanism for specifying ACLs and the need to ensure accountability in the fishery. The Proposed Action would not change the mechanism for establishing ACLs.

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 the MSA and NEPA. The Council on Environmental Quality has issued regulations specifying the requirements for NEPA documents (40 CFR 1500 – 1508), as has NOAA in its policy and procedures for NEPA (NAO 216-6A §5.04b.1). All those requirements are addressed in this action, as described below.

8.2.1 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 National Oceanic and Atmospheric Administration 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 2019-2021 catch limits for Atlantic herring that are consistent with FMP objectives and implements an updated overfishing definition. Overall this action is expected to have low 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 7.1). However, the level of allowable catch in the near term 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 proposed action does not alter the way the industry conducts fishing activities for the target species. Therefore, no changes in fishing behavior are anticipated that would affect safety. The overall effect of the proposed actions on these fisheries, 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?

Historic or cultural resources (e.g., shipwrecks) may be present in the area where the herring fishery occurs. However, vessels try to avoid fishing too close to wrecks due to the possible loss or entanglement of fishing gear. Therefore, it is unlikely that the proposed action would result in substantial impacts to unique areas.

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

The impacts of the proposed measures on the human environment are described in Section 7.5. The proposed action primarily establishes catch and landing limits for the Atlantic herring fishery. The proposed action is based upon measures contained in the FMP which have been in place for years. In addition, the scientific information upon which the annual quotas are based has been peer-reviewed and is the most recent information available. Therefore, 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 proposed action on the human environment are described in Section 7.5 of the EA. The proposed action establishes catch and landing limits for each small-mesh multispecies stock. The proposed action is not expected to substantially alter fishing methods or activities and is not expected to substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort. The measures contained in this action are not expected to have highly uncertain, 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 proposed action primarily establishes catch and landing limits for Atlantic herring and is not expected to substantially alter fishing methods or activities and is not expected to substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort. When new stock assessment or other biological information about these species becomes available in the future, then the specifications may be adjusted according to the FMP and MSA. Therefore, the proposed action will not result in significant effects, nor does it represent a decision in principle about a future consideration.

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

The impacts of the proposed action on the biological, physical, and human environment are described in Section 7.0. The cumulative effects of the proposed action on target and non-target species are detailed in Section 7.6. The proposed action is not expected to substantially increase fishing effort or substantially alter the spatial and/or temporal distribution of current fishing effort. The improvements in the condition of the stock through implementation of ACLs based on the MSY-based fishing mortality target contained in the FMP are expected to generate positive impacts overall.

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?

Although shipwrecks may be present in the area where fishing occurs, including some registered on the National Register of Historic Places, vessels typically avoid fishing too close to wrecks due to the possible loss or entanglement of fishing gear. Therefore, it is unlikely that the proposed action would adversely affect the historic resources listed above.

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 proposed action is not expected to substantially alter fishing methods or activities. It is not expected to substantially increase fishing effort or substantially modify the spatial and/or temporal distribution of current fishing effort (Section 7.3). Some redistribution of fishing effort may occur, but this redistribution is likely minor in time and space relative to the seasonal distribution of endangered or threatened species and marine mammals. Also, existing measures to protect endangered or threatened species, marine mammals, and critical habitat for these species would continue (Section 6.3). Therefore, this action is not expected to be significant or adversely affect endangered or threatened species, marine mammals, or critical habitat in any manner not previously considered.

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 proposed action primarily establishes catch and landing limits for Atlantic herring and 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 proposed action has been found to be consistent with other applicable laws (Section 8.3 – 8.12).

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 7.3. 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 proposed action establishes catch and landing limits for Atlantic herring that is consistent with the FMP objectives and the recommendations of the Council's SSC. The proposed action is not expected to adversely affect Atlantic herring or other non-target fish species that are managed in this region. The biological impacts of the proposed action on target species are analyzed in Section 7.1 and non-target species in Section 7.2.

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 proposed action is not expected to have a substantial impact on the natural or physical environment. The proposed action is not expected to alter fishing methods or activities or substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort. Therefore, there are no social or economic impacts interrelated with significant natural or physical environmental effects.

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 proposed action establishes catch and landing limits for Atlantic herring. It is not expected to have a substantial impact on biodiversity and ecosystem function within the affected area. The action is not expected to substantially alter fishing methods or activities or fishing effort or the spatial and/or temporal distribution of current fishing effort.

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

The proposed action primarily establishes catch and landing limits for Atlantic herring. There is no evidence or indication that this fishery has ever resulted in the introduction or spread of nonindigenous species. The proposed action is not expected to substantially alter fishing methods or activities and is not expected to substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort. Therefore, it is highly unlikely that the proposed action would be expected to 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 Environmental Assessment prepared for Framework 6 of the Atlantic Herring Fishery Management Plan MP, it is hereby determined that the proposed actions 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 environmental impact statement for this action is not necessary.

Regional Administrator, Greater Atlantic Region, NMFS

Date

8.2.2 Environmental Assessment

The required elements of an Environmental Assessment (EA) are specified in 40 CFR 1508.9(b). They are included in this document as follows:

- The need for this action is in Section 3.1;
- The alternatives that were considered are in Section 4.0;
- The environmental impacts of the proposed action are in Section 7.0;
- A determination of significance is in Section 8.2.1; and,
- The agencies and persons consulted on this action are in Sections 8.2.4 and 8.2.5.

While not required for the preparation of an EA, this document includes the following additional sections that are based on requirements for an Environmental Impact Statement (EIS).

- An executive summary is in Section 1.0;
- A table of contents is in Section 2.0;
- Background and purpose are in Section 3.0;
- A summary of the document is in the executive summary, Section 1.0;
- A brief description of the affected environment is in Section 0;
- Cumulative impacts of the proposed action are in Section 7.6;
- A list of preparers is in Section 8.2.5.

8.2.3 Point of Contact

Questions concerning this document may be addressed to:

Mr. Thomas A. Nies, Executive Director
New England Fishery Management Council
50 Water Street, Mill 2
Newburyport, MA 01950 (978) 465-0492

8.2.4 Agencies Consulted

The following agencies were consulted in preparing this document:

- Atlantic States Marine Fisheries Commission and Atlantic Herring Section
- Mid-Atlantic Fishery Management Council
- New England Fishery Management Council, which includes representatives from the following additional organizations:
 - Connecticut Department of Environmental Protection
 - Maine Department of Marine Resources
 - Massachusetts Division of Marine Fisheries
 - New Hampshire Fish and Game
 - Rhode Island Department of Environmental Management
- National Marine Fisheries Service, NOAA, Department of Commerce
- United States Coast Guard, Department of Homeland Security
- United States Fish and Wildlife Service, Department of Interior

8.2.5 List of Preparers

The following personnel participated in preparing this document:

- ***New England Fishery Management Council.*** Deirdre Boelke (Herring Plan Coordinator), Michelle Bachman, Woneta Cloutier, Dr. Rachel Feeney, Chris Kellogg, Thomas Nies
- ***National Marine Fisheries Service.*** Glenn Chamberlin, Katherine Connelly, Dr. Jonathan Deroba, Marianne Ferguson, Daniel Luers, Brant McAfee, Carrie Nordeen, Danielle Palmer, Sara Weeks
- ***State agencies.*** Matthew Cieri (Maine DMR), Micah Dean (MADMF), Renee Zobel (NHFG)
- ***Mid-Atlantic Fishery Management Council.*** Jason Didden
- ***Atlantic States Marine Fisheries Commission.*** Kirby Roots-Murdy

8.2.6 Opportunity for Public Comment

This action was developed from June 2018-2019, and there were 16 public meetings related to this action (Table 36). Opportunities for public comment occurred at Advisory Panel, Committee, and Council meetings. There were more limited opportunities to comment at PDT meetings. Meeting discussion documents and summaries are available at www.nefmc.org.

Table 41. Public meetings related to Framework 6.

Date	Meeting Type	Location
2018		
6/12-14/2019	Council Meeting	Holiday Inn by the Bay, Portland, ME
8/1/2018	HE_PDT	GARFO, Gloucester, MA
9/18/2018	HE_AP	Four Points, Wakefield, MA
9/19/2018	HE_CTE	Four Points, Wakefield, MA
9/24-27/2018	Council Meeting	Hotel 1620 Plymouth Harbor
9/28/2018	PDT Call	Webinar
2019		
1/29-30/2019	Council Meeting	Sheraton Harborside, Portsmouth, NH
2/13/2019	PDT Call	Webinar
3/15/2019	PDT Call	Webinar
3/27/2019	HE_AP	Holiday Inn, Mansfield, MA
3/28/2019	HE_CTE	Holiday Inn, Mansfield, MA
4/16-18/2019	Council Meeting	Hilton Hotel, Mystic, CT
5/8/2019	HE_PDT	GARFO, Gloucester, MA
5/29/2018	HE_AP	Four Points, Wakefield, MA
5/30/2019	HE_CTE	Four Points, Wakefield, MA
6/11-13/2019	Council Meeting	DoubleTree, South Portland, ME

8.2.7 Document Distribution

This document is available on the Council’s web page, www.nefmc.org and has been provided to all Council members. Announcements of document availability will be made in the *Federal Register* and to the interested parties’ mailing list. Copies were distributed to:

U.S. EPA, Region 1 1 Congress St., 11 th Floor Boston, MA 02203-0001	U.S. EPA, Region 2 290 Broadway, 25 th Floor New York, NY 10007
Director, Office of Marine Conservation Department of State 2201 "C" Street, NW Washington, DC 20520	Executive Director Marine Mammal Commission 4340 East-West Highway Bethesda, MD 20814
U.S. EPA, Region 3 1650 Arch Street Philadelphia, PA 19106 U.S. EPA, Region 4 61 Forsyth Street Atlanta, GA 30303	Director, Office of Environmental Policy and Compliance U.S. Department of Interior Main Interior Building (MS 2462) 1849 "C" Street, NW Washington, DC 20520
District Commander First U.S. Coast Guard District 408 Atlantic Avenue Boston, MA 02210-2209	U.S. EPA, Region 2 290 Broadway, 25 th Floor New York, NY 10007

8.3 MARINE MAMMAL PROTECTION ACT (MMPA)

Section 7.3 contains an assessment of the impacts of the proposed action on marine mammals. The New England Fishery Management Council has reviewed the impacts of the proposed 2019-2021 Atlantic herring fishery specifications on marine mammals and has concluded that the management actions proposed are consistent with the provisions of the 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 (ESA)

Section 7 of the Endangered Species Act requires federal agencies to ensure actions they conduct, authorize, or fund do not jeopardize the continued existence of listed species, or destroy or adversely modify critical habitat designated for any listed species. NMFS previously considered the effects of the continued authorization of the herring fishery under the Herring FMP on ESA-listed cetaceans, sea turtles, and fish during an ESA section 7 consultation. An informal consultation was completed on February 9, 2010, that fully analyzed and considered the effects of the herring fishery on all ESA-listed species and designated critical habitat. This consultation concluded that the herring fishery is not likely to interact with ESA-listed species and is not likely to adversely affect ESA-listed species or designated critical habitat under NMFS's jurisdiction.

Since the 2010 informal consultation, the following species have been listed or critical habitat designated/expanded in the marine environment:

- Five distinct population segments (DPSs) of Atlantic sturgeon (Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic; February 6, 2012; 77 FR 5880 and 77 FR 5914);
- Northwest Atlantic Ocean Loggerhead DPS critical habitat (July 10, 2014; 79 FR 39755 (nesting beaches), 79 FR 39856 (marine areas));
- 11 DPSs of green sea turtles; the North Atlantic DPS occurs in the Greater Atlantic Region (April 6, 2016; 81 FR 20057); and,
- North Atlantic right whale critical habitat expanded (January 27, 2016; 81 FR 4837)

As provided at 50 CFR §402.16, reinitiation of ESA section 7 consultation is required where discretionary involvement or control over a Federal action has been retained or is authorized by law and when a new species is listed or critical habitat designated that may be affected by the action.⁵ As a result of the above listings and critical habitat, NMFS, in accordance with this regulation, considered whether ESA section 7 consultation must be reinitiated. After review of the best available information, NMFS determined that none of the new listings or designated critical habitat provided above warranted the reinitiation of consultation on the herring fishery. Support for these determinations are provided in the following ESA memos/reports issued by NMFS:

- April 23, 2012: 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.
- September 17, 2014: Determination regarding reinitiation of Endangered Species Act section 7 consultation on 12 Greater Atlantic Region fisheries and two Northeast Fisheries Science Center funded fisheries research surveys due to critical habitat designation for loggerhead sea turtles.

⁵ See 50 CFR §402.16 for additional triggers for reinitiation of ESA section 7 consultation.

- May 16, 2016: Determination regarding reinitiation of Endangered Species Act section 7 consultation due to newly listed distinct population segments of green sea turtles
- December 2015: ESA 4(b)(2) report- Critical Habitat for the North Atlantic Right Whale (*Eubalaena glacialis*).
- February 10, 2016: North Atlantic right whale critical habitat designation and consultation under section 7 of the ESA.

Section 7.3 should be referenced for an assessment of the impacts of the proposed action on ESA-listed species. None of the actions proposed in this document are expected to alter fishing methods or activities. In addition, none of the proposed actions are expected to increase fishing effort or significantly change the spatial and/or temporal distribution of current fishing effort. Therefore, this action is not expected to affect endangered or threatened species or critical habitat in any manner not considered in previous consultations on these fisheries.

8.5 ADMINISTRATIVE PROCEDURE ACT (APA)

Sections 551-553 of the Administrative Procedure Act established procedural requirements applicable to informal rulemaking by federal agencies. The purpose is to ensure public access to the federal rulemaking process, and to give public notice and opportunity for comment. The Council did not request relief from notice and comment rule making for this action and expects that NOAA Fisheries will publish proposed and final rule making for this action.

8.6 PAPERWORK REDUCTION ACT (PRA)

The purpose of the Paperwork Reduction Act is to minimize paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by or for the Federal Government. It also ensures that the Government is not overly burdening the public with information requests. This action does not include any revisions to the current PRA collection requirements.

8.7 COASTAL ZONE MANAGEMENT ACT (CZMA)

Section 307 of the Coastal Zone Management Act (CZMA) is known as the federal consistency provision. Federal Consistency review requires that “federal actions, occurring inside or outside of a state's coastal zone, that have a reasonable potential to affect the coastal resources or uses of that state's coastal zone, to be consistent with that state's enforceable coastal policies, to the maximum extent practicable.” The Council previously made determinations that the FMP was consistent with each state’s coastal zone management plan and policies, and each coastal state concurred in these consistency determinations (in the Herring FMP). Since the proposed action does not propose any substantive changes from the FMP, the Council has determined that this action is consistent with the coastal zone management plan and policies of the coastal states in this region. Once the Council has adopted final measures and submitted Framework 6 to NMFS, NMFS will request consistency reviews by CZM state agencies directly.

8.8 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) 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

Framework 6 and the proposed 2019-2021 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 presented 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 being provided in the 2019-2021 Atlantic herring specifications concerning the status of the Atlantic herring fishery is updated based on landings and effort information through the 2017 and 2018 fishing years when possible. Information presented in this document is intended to support Framework 6 and the proposed specifications for the 2019-2021 fishing years, 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 NOAA Fisheries.

Until a proposed rule is prepared and published, this document is the principal means by which the information herein is publicly available. The information provided in this document is based on the most recent available information from the relevant data sources, including detailed and relatively recent information on the herring resource and, therefore, represents an improvement over previously available information. This document will be subject to public comment through proposed rulemaking, as required under the Administrative Procedure Act and, therefore, may be improved based on comments received.

This document is available in several formats, including printed publication, and online through the NEFMC's web page (www.nefmc.org). The Federal Register notice that announces the proposed rule and the final rule and implementing regulations will be made available in printed publication, on the website for the Greater Atlantic Regional Fisheries Office (www.greateratlantic.fisheries.noaa.gov), and through the Regulations.gov website. The Federal Register documents will provide metric conversions for all measurements.

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, information associated with this action, independent of the specific intended distribution mechanism, 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 NMFS adheres to the standards set out in Appendix III, “Security of Automated Information Resources,” of OMB Circular A-130; the Computer Security Act; and the Government Information Security Act. All confidential information (e.g. dealer purchase reports) is safeguarded pursuant to the Privacy Act; Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business, and financial information); the Confidentiality of Statistics provisions of the Magnuson-Stevens Act; and NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics.

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 a “Natural Resource Plan.” Accordingly, the document adheres to the published standards of the MSA; 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 NEPA. This information product uses information of known quality from sources acceptable to the relevant scientific and technical communities. Several data sources were used in the development of this action, including, but not limited to, historical and current landings data from the Commercial Dealer database, vessel trip report (VTR) data, and fisheries independent data collected through the NMFS bottom trawl surveys. The analyses herein were prepared using data from accepted sources and have been reviewed by members of the Atlantic Herring Plan Development Team and by the SSC where appropriate.

Despite current data limitations, the conservation and management measures considered for this action were selected based upon the best scientific information available. The analyses important to this decision used information from the most recent complete calendar years, generally through 2016. The data used in the analyses provide the best available information on the number of permits, both active and inactive, in the fishery, the catch (including landings and discards) by those vessels, the landings per unit of effort (LPUE), and the revenue produced by the sale of those landings to dealers, as well as data about catch, bycatch, gear, and fishing effort from a subset of trips sampled at sea by government observers.

Specialists (including professional members of plan development teams, technical teams, committees, and Council staff) who worked with these data are familiar with the most current analytical techniques and with the available data and information relevant to the small-mesh multispecies fishery. The proposed action is supported by the best available scientific information. The policy choice is clearly articulated in Section 4.0, the management alternatives considered in this action.

The supporting science and analyses, upon which the policy choice was based, are summarized and described in the SAFE Report for Fishing Years 2019-2021, Section 6.0 of this document, and in the Amendment 8 FEIS (in review). 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. The review process used in preparation of this document involves the responsible Council, the NEFSC, GARFO, and NOAA Fisheries Service Headquarters. The NEFSC's technical review is conducted by senior-level scientists specializing in population dynamics, stock assessment, population biology, and social science.

The Council review process involves public meetings at which affected stakeholders have opportunity to comment on the document. Review by staff at GARFO is conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. The Council also uses its Scientific and Statistical Committee to review the background science and assessment to approve the Overfishing Limits (OFLs) and Allocable Biological Catch (ABCs), including the effects those limits would have on other specifications in this document. The SSC is the primary scientific and technical advisory body to the Council and is made up of scientists that are independent of the Council. A list of current committee members can be found at <https://www.nefmc.org/committees/scientific-and-statistical-committee>.

Final approval of the action proposed in this document and clearance of any rules prepared to implement resulting regulations is conducted by staff at NOAA Fisheries Service Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget. In preparing this action for the Herring FMP, NMFS, the Administrative Procedure Act, the Paperwork Reduction Act, the Coastal Zone Management Act, the Endangered Species Act, the Marine Mammal Protection Act, the Information Quality Act, and Executive Orders 12630 (Property Rights), 12866 (Regulatory Planning), 13132 (Federalism), and 13158 (Marine Protected Areas). The Council has determined that the proposed action is consistent with the National Standards of the MSA and all other applicable laws.

8.9 EXECUTIVE ORDER 13158 (MARINE PROTECTED AREA)

Executive Order (EO) 13158 on Marine Protected Areas (MPAs) 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 maximum extent practicable, in taking such actions, avoid harm to the natural and cultural resources that are protected by an MPA. The EO directs federal agencies to refer to the MPAs identified in a list of MPAs that meet the definition of MPA for the purposes of the EO. The EO requires that the Departments of Commerce and the Interior jointly publish and maintain such a list of MPAs. A list of MPA sites has been developed and is available at:

<http://marineprotectedareas.noaa.gov/nationalsystem/nationalsystemlist/>. No further guidance related to this EO is available at this time.

In the Northeast U.S., the only MPAs are the Stellwagen Bank National Marine Sanctuary (SBNMS), the Tilefish Gear Restricted Areas in the canyons of Georges Bank, and the National Estuarine Research Reserves and other coastal sites. The only MPA that overlaps the Atlantic Herring fishery footprint is the SBNMS.

This action is not expected to more than minimally affect the biological/habitat resources of the SBNMS, which was comprehensively analyzed in the Omnibus Habitat Amendment 2 (NEFMC 2016b). Fishing gears regulated by the Atlantic Herring FMP are unlikely to damage shipwrecks and other cultural artifacts because fishing vessel operators avoid contact with cultural resources on the seafloor to minimize costly gear losses and interruptions to fishing.

8.10 EXECUTIVE ORDER 13132 (FEDERALISM)

E.O. 13132 on federalism established nine fundamental federalism principles for Federal agencies to follow when developing and implementing actions with federalism implications. However, no federalism issues or implications have been identified relative to the measures proposed in this action, thus preparation of an assessment under E.O. 13132 is unwarranted. The affected states have been closely involved in the development of the proposed action through their representation on the Council (all affected states are represented as voting members of at least one Regional Fishery Management Council). No comments were received from any state officials relative to any federalism implications that may be associated with this action.

8.11 EXECUTIVE ORDER 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). NOAA guidance NAO 212-6, at Section 7.02, states that “consideration of EO 12898 should be specifically included in the NEPA documents for decision-making purposes.” Agencies should also encourage public participation, especially by affected communities, during scoping, as part of a broader strategy to address environmental justice issues. Minority and low-income 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 this action may affect communities with environmental justice concerns, the proposed actions should not have disproportionately high effects on low income or minority populations. The proposed actions 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 impossible to fully determine how the actions within this specification document may raise any concerns relative to environmental justice. The public comment process is an opportunity to identify issues that may be related to environmental justice, but none have been raised relative to this action. The public has never requested translations of Atlantic Herring FMP documents.

For the primary port communities relevant to this action (Section 6.5.3), poverty and minority rate data at the state and county levels are in Table 42. In terms of poverty, Washington County is the only county that is more than 1% higher than its state average (Maine). Washington and Cumberland Counties are the only counties with a minority rate more than 1% higher than their state average (Maine). Minority populations in Southern New England have historically participated in the fishing industry. For the Atlantic herring fishery, evidence suggests that minority participation is focused within the processing sector. For a New Bedford-based herring processor, 90-95% of its employees are of Central American decent (NEFMC 2018a, Section 3.6.1.9). For a New Jersey-based processor, its minority employees are Hispanic, and the rate is close to the county rate (Lund’s, personal communication, 2012).

With respect to subsistence consumption of fish and wildlife, federal agencies are required to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence. GARFO tracks these issues, but there are no federally recognized tribal agreements for subsistence fishing in New England federal waters.

Table 42. Demographic data for Atlantic herring fishing communities (counties)

State/County	Minority Rate ^a	Poverty Rate ^b
Maine	5.7%	12.6%
Cumberland	8.3%	10.5%
Knox	3.7%	12.5%
Hancock	4.0%	11.5%
Washington	9.0%	19.8%
Sagadahoc	4.6%	8.8%
New Hampshire	7.8%	7.8%
Rockingham	6.0%	4.7%
Massachusetts	23.6%	10.5%
Essex	24.3%	10.1%
Bristol	13.5%	11.3%
Rhode Island	23.5%	12.2%
Newport	12.2%	7.3%
Washington	7.9%	7.4%
New Jersey	41.1%	9.1%
Cape May	13.4%	9.2%

Source: U.S. Census Bureau, 2010, <http://quickfacts.census.gov/qfd/states.html>
^a Persons other than those who report as White persons not Hispanic.
^b Persons below poverty level, 2006-2010.

8.12 REGULATORY FLEXIBILITY ACT (RFA) –REGULATORY FLEXIBILITY ANALYSIS

The purpose of the 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 document contains a Regulatory Flexibility Analysis (RFA), found below, 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 RFA 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.

8.12.1 Reasons for Considering the Action

The purpose and need for this action are presented in Section 3.1 of this framework.

8.12.2 Objectives and Legal Basis for the Action

The objectives for this action are presented in Section 3.2 of this framework, and the legal basis is in Section 8.0.

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

For RFA purposes only, NMFS has established a small business size standard for businesses, including their affiliates, whose primary industry is commercial fishing (see 50 CFR § 200.2). A business primarily engaged in commercial fishing (NAICS code 11411) is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual receipts not in excess of \$11 million for all its affiliated operations worldwide.

For the purposes of this analysis, ownership entities are defined by 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 rule would affect all permitted herring vessels; therefore, the direct regulated entity is a firm 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. Firms are defined as active in the herring fishery if they landed any herring in 2018. 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 2018, there were 1205 firms (1193 small) that held at least one herring permit. There were 62 (60 small) active firms that held at least one herring permit. There were 68 (62 small) firms that held at least one Limited Access permit, 31 (29 small) of which were active. Small entity limited access permit holders as a whole derived approximately 38 percent of total entity revenue from the herring fishery. All small entity herring permit holders as a whole derived approximately 29 percent of total entity revenue from the herring fishery.

8.12.4 Record Keeping and Reporting Requirements

There are no additional record keeping or reporting requirements associated with this action.

8.12.5 Duplication, Overlap, or Conflict with Other Federal Rules

No relevant Federal rules have been identified that would duplicate or overplay the proposed rule.

8.12.6 Impacts of the Proposed Rule on Small Entities

The No Action alternative can serve as a baseline as it would implement the ACL from FY2019 in FY2020 and FY 2021 and make no changes to the management uncertainty buffers. We focus on the OFL/ACL and management uncertainty alternatives the other alternatives would have minimal impacts on firms participating in the fishery. The preferred alternative decreases the ACL in 2020 and 2021 from the baseline, as presented in the following table:

Table 43. ACL for the baseline (2019) compared to 2020 and 2021.

Year	Baseline	Preferred Alternative 2020 and 2021
Total ACL	15,066	11,571
Area 1A Sub ACL (28.9%)	4,354	3,344
Area 1B Sub ACL (4.3%)	647	498
Area 2 Sub ACL (27.8%)	4,188	3,217
Area 3 Sub ACL (39%)	5,876	4,513

To examine effects of the preferred alternative we assume catch is equal to ACL. Recent catch from the four herring management areas has frequently been below the sub-ACLs. However, recent catch limits have been far higher than the proposed preferred schedule and portions of the fishery have been closed due to catch of non-target species. With decreasing ACLs but stable non-target species by-catch limits, excessive catch of non-target species becomes less likely. The sub ACL percentages between fishing areas remain constant throughout the specification period, therefore there is an approximate 23% decrease in metric tons in each zone from 2019 to 2021. Using this information we can evaluate the effects on small entity revenues due to Framework 6. The average percentage of total small entity revenue derived from each fishing area is listed below (Table 44).

Table 44. Average percentage of small entity revenue derived from each herring fishing area

Area	Overall Average Entity Revenue
1A	44
1B	40
2	10
3	43

Seventeen small entities, largely purse seining, fished for herring in Area 1A in 2018. Ten of these small businesses derived 30 or less percent of total entity revenue in Area 1A. Seven small entities derived more than 80 percent of total entity revenue from Area 1A. This is more than any other area (all other areas have 3 entities deriving more than 80 percent of revenue from herring in each specific zone). Nine small entities fished for herring in Area 1B in 2018, with five deriving 30 percent or less from the area and four deriving between 70 and 100 percent from 1B. There were 39 small entities herring fishing in Area 2 in 2018. Twenty-seven of them derived between 0 and 1 percent of total entity revenue from Area 2, and another six entities derived less than 30 percent of entity revenue from the area. Four entities derived between 70 and 100 percent of total entity revenue from herring in Area 2. Finally, eight small entities

fished in Area 3 in 2018. Four of those entities derived less than 30 percent of total entity revenue from Area 3, and 4 derived between 70 and 100 percent of total entity revenue from Area 3.

While the overall fishery will decline by 23 percent, we do not expect that each of these small entities will have a 23 percent fall in total herring revenue. Rather, with small enough quotas, some companies may decide not to herring fish, and lose 100 percent of revenue from herring. In this way, the remaining small entities may realize less than 23 percent decrease in revenue from herring, as there may be fewer vessels herring fishing. Because firms that catch herring are also active in other fisheries, the changes in total revenue are smaller in percentage terms. Without being able to predict these specific shifts, Table 45 estimates, for limited access entities, the percent change in total entity revenue from a 23 percent reduction in ACL.

Table 45. Estimates for percent change in total entity revenue from this action.

Percent Change in Total Entity Revenue	Count of Entities
0 to 1 percent	17
1 to 7 percent	4
18 to 23 percent	8

8.13 EXECUTIVE ORDER 12866 (REGULATORY PLANNING AND REVIEW)

The purpose of E.O 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:

- 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;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- 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 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.

8.13.1 Statement of the Problem/Goals and Objectives

Problem, goals, and objectives are explained in Section 3.1 and 3.2.

8.13.2 Management Alternatives and Rationale

The alternatives under consideration in this Framework are explained in Section 4.2.

8.13.3 Description of the Fishery

A description of the fishery is available in Section 6.0.

8.13.4 Summary of Impacts

The expected effects of each specifications alternative relative to the status quo for the herring fishery are discussed throughout Section 7.5 and 7.6 of this document. We focus on the OFL/ACL and management uncertainty alternatives; the other alternatives would have minimal impacts on firms participating in the fishery. To summarize, the preferred specifications alternative is expected to result in net revenues that are approximately 23 percent lower than the status quo. The average ex-vessel price per metric ton of herring from 2016-2018 was \$513.830. If we assume this price is a reasonable estimate for 2019-2021 and that total ACL will be caught in each year, then in 2019 the herring fishery will have revenues of approximately \$7.741 million. The 2020 and 2021 revenues will be approximately \$5.945 million per year. The preferred alternative results in a total fishery revenue decrease of approximately \$1.795 million per year, or \$3.590 million over two years as compared to the status quo.

Table 10 of this framework presents the OFL/ABC Alternatives 1, 2a, and 2b with the Management Uncertainty Buffer Options that result in the ACL specifications. Using the 2016-2018 \$513.80 average per metric ton, the table below presents the expected revenues for these permutations of possible alternatives. The forth column includes expected revenues relative to the baseline of \$7.741M (Table 46).

Table 46. Estimated revenues for Framework 6 OFL/ABC and management uncertainty buffer options.

OFL/ABC Alternative	Management Uncertainty Alternative	Projected Revenue (\$M)	Relative to baseline (\$M)
OFL/ABC Alt 1	No Action	\$ 7.741	N/A
OFL/ABC Alt 1	Buffer Option 1	\$ 7.901	\$0.160
OFL/ABC Alt 1	Buffer Option 2	\$ 8.875	\$1.134
OFL/ABC Alt 1	Buffer Option 3	\$ 8.584	\$0.843
OFL/ABC Alt 2a	No Action	\$ 5.103	-\$2.638
OFL/ABC Alt 2a	Buffer Option 1	\$ 5.263	-\$2.478
OFL/ABC Alt 2a	Buffer Option 2	\$ 6.237	-\$1.504
OFL/ABC Alt 2a	Buffer Option 3	\$ 5.945	-\$1.796
OFL/ABC Alt 2b	No Action	\$ 4.144	-\$3.597
OFL/ABC Alt 2b	Buffer Option 1	\$ 4.304	-\$3.437
OFL/ABC Alt 2b	Buffer Option 2	\$ 5.278	-\$2.463
OFL/ABC Alt 2b	Buffer Option 3	\$ 4.986	-\$2.755

Depending on the management uncertainty buffer, OFL/ACL Alternative 1 yields is expected to increase revenue by \$0.160-\$1.134 million. Depending on the management uncertainty buffer, OFL/ACL Alternative 2a is expected to decrease revenue by \$2.638 million to \$1.504 million. Depending on the management uncertainty buffer, OFL/ACL Alternative 2b is expected to decrease revenue by -\$3.597 million to \$2.463 million.

8.13.5 Determination of Significance

Based on the analyses provided in this document, Framework 6 is 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.

9.0 GLOSSARY

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 Atlantic Herring FMP (in addition to future amendments), as appropriate.

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.

$$\text{OFL} - \text{Scientific Uncertainty} = \text{ABC (Determined by SSC)}$$

Annual Catch Limit (ACL) - A stock-wide ACL accounts for both scientific uncertainty (through the specification of ABC) and management uncertainty (through the specification of the stock-wide 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 stock-wide 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 stock-wide ACL, total fishery closure at 95%, reduces the risk of overfishing.

$$\text{ABC} - \text{Management Uncertainty} = \text{Stock wide ACL} = \text{OY}$$

Assessment model - Method for determining stock status, the results of which are used by the control rule.

Bycatch - (v.) The capture of nontarget species in directed fisheries which occurs because fishing gear and methods are not selective enough to catch only target species. (n.) Fish which are harvested in a fishery but are not sold or kept for personal use, including economic discards and regulatory discards but not fish released alive under a recreational catch and release fishery management program.

Capacity - The level of output a fishing fleet can produce given specified conditions and constraints. Maximum fishing capacity results when all fishing capital is applied over the maximum amount of available (or permitted) fishing time, assuming all variable inputs are used efficiently.

Catch - The sum of fish killed in a fishery in a given period. Catch is given in either weight or number of fish and may include landings, unreported landings, discards, and incidental deaths.

Continental shelf waters - The waters overlying the continental shelf, which extends seaward from the shoreline and deepens gradually to the point where the sea floor begins a slightly steeper descent to the deep ocean floor; the depth of the shelf edge varies but is about 200 m in many regions.

Days absent - An estimate by port agents of trip length. These data were collected as part of the NMFS weighout system before May 1, 1994.

Discards: Animals returned to sea after being caught; see *bycatch* (*n.*).

Essential Fish Habitat (EFH) - Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The EFH designation for most managed species in this region is based on a legal text definition and geographical area that are in the Habitat Omnibus Amendment (NEFMC 1998).

Exclusive Economic Zone (EEZ) - A zone in which the inner boundary is a line coterminous with the seaward boundary of each of the coastal states and the outer boundary is line 200 miles away and parallel to the inner boundary

Exempt fisheries - Any fishery determined by the Regional Director to have <5% regulated species as a bycatch (by weight) of total catch according to 50 CFR 648.80(a)(7).

Fishing effort - The amount of time and fishing power used to harvest fish. Fishing power is a function of gear size, boat size and horsepower.

Framework adjustments - Adjustments within a range of measures previously specified in a fishery management plan (FMP). A change usually can be made more quickly and easily by a framework adjustment than through an amendment. For plans developed by the NEFMC, the procedure requires at least two Council meetings including at least one public hearing and an evaluation of environmental impacts not already analyzed as part of the FMP.

Harvest control rule - Relationship describing how the results of the assessment are translated into advice for management (i.e., turns the assessment result into an allowable biological catch).

Landings - The portion of the catch that is harvested for personal use or sold.

Limited-access permits - Permits issued to vessels that met certain qualification criteria by specified date

Metric ton - A unit of weight equal to a thousand kilograms (1kgs = 2.2 lbs.). A metric ton is equivalent to 2,205 lbs. A thousand metric tons is equivalent to 2.2 million lbs.

Northeast Shelf Ecosystem - The Northeast U.S. Shelf Ecosystem has been described as including the area from the Gulf of Maine south to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream.

Operating model - model which represents the real-world resource and fishery dynamics, used as the basis for testing management options. Multiple operating models can be considered, each representing a possible state of nature.

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 neither overfished nor subject to overfishing, usually F_{MSY} or its proxy.

$$OFL \geq ABC \geq ACL.$$

Statistical area - A delineated area of ocean used to track where fish were caught. NMFS overlays a grid of statistical areas onto nautical charts to accurately identify specific areas of the ocean. Statistical areas are about 1 degree square, although in many cases they do not correspond exactly to specific latitudes and longitudes.

Stock - A grouping of fish usually based on genetic relationship, geographic distribution and movement patterns. A species, subspecies, geographical grouping, or other category of fish capable of management as a unit.

Stock area - A group of connected statistical areas that defines the geographic distribution of a particular population of a species. For example, the Gulf of Maine cod stock area comprises statistical areas 464, 465, 467, 510, 511, 512, 513, 514, and 515. All catch of cod in any of these stock areas is attributed to the GOM cod stock.

Total Allowable Catch (TAC) - The amount (in metric tons) of a stock that is permitted to be caught during a fishing year. This value is calculated by applying a target fishing mortality rate to exploitable biomass.

Trade-off - Degree to which performance against a set of management objectives are related. A strong tradeoff between two objectives implies that gaining on one means forgoing the other.

Valued Ecosystem Component (VEC) - A resource or environmental feature that is important (not only economically) to a local human population, or has a national or international profile, or if altered from its existing status, will be important for the evaluation of environmental impacts of industrial developments, and the focusing of administrative efforts.

10.0 REFERENCES

- Anthony V.C. & G.T. Waring (1978). The assessment and management of the Georges Bank herring fishery. In: *The Assessment and Management of Pelagic Fish Stocks*. Aberdeen, Scotland: Council International Pour L'Exploration De La Mer. p. 72-111.
- ASMFC (2009). *Amendment 2 to the Interstate Fishery Management Plan for Shad and River Herring (River Herring Management)*. Alexandria, VA: Atlantic States Marine Fisheries Commission. 193 p. http://www.asmfc.org/uploads/file/amendment2_RiverHerring.pdf.
- ASMFC (2017). *River Herring Stock Assessment Update Volume I: Coastwide Summary*. August 2017. Arlington, VA: Atlantic States Marine Fisheries Commission. 193 p. http://www.asmfc.org/uploads/file/59b1b81bRiverHerringStockAssessmentUpdate_Aug2017.pdf.
- 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.
- Blumenthal J.M., J.L. Solomon, C.D. Bell, T.J. Austin, G. Ebanks-Petrie, M.S. Coyne, A.C. Broderick & B.J. Godley (2006). Satellite tracking highlights the need for international cooperation in marine turtle management. *Endangered Species Research*. 2: 51-61.
- Braun-McNeill J. & S.P. Epperly (2002). 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., S.P. Epperly, L. Avens, M.L. Snover & J.C. Taylor (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. & S.P. Epperly (1996). Aerial surveys for sea turtles in southern Georgia waters, June 1991. *Gulf of Mexico Science*. 1996(1): 39-44.
- Burdge R.J. (1998). *A Conceptual Approach to Social Impact Assessment*. Revised ed. Madison, WI: Social Ecology Press. 284 p.
- Clay P.M., L.L. Colburn, J.A. Olson, P. Pinto da Silva, S.L. Smith, A. Westwood & J. Ekstrom (2007). Community Profiles for the Northeast U.S. Fisheries. Woods Hole, MA: U.S. Department of Commerce; <http://www.nefsc.noaa.gov/read/socialsci/communityProfiles.html>.
- Collins M.R. & T.I.J. Smith (1997). Distribution of shortnose and Atlantic sturgeons in South Carolina. *North American Journal of Fisheries Management*. 17: 995-1000.
- Dadswell M.J. (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 M.J., B.D. Taubert, T.S. Squires, D. Marchette & J. Buckley (1984). Synopsis of biological data on shortnose sturgeon, *Acipenser brevirostrum*. *LeSuer*. 1818.
- Dodge K.L., B. Galuardi, T.J. Miller & M.E. Lutcavage (2014). Leatherback turtle movements, dive behavior, and habitat characteristics in ecoregions of the northwest Atlantic Ocean. *PLoS ONE*. 9(3 e91726): 1-17.
- Dovel W.L. & T.J. Berggren (1983). Atlantic sturgeon of the Hudson River Estuary, New York. *New York Fish and Game Journal*. 30: 140-172.
- Dunton K.J., D.D. Chapman, A. Jordaan, K. Feldheim, S.J. O'Leary, K.A. McKnown & M.G. Frisk (2012). Brief communications: genetic mixed-stock analysis of Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus* in a heavily exploited marine habitat indicates the need for routine genetic monitoring. *Journal of Fish Biology*. 80: 207-217.

- Dunton K.J., A. Jordaan, D.O. Conover, K.A. McKown, L.A. Bonacci & M.G. Frisk (2015). Marine distribution and habitat use of Atlantic sturgeon in New York lead to fisheries interactions and bycatch. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science*. 7: 18-32.
- Dunton K.J., A. Jordaan, K.A. McKown, D.O. Conover & M.G. Frisk (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 S.A., D. Bagley, S. Kubis, L. Ehrhart, C. Johnson, K. Stewart & D. DeFreese (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 S.P., J. Braun & A.J. Chester (1995a). Areal surveys for sea turtles in North Carolina inshore waters. *Fishery Bulletin*. 93: 254-261.
- Epperly S.P., J. Braun, A.J. Chester, F.A. Cross, J.V. Merriner & P.A. Tester (1995b). 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 S.P., J. Braun & Veishlow (1995c). Sea turtles in North Carolina waters. *Conservation Biology*. 9(2): 384-394.
- Erickson D.L., A.W. Kahnle, M.J. Millard, E.A. Mora, M. Bryja, A. Higgs, J. Mohler, M. DuFour, G. Kenney, J. Sweka, et al. (2011). Use of pop-up satellite archival tags to identify oceanic-migratory patterns for adult Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*. *Journal of Applied Ichthyology*. 27: 356-365.
- Griffin D.B., S.R. Murphy, M.G. Frick, A.C. Broderick, J.W. Coker, M.S. Coyne, M.G. Dodd, M.H. Godfrey, B.J. Godley, L.A. Mawkes, 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.
- Hare J.A., W.E. Morrison, M.W. Nelson, M.M. Stachura, E.J. Teeters, R.B. Griffis, M.A. Alexander, J.D. Scott, L. Alade, R.J. Bell, et al. (2016). A vulnerability assessment of fish and invertebrates to climate change on the Northeast U.S. continental shelf. *PLoS ONE*. 11: e0146756.
- Hatch J.M. (2018). Comprehensive estimates of seabird–fishery interactions for the U.S. Northeast and Mid-Atlantic. *Aquatic Conservation: Marine and Freshwater Ecosystems*. 28: 182-193.
- Hatch J.M., D.N. Wiley, K.T. Murray & L. Welch (2016). Integrating satellite-tagged seabird and fishery-dependent data: A case study of great shearwaters (*Puffinus gravis*) and the U.S. New England sink gillnet fishery. *Conservation Letters*. 9: 43-50.
- Hawkes L.A., A.C. Broderick, M.S. Coyne, M.H. Godfrey, L.-F. Lopez-Jurado, P. Lopez-Suarez, S.E. Merino, N. Varo-Cruz & B.J. Godley (2006). Phenotypically linked dichotomy in sea turtle foraging requires multiple conservation approaches. *Current Biology*. 16: 990-995.
- Hawkes L.A., M.J. Witt, A.C. Broderick, J.W. Coker, M.S. Coyne, M.G. Dodd, M.G. Frick, M.H. Godfrey, D.B. Griffin, S.R. Murphy, et al. (2011). Home on the range: spatial ecology of loggerhead turtles in Atlantic waters of the USA. *Diversity and Distributions*. 17: 624-640.

- Hayes S.A., E. Josephson, K. Maze-Foley & P.E. Rosel (2018). *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2017*. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-245. 371 p.
- Hayes S.A., E. Josephson, K. Maze-Foley & P.E. Rosel (2019). *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2018*. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-258. 291 p.
- James M.C., R. Myers & C. Ottenmeyer (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 M.C., S.A. Sherrill-Mix, K. Martin & R.A. Myers (2006). Canadian waters provide critical foraging habitat for leatherback sea turtles. *Biological Conservation*. 133: 347-357.
- Jepson M. & L.L. Colburn (2013). *Development of Social Indicators of Fishing Community Vulnerability and Resilience in the U.S. Southeast and Northeast Regions*. Silver Spring, MD: U.S. Department of Commerce. NOAA Technical Memorandum NMFS-F/SPO-129. 64 p.
- Josephson E., F.W. Wenzel & M.C. Lyssikatos (2019). *Serious Injury Determinations for Small Cetaceans and Pinnipeds Caught in Commercial Fisheries off the Northeast U.S. Coast, 2012-2016*. U.S. Department of Commerce. NEFSC Reference Document 19-05. 27 p.
- Kynard B., M. Horgan, M. Kieffer & D. Seibel (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 R.W., J.E. Hightower, B.R. Versak, M.F. Mangold, W.W. Cole Jr. & S.E. Winslow (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. p. 167-182.
- MSFCMA (2007). Magnuson-Stevens Fishery Conservation and Management Reauthorization Act. Public Law 109-479, 16 USC 1801-1884.
- Mansfield K.L., V.S. Saba, J.A. Keinath & J.A. Mauick (2009). Satellite telemetry reveals a dichotomy in migration strategies among juvenile loggerhead sea turtles in the northwest Atlantic. *Marine Biology*. 156: 2555-2570.
- McClellan C.M. & A.J. Read (2007). Complexity and variation in loggerhead sea turtle life history. *Biology Letters*. 3: 592-594.
- Mitchell G.H., R.D. Kenney, A.M. Farak & R.J. Campbell (2003). *Evaluation of Occurrence 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.J. & E. Standora (2005). Western North Atlantic waters: Crucial developmental habitat for Kemp's ridley and loggerhead sea turtles. *Chelonean Conservation and Biology*. 4(4): 872-882.
- Murphy T.M., S.R. Murphy, D.B. Griffin & C.P. Hope (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.
- NEPA (1970). National Environmental Policy Act. Public Law 91-190: 852-859 and as amended Public Law 94-52 and 94-83, 42 USC 4321- 4347.

- NEFMC (1998). *Final Amendment #11 to the Northeast Multispecies Fishery Management Plan, #9 to the Atlantic Sea Scallop Fishery Management Plan, Amendment #1 to the Monkfish Fishery Management Plan, Amendment #1 to the Atlantic Salmon Fishery Management Plan, and components of the proposed Atlantic Herring Fishery Management Plan for Essential Fish Habitat, incorporating the Environmental Assessment*. Newburyport, MA: New England Fishery Management Council. 388 p.
- NEFMC (1999). *Final Atlantic Herring Fishery Management Plan, Incorporating the Environmental Impact Statement and Regulatory Impact Review*. Vol. I. Saugus, MA: New England Fishery Management Council in consultation with the ASMFC, MAFMC and NMFS. 390 p.
- NEFMC (2006). *Final Amendment 1 to the Atlantic Herring Fishery Management Plan incorporating the Environmental Impact Statement*. Vol. I and II. Newburyport, MA: New England Fishery Management Council in consultation with the ASMFC, MAFMC and NMFS. 1660 p.
- NEFMC (2012). *Final Amendment 5 to the Atlantic Herring Fishery Management Plan, Incorporating the Environmental Impact Statement*. Vol. I and II. Newburyport, MA: New England Fishery Management Council in consultation with the ASMFC, MAFMC and NMFS. 696 p.
- NEFMC (2014a). *Framework Adjustment 2 to the Atlantic Herring Fishery Management Plan and the 2013-2015 Atlantic Herring Fishery Specifications, Incorporating the Environmental Assessment*. Newburyport, MA: New England Fishery Management Council in consultation with the ASMFC, MAFMC and NMFS. 401 p.
- NEFMC (2014b). *Framework Adjustment 3 to the Atlantic Herring Fishery Management Plan*. Newburyport, MA: New England Fishery Management Council. 241 p.
- NEFMC (2016a). *Atlantic Herring Fishery Specifications for the 2016-2018 Fishing Years (January 1 2016 - December 31, 2018), Including an Environmental Assessment*. Newburyport, MA: New England Fishery Management Council in consultation with the ASMFC, NMFS and MAFMC. 232 p.
- NEFMC (2016b). *Final Omnibus Essential Fish Habitat Amendment 2*. Vol. 1. Newburyport, MA: New England Fishery Management Council. 490 p.
- NEFMC (2017). *Framework Adjustment 56 to the Northeast Multispecies Fishery Management Plan*. Newburyport, MA: New England Fishery Management Council in consultation with the NMFS. 309 p.
- NEFMC (2018a). *Amendment 8 to the Atlantic Herring Fishery Management Plan*. Newburyport, MA: New England Fishery Management Council. 563 p.
- NEFMC (2018b). *Updated Consideration of Federal Management for River Herring and Shad Stocks*. Newburyport, MA: New England Fishery Management Council. Discussion document. 104 p. <https://s3.amazonaws.com/nefmc.org/Final-white-paper-on-River-herring-and-Shad.pdf>.
- 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. <https://www.nefsc.noaa.gov/publications/crd/crd1218/>.
- NEFSC (2017). *Operational Assessment of 19 Northeast Groundfish Stocks, updated through 2016*. Woods Hole, MA: U.S. Department of Commerce. NEFSC Reference Document 17-17. 259 p.

- NEFSC (2018). *65th Northeast Regional Stock Assessment Workshop (65th SAW) Assessment Summary Report*. Woods Hole, MA: USDo Commerce. NEFSC Reference Document 18-08. 38 p. <http://www.nefsc.noaa.gov/publications/>.
- NMFS (2005). *Final Environmental Impact Statement for Minimizing Impacts of the Atlantic Herring Fishery on Essential Fish Habitat*. Gloucester, MA: U.S. Department of Commerce. 297 p.
<https://www.greateratlantic.fisheries.noaa.gov/nero/regs/frdoc/05/herring-feis-010705.pdf>.
- 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.
http://www.nmfs.noaa.gov/sfa/reg_svcs/social_impact_assess.htm.
- NMFS (2014a). *Endangered Species Act Section 7 Consultation Biological Opinion*. Juneau, AK: National Marine Fisheries Service. 283 p.
<https://alaskafisheries.noaa.gov/sites/default/files/final0414.pdf>.
- NMFS (2014b). *North Atlantic Right Whale (*Eubalaena glacialis*) Source Document for the Critical Habitat Designation: A Review of Information Pertaining to the Definition of "Critical Habitat"*. July 2014. U.S. Department of Commerce. Prepared by NMFS GARFO and SERO. 172 p.
<https://www.greateratlantic.fisheries.noaa.gov/regs/2015/February/narwsourcedocumentfinal072114.pdf>.
- NMFS (2015). *Endangered Species Act Section 4(b)(2) Report: Critical Habitat for the North Atlantic Right Whale (*Eubalaena glacialis*)*. December 2015. U.S. Department of Commerce. Prepared by NMFS GARFO and SERO. 110 p.
http://www.greateratlantic.fisheries.noaa.gov/regs/2016/January/16narwchsection4_b_2_report012616.pdf.
- 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. <http://www.nmfs.noaa.gov/pr/listing/reviews.htm>.
- 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. <http://www.nmfs.noaa.gov/pr/listing/reviews.htm>.
- O'Leary S.J., K.J. Dunton, L. King, M.G. Frisk & D.D. Chapman (2014). Genetic diversity and effective size of Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus* river spawning populations estimated from the microsatellite genotypes of marine-captured juveniles. *Conservation Genetics*. 1-9.
- Reid R.N., L.M. Cargnelli, S.J. Griesbach, D.B. Packer, D.L. Johnson, C.A. Zetlin, W.W. Morse & P.L. Berrien (1999). *Essential Fish Habitat Source Document: Atlantic Herring, *Culpea Harengus L.*, Life History and Habitat Characteristics*. Highlands, NJ: U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-192. 84 p.
- Sherman K., N.A. Jaworski & T.J. Smayda, eds. (1996). *The Northeastern Shelf Ecosystem - Assessment, Sustainability, and Management*. Cambridge, MA: Blackwell Science. 564 p.
- Shoop C. & R.D. Kenney (1992). Seasonal distributions and abundances of loggerhead and leatherback sea turtles in waters of the northeastern United States. *Herpetological Monographs*. 6: 43-67.

- Stein A., K.D. Friedland & M. Sutherland (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., K.D. Friedland & M. Sutherland (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.
- Stenseth N.C. & A. Mysterud (2002). Climate, changing phenology, and other life history traits: Nonlinearity and match–mismatch to the environment. *Proceedings of the National Academy of Sciences*. 99(21): 13379-13381.
- SFA (1996). Sustainable Fisheries Act. Public Law 104-297, 16 USC 1801.
- 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 V.P. (1968). Atlantic sturgeon (*Acipenser sturio* L.) caught at sea. *Journal of Ichthyology*. 8(4): 598.
- Waldman J.R., T.L. King, T. Savoy, L. Maceda, C. Grunwald & I.I. Wirgin (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.
- Wirgin I.I., M.W. Breece, D.A. Fox, L. Maceda, K.W. Wark & T.L. King (2015a). Origin of Atlantic sturgeon collected off the Delaware Coast during spring months. *North American Journal of Fisheries Management*. 35: 20-30.
- Wirgin I.I., L. Maceda, C. Grunwald & T.L. King (2015b). Population origin of Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus* by-catch in U.S. Atlantic coast fisheries. *Journal of Fish Biology*. 86(4): 1251-1270.
- Wirgin I.I., L. Maceda, J.R. Waldman, S. Wehrell, M.J. Dadswell & T.L. King (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.