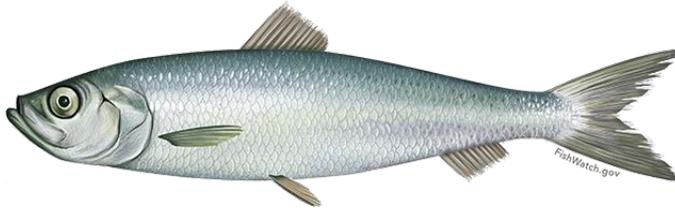


Atlantic Herring Fishery Management Plan

Framework Adjustment 6 and 2019-2021 Atlantic Herring Fishery Specifications

Including an Environmental Assessment and
Regulatory Flexibility Analysis



DRAFT

May, 2019

AP / CMTE – There are 5 issues to address identified in the margin

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

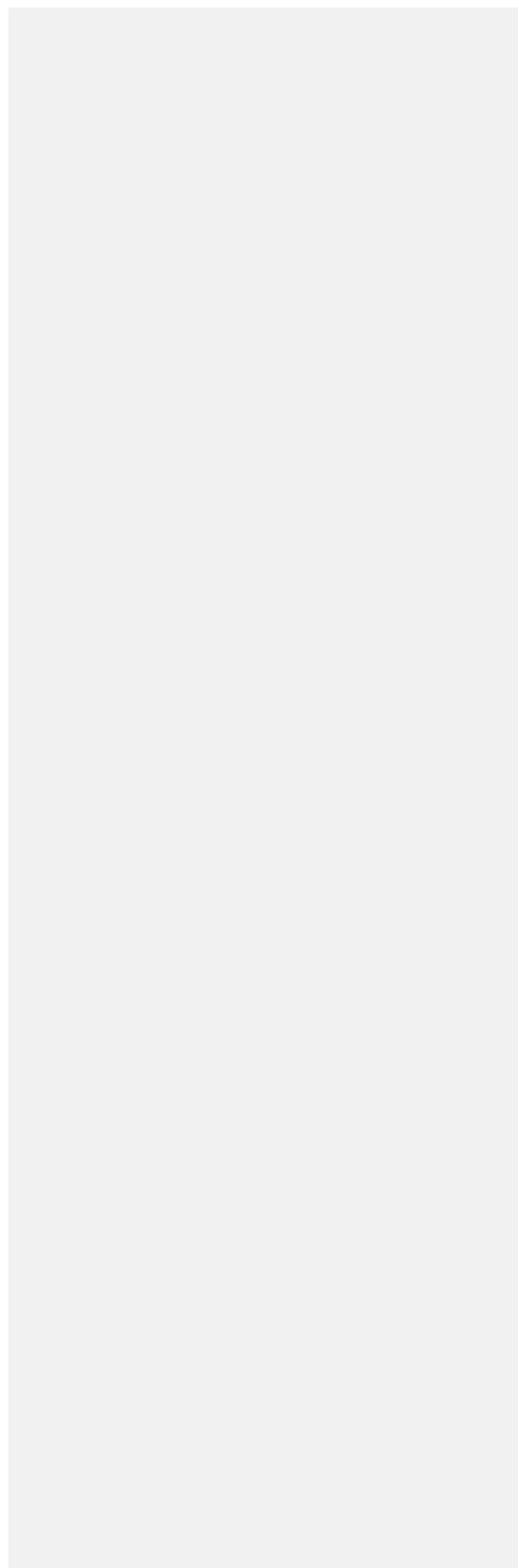


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**FRAMEWORK ADJUSTMENT 6 TO THE ATLANTIC HERRING FISHERY
MANAGEMENT PLAN AND 2019-2021 ATLANTIC HERRING FISHERY
SPECIFICATIONS**

Proposed Action: Propose a ????.

Type of Statement: Draft Environmental Assessment

Responsible Agencies: New England Fishery Management Council
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National Marine Fisheries Service
National Oceanic and Atmospheric Administration
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Abstract: The New England Fishery Management Council, in consultation with NOAA's 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 ...???. 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.

1.0 EXECUTIVE SUMMARY

This document contains the New England Fishery Management Council's (Council's) recommendations for updating the overfishing limit for Atlantic herring and for the Atlantic herring fishery specifications for the 2019-2021 fishing years, consistent with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and the Atlantic Herring Fishery Management Plan (FMP), approved by the National Marine Fisheries Service (NMFS) on October 27, 1999. This document also contains information and supporting analyses required under other applicable law, including the National Environmental Policy Act (NEPA) and Regulatory Flexibility Act (RFA).

The Atlantic herring fishery specifications are annual amounts specified for the 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 2019-2019 fishing years.

Proposed Action

Impacts of the Proposed Action

Alternatives to the Proposed Action

Insert table summarizing impacts by VEC

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2.3 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
MSFCMA	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
SFA	Sustainable Fisheries Act
SIA	Social Impact Assessment
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. 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, 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 1. 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 ATLANTIC HERRING FISHERY SPECIFICATIONS – DEFINITIONS AND FORMULAS

The following definitions/formulas were adopted in the Atlantic Herring FMP (modified in Amendment 4) and are described below as they apply to the 2019-2021 Atlantic herring fishery specifications.

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

$$OFL \geq ABC \geq ACL$$

The proposed Atlantic herring OFL specification for 2019-2021 is derived from short-term projections that considered a range of total herring catch in 2018 of 49,900 mt and over 55,000 mt. These values were developed by the Herring PDT and reviewed by the SSC.

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

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

The proposed Atlantic herring ABC specification for 2019-2021 is derived from short-term projections following the 2018 Atlantic herring update assessment and was recommended by the SSC at its October 2018 meeting (Appendix 1).

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

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

The current ABC control rule is considered an interim control rule, i.e., a placeholder until the Council can develop a long-term control rule through a more comprehensive management action. The Council initiated Amendment 8 to the Atlantic Herring FMP in January 2015 to consider a range of alternatives to establish a long-term ABC CR for Atlantic herring, including alternatives

that explicitly account for Atlantic herring's role in the ecosystem. The Council approved Amendment 8 in December 2018 including an ABC control rule. That action is currently under review and has not been implemented by NMFS yet. Therefore, this action is considering OFL/ABC alternatives that would modify the current interim control rule, and replace it with the ABC control rule recommended in Amendment 8 as the new interim control rule (See Section 4.2.1 for more detail). This action is also considering a No Action OFL/ABC that would maintain the OFL and ABC values implemented in 2019 for fishing years 2020 and 2021.

Annual Catch Limit (ACL). A stock-wide ACL will be established that 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 potential sources of management uncertainty in this plan are catches of Atlantic herring in the New Brunswick, Canadian fishery since that catch is considered part of the same stock, catch in state waters, and estimates of discarded catch. 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.

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

Sub-ACL. Area-based sub-divisions of the stock-wide/total Atlantic herring ACL, intended to minimize the risk of overfishing any stock sub-component. The herring plan has four sub-ACLs, one for Area 1A, Area 1B, Area 2 and Area 3 (Figure ???). The Council has chosen to apply AMs to the sub-ACLs (closure of the area at 92%), further reducing the risk of overfishing.

Accountability Measure(s) (AMs). Management measures established to ensure that (1) the ACL is not exceeded during the fishing year; and (2) any ACL overages, if they occur, are mitigated and corrected. During the year, when 92% of any sub-ACL is estimated to be harvested, or 95% of the entire ACL is estimated to be harvested, the herring fishery is limited to 2,000 lb per trip/day to end directed herring trips. This is an in-season accountability measure intended to ensure catch limits are not exceeded. If the sub-ACL for any management area is exceeded at the end of a fishing year, the sub-ACL will be reduced in a subsequent fishing year to account for the overage. Overages are calculated during the year following the fishing year and deducted the next year. For example, any overages in 2015 will be calculated during 2016 and deducted during 2017. If total herring catch does not exceed the stock wide-ACL and if a management area's sub-ACL has not been fully harvested during a fishing year, then the amount of the underage, up to 10% of the sub-ACL, will be carried over and added to the sub-ACL for that management area in a subsequent year. Additional herring harvest added to each sub-ACL will not be added to the stock wide herring ACL. See Section 4.5 for more detail on ACL and sub-ACL underages and overages.

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

$$\text{OY} \geq \text{DAH}$$

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

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

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

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

Border Transfer (BT). The amount of herring that can be taken in U.S. waters and transferred to Canadian herring carriers for transshipment to Canada, (4,000 mt for 2016-2018 and previous specifications, the 2019 in-season adjustments set it at 0 mt).

Research Set-Aside (RSA). RSAs are allowed in any or all of the herring management areas with a sub-ACL of 0-3%. In many years this has been set at 3% of each area, and in some years the RSA set-aside has been set to 0%.

Fixed Gear Set-Aside (FGSA). FGSA can be specified up to 500 mt in Area 1A and will be returned to the 1A sub-ACL if not used by November 1. This set-aside has been set at 500mt some years, 295mt for some years, and much lower in recent years when total quotas reduced (39 mt in 2019).

4.0 ALTERNATIVES UNDER CONSIDERATION

4.1 OVERFISHING AND OVERFISHED DEFINITIONS

The M-S Act 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)

The current overfishing and overfished definitions in the Herring FMP 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 $F_{Threshold}$.

4.1.2 Updated overfishing and overfished definitions (Alternative 2)

This alternative would update the overfishing and overfished definitions to clarify some of the text, [make it more consistent with definitions used for other stocks in the region](#), but more importantly to be more consistent with the 2018 [Atlantic herring stock assessment and Amendment 8](#). 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, the reference points are estimated based on a proxy of F40%. 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.

Updated text following Herring PDT meeting (May 8, 2019)

The stock will be considered overfished if a given measure of stock abundance or biomass is less than 1/2 the stock abundance or 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 a given measure of fishing intensity (e.g., the estimated fishing mortality rate, annual harvest rate, annual catch) exceeds the level of fishing intensity fishing mortality rate associated with the MSY level or a proxy (e.g., F_{MSY} or F_{MSY} proxy).

Commented [DB1]:
AP/CMTE ISSUE #1

Clarify Overfishing/Overfished Definition alternative.

See background on the following page.

Previous text drafted for March/April meetings:

(This would be replaced with text above if Committee/Council agree the update above is superior).

If stock biomass is equal or greater than SSB_{MSY} or SSB_{MSY} proxy, overfishing occurs when fishing mortality exceeds F_{MSY} or F_{MSY} proxy. If stock biomass is below SSB_{MSY} or SSB_{MSY} proxy, overfishing occurs when fishing mortality exceeds the level that has a 50 percent probability to rebuild stock biomass to SSB_{MSY} in 5 years ($F_{Threshold}$). The stock is in an overfished condition when stock biomass is below $1/2$ SSB_{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} or F_{MSY} proxy. If stock biomass is equal to or greater than $1/2 B_{MSY}$ or $1/2 B_{MSY}$ proxy, the target fishing mortality will be the lower value level of the 80 percent confidence interval around F_{MSY} or F_{MSY} proxy. When biomass is below SSB_{MSY} or SSB_{MSY} proxy, the target fishing mortality will be reduced consistent with the five-year rebuilding schedule used to determine $F_{Threshold}$.

Draft Rationale: 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 abundance or biomass (B, SSB, or relevant proxy), whatever is used in the stock assessment and considered the best available science. 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. (will update this after more Committee/Council discussion)

AP/ Cmte Discussion – Need for clarification

Current text above (Option 1): 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.

Other approaches used in this region (Option 2): The parameters used for MFMT and MSST must be adopted by the Council in a management action. For example, changing the MFMT from FMSY to a proxy value would require a Council action. However, updated numerical estimates of a parameter become effective without a Council action.

Option 1: The OFD does not define what the parameter is, it is left 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 this definition would be used automatically. Under this option the Council would not need to develop an action to adjust the OFD, if a new parameter was used and approved in a subsequent assessment.

Option 2: The OFD allows use of a parameter, but it specifies what the parameter is from the last approved assessment. What that means is if a future assessment uses and approves a different parameter, the Council would need to adjust the OFD to be consistent in a future action.

Under both options the "value" associated with a parameter can change automatically (i.e. Fmsy proxy in Assessment 1 may be 0.2, but in a subsequent assessment Fmsy proxy = 0.3), but the parameter itself would need to be the same for Scenario 2. Alternatively, under Scenario 1, both the method used to define proxy as well as the value could be automatically adjusted (i.e. Fmsy proxy in Assessment 1 may be based on F40%, and Fmsy proxy in Assessment 2 may be based on F50%).

For reference, in the GF plan, the OFD allows for the use of a parameter, but the specific method behind the parameter is included in the definition (Option 2). In this case the Council desired more certainty about the parameters used to define overfished/overfishing, and recommended the specific criteria should be more formally hardwired into the plan. This approach precludes a change to the definition of a parameter based on the approval of a stock assessment only; that process generally has less public participation and formal NMFS review and approval.

Major tradeoffs to consider: Option 1 is more potentially more flexible and efficient; Option 2 is more potentially more certain in terms of the criteria used to evaluate the plan.

Right now the definition in Framework 6 is consistent with Option 1, parameter is not defined. If the Committee instead wants to make the proxy defined to be consistent with Option 2 then the OFD should be modified to read:

The stock will be considered overfished if a given measure of stock biomass is less than 1/2 the stock biomass associated with the MSY level or a proxy (e.g., SSBMSY or SSBMSY proxy). The stock will be considered subject to overfishing if the estimated fishing mortality rate (F) exceeds the fishing mortality rate associated with the MSY level or a proxy (e.g., FMSY or FMSY proxy). FMSY proxy is currently defined as the fishing mortality rate associated with F(40%).

4.2 2019-2021 ATLANTIC HERRING SPECIFICATIONS WITH ALTERNATIVES

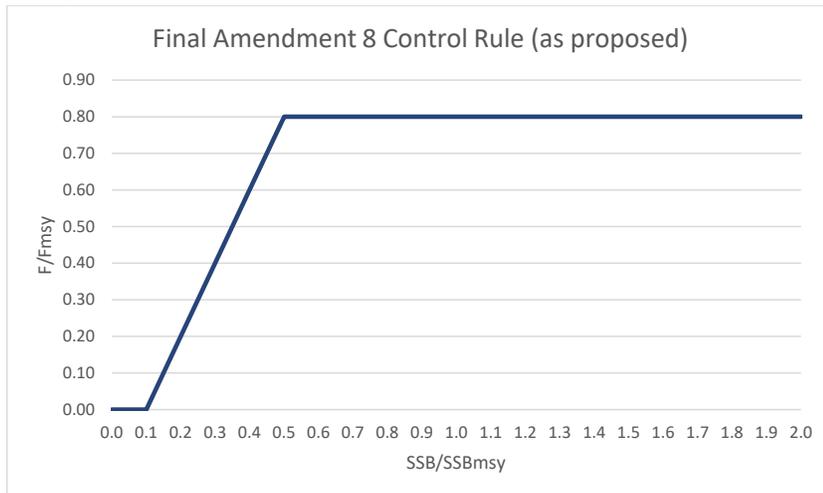
4.2.1 Overfishing Limit and Acceptable Biological Catch

Following the 2018 Atlantic herring benchmark assessment meeting, the SSC met in October 2018 to review the assessment results and develop recommendations for the Atlantic herring overfishing limit (OFL) and acceptable biological catch (ABC) specifications for the 2019-2021 fishing years. The final SSC report is included as Appendix I. The SSC reviewed ABC recommendations made by the PDT that were based on the ABC control rule that is the preferred alternative in Amendment 8 (currently under review). This ABC control rule was applied to projected biomass estimates for 2019-2021.

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).



The SSC was prepared to recommend the harvest control rule selected through Amendment 8 but had reservations about the Atlantic herring projections and were concerned about the assumptions regarding future recruitment. The SSC was concerned that age 1 recruitment in projections for 2019-2021 were drawn from 1965-2015 and the resulting projected biomass showed a substantial increase over time. The SSC did not have confidence in this increase in biomass in 2021 and were concerned about setting ABC based on this value. Following extensive discussion, 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. The SSC recommended the NEFMC request an assessment update in 2020 based on the existing benchmark assessment to verify the projected trend in biomass and recruitment with the aim of revising advice for 2021 based on more informed estimates of recent recruitment.

Table 2. 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

Typically, herring projections are done once in the fall for the subsequent three fishing years, but in this case, more time was available to consider updated catch information 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 3). 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 2).

Table 3. 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

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

Alternative 2a would implement the OFL and ABC consistent with the ABC control rule that is the preferred alternative in Amendment 8, as presented and approved by the SSC in October 2018 (Table 4). Amendment 8 is still under review by NMFS; however, the proposed rule is scheduled to be published around the time the Council takes final action on Framework 6 (June 2019). Selecting this alternative is not dependent on Amendment 8 being approved. If the Council selects this alternative for setting OFL and ABC, it would be replacing the current interim control rule (described in Section 3.3) with this rule.

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.

Table 4. 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.			

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 5). Updated 2018 landings equal 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.

The OFL and ABC values for this alternative 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 recommendation from the SSC 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 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.

Table 5. 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.			

4.2.2 Management Uncertainty and Annual Catch Limit (ACL)

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 package, and it was determined that the same three sources likely encompass the vast majority of any management uncertainty in this fishery. Keep in mind that a separate action set the management uncertainty buffer for FY2019, so these alternatives apply to FY2020 and FY2021 only.

4.2.2.1 Background

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 (Table 6) but 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. 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.

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 7); 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.

Table 6. Active weirs and the catch per weir in the New Brunswick, Canada fishery, 1978-2017

Year	NB Weir Catch (mt)	No. Active Weirs	Catch Per Weir (mt)
1978	33,570	208	162
1979	32,477	210	155
1980	11,100	120	92
1981	15,575	147	102
1982	22,183	159	140
1983	10,594	143	88
1984	8,374	116	72
1985	26,724	156	171
1986	27,515	105	262
1987	26,622	123	216
1988	32,554	191	200
1989	43,475	171	255
1990	38,224	154	258
1991	23,713	143	166
1992	31,899	151	212
1993	31,431	145	216
1994	20,622	129	160
1995	18,198	106	172
1996	15,781	101	156
1997	20,416	102	200
1998	19,113	108	181
1999	18,234	100	191
2000	16,472	77	213
2001	20,064	101	199
2002	11,807	83	142
2003	9,003	78	115
2004	20,620	84	245
2005	12,639	76	166
2006	11,641	89	131
2007	30,145	97	311
2008	6,041	76	79
2009	3,603	38	95
2010	10,671	77	139
2011	2,643	37	71
2012	494	4	124
2013	5,902	49	120
2014	1,571	26	60
2015	146	11	13
2016	2,777	26	107
2017	1732	11	157
Long-Term Average	17,409	103	158
3-Year Average	1,552	16	92
5-Year Average	4,923	38	102
10-Year Average	4,545	40	101

Source: Department of Fisheries and Oceans Canada.

Table 7. Monthly weir landings (mt) for weirs in New Brunswick, 1978-2018 (2018 is preliminary – need to update)

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.
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 8). These are the same options considered in the previous specifications package for 2016-2018.

Table 8. 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>	

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. [PDT will update these estimates through 2017 or 2018.]

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 9 provides updated catch estimates from the fixed gear fishery through 2013. The Council specifies a set-aside for West of Cutler fixed gear fishermen (FGSA), 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 9. Atlantic herring landings from fixed gear fishery, before and after November 1 rollover date

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

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

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 considered problematic to the Atlantic herring stock assessment, according to SAW 54 (NEFSC 2012).

Atlantic herring discards are estimated by NMFS using vessel and observer data and are counted against the management area sub-ACLs. To date, uncertainty related to estimating Atlantic herring discards has not been a substantial source of management uncertainty. There does not appear to be a need to change this conclusion when considering management uncertainty for the 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 10 provides 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 17), 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 10. Atlantic herring discards (mt), 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>).

4.2.2.2 Management uncertainty options and associated ACLs

4.2.2.2.1 No Action (management uncertainty buffer used in FY2019)

Under No Action, the management uncertainty buffer used in FY2019 would be used again for 202 and 2021.

4.2.2.2.2 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 8), **5,888 mt**.

4.2.2.2.3 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 8), **3,992 mt**.

4.2.2.2.4 10-year average (2009-2018) (Option 3)

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 8), **4,560 mt**.

4.2.2.3 Trigger values for rollback of unused quota to Area 1A

There is a provision in the herring plan that allows NMFS to rollback 1,000 my from the management uncertainty buffer and allocate it 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 PDT has calculated the associated triggers for each option in Table 11 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

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The PDT recommends another alternative be added to this section that considers the No Action allocation of 6,200 mt. This value has been used in several of the previous actions and would help round out the alternatives.

Please review and consider whether this alternative should be added to the document.

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, 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.

Table 11. Trigger values associated with each management uncertainty buffer option in this action

	No Action	3-year Option	5-year Option	10-year Option
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

4.2.2.4 Other measures that address management uncertainty

The Herring FMP also includes other proactive in-season measures to address the management uncertainty of US catch of Atlantic herring. Specifically, there are two in-season measures in place that close the directed herring fishery. 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 sufficient 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 the state of 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 invokes 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.

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 in light of 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 US 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.

When the Council discussed this issue, it decided to include two alternatives for the maximum amount of border transfer allowed, 0 mt and 250 mt, but the Council decided that any amount between those two alternatives could be selected. So if alternative 2 is selected below, the Council could set border transfer at any amount up to 250mt. Table 12 indicates a decrease in BT from almost 1,000 mt in 2013 to zero in the last few years (2016-2018). Border transfer reached over 3,000 mt in 1996, but for many years since has been 0-1,000 tons.

Table 12. Use of border transfer

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

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

4.2.3.1 Set border transfer at 0 mt (No Action)

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.

4.2.3.2 Set border transfer at up to 250 mt

Alternative 2 would set border transfer at up to 250 mt for 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. The Council may select a poundage up to 250 mt, to be specified at the final Council meeting if this alternative is selected.

4.3 2019-2021 ATLANTIC HERRING SPECIFICATIONS WITHOUT ALTERNATIVES

The Council does not always consider alternatives for all the herring fishery specifications. The specifications that do not have alternatives and were specified by the Council at the April 2019 Council meeting, are included in this section.

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 established 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 (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 became effective during the 2001 fishing year, and since 2001, total landings in the U.S. fishery have decreased.

Table 18 summarizes total Atlantic herring catch as a percentage of the total available catch in each year from 2003-2018 (preliminary). 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, increased 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 minus ??? mt (???) for BT during the 2019-2021 fishing years and in prior specifications. [*This will be filled in after the BT reduction is known from above, 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 US 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 and is not a specific allocation to this processing sector.

During the 2007-2009 fishing years, the Council maintained a USAP specification of 20,000 mt (Areas 2/3 only) based on information received about a new at-sea processing vessel that intended to utilize a substantial amount of the USAP specification. At that time, landings from Areas 2 and 3 – where USAP is authorized – were considerably lower than allocated sub-ACLs for each of the past several years. Moreover, the specification of 20,000 mt for USAP did not restrict either the operation or the expansion of the shoreside processing facilities during the 2007-2009 fishing years. However, this operation never materialized, and none of the USAP specification was used during the 2007-2009 fishing years. Consequently, the Council set USAP at zero for the 2010-2012, 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 of USAP for the 2019-2021 fishing years would remain at 0 mt**.

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

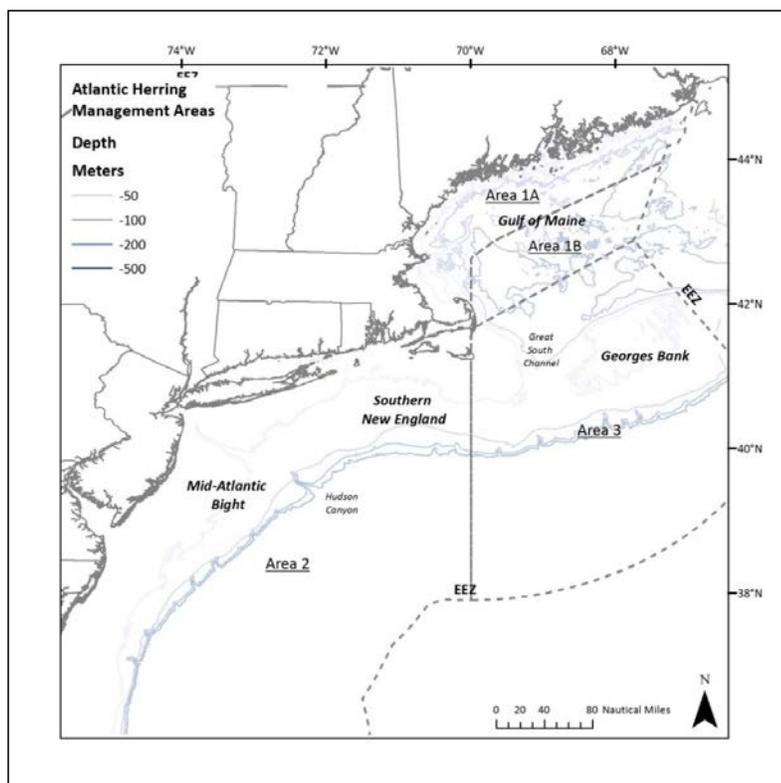
4.3.4 Management area sub-ACLs for 2019-2021

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 of Southern New England and the Mid-Atlantic (Figure 2). The allocations and herring management area boundaries themselves have been adjusted over the years. However, since Framework 2, specifications for

fishing years 2013-2015, the sub-ACLs have been allocated with 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.**

Figure 2. Atlantic herring management areas (current boundaries in place since Amendment 1, 2007)



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 (monthly) 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 (RSA)

The RSA process is a competitive grants process administered by the Northeast Fisheries Science Center. Proposals are requested for research, and incoming proposals are reviewed and ranked by a technical body. With competitive grants awarded through this process, different entities will apply. 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, RH bycatch avoidance, electronic monitoring, and research to support herring stock assessments.

In December 2017 the Council-approved research priorities for FY2019-2021 and an announcement for potential funding came out in summer 2018. Final awards were made in April 2019, and would be subject to this action approving set-aside for FY2020 and 2021. **The Council has specified that RSA for 2019-2021 fishing years be 3% of each herring management area sub-ACL.**

Council-approved priorities for Herring RSA (2019-2021)

- Portside sampling and bycatch avoidance projects primarily related to haddock and river herring/shad;
- Stock structure and spatial management projects – in particular, continued work on:
 - (a) distinguishing among subcomponents of the herring resource
 - Gulf of Maine, Georges Bank, and Southern New England – and identifying stocks of origin from mixed catches,
 - (b) identifying the relative size of stock components, movements, and mixing rates,
 - (c) ascertaining the degree of homing, and
 - (d) investigating potential effects of climate change;
- Research spawning dynamics, including projects related to life history, gear interactions, and spatial patterns, including studies to evaluate whether gear interactions disrupt spawning and negatively affect recruitment due to egg disposition and survival;
- Localized depletion studies to evaluate the influence of potential localized depletion of herring on predators; and
- Projects designed to evaluate discard rates and mortality of released fish in the purse seine fishery.

4.3.7 Fixed Gear Set-Aside (FGSA)

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 set-aside 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 9 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 other reductions in the fishery.

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 back to Area 1A to December 31. The state of Maine has also implemented a closure to state permitted vessels when it is estimated that the fixed gear set-aside has been harvested. This state regulation coupled with increased 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 a level that is proportionally reduced relative to the 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 will rollover 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 13). These allocations 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 continuing to include additional years to this reference period. Including the years 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.

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Clarify that the FGSA specification is based on a proportional reduction relative to the Area 1A sub-ACL, not the total ACL. This was not totally clear from previous Herring Committee and Council motions.

Table 13. 2019 RH/S catch caps in the herring fishery, implemented by NMFS through in-season adjustment

RH/S catch caps	Allocation (MT)
MWT GOM	76.7
MWT Cape Cod	32.4
MWT SNE/MA	129.6
BT SNE/MA	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 14 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 4.2.2.2).

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 14. 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
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	452
				5,888	10,243	2,960	440	2,848	3,995	27	461
				3,992	12,139	3,508	522	3,375	4,734	31	518
	2020	41,830	16,131	4,560	11,571	3,344	498	3,217	4,513	30	501
				6,200	9,931	2,870	427	2,761	3,873	26	452
				5,888	10,243	2,960	440	2,848	3,995	27	461
				3,992	12,139	3,508	522	3,375	4,734	31	518
	2021	69,064	16,131	4,560	11,571	3,344	498	3,217	4,513	30	501
				6,200	9,931	2,870	427	2,761	3,873	26	452
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	452
				5,888	8,377	2,421	360	2,329	3,267	22	461
				3,992	10,273	2,969	442	2,856	4,006	27	518
	2020	40,574	14,265	4,560	9,705	2,805	417	2,698	3,785	25	501
				6,200	8,065	2,331	347	2,242	3,145	21	452
				5,888	8,377	2,421	360	2,329	3,267	22	461
				3,992	10,273	2,969	442	2,856	4,006	27	518
	2021	68,718	14,265	4,560	9,705	2,805	417	2,698	3,785	25	501
				6,200	8,065	2,331	347	2,242	3,145	21	452

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. Section 648.201 of the herring regulations specify the carryover provisions.

The 2018 catch estimates are not officially final yet, but will likely be very close to final estimates available on the GARFO monitoring website. Table 15 shows that 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. 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, in-season the fishery is closed 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 have the potential to reduce potential access in 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 ACLs are 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 approximately 5,000 mt (Table 15). 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 15. 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	2,63.9
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

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Clarify that current regulations allow up to 10% of unharvested catch in each herring management area to carryover, but total ACL does not increase. This could create an issue for the distribution of catch by area if some areas harvest increased sub-ACLs before other areas.

Discuss if additional measures should be considered in this action.

1. Temporarily prohibit carryover under low quotas, for this action only.
2. Change carryover provisions to increase total ACL by carryover amount.
3. Do not make any changes in FMP but give NMFS discretion that they do not have to approve carryover under certain conditions.

If any changes are made the AP/Cmte may need to revisit management uncertainty buffer. Would there still be adequate buffer between ABC and ACL?

If no change is made there may be increased risks of exceeding the ACL and ABC in 2020.

4.6 SUMMARY OF MONITORING AND REPORTING REQUIREMENTS IN THE ATLANTIC HERRING PLAN

This section has been included in this document to clarify the existing monitoring program in place for the Atlantic herring fishery, as well as the various reporting requirements. Questions have been raised at recent meetings about the challenges of monitoring relatively low herring quotas, and the potential impacts that could have on the fishery in-season as well as in future years if sub-ACLs or total ACLs are exceeded. 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 to 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 Squid, Mackerel, Butterfish 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.

5.0 ALTERNATIVES CONSIDERED BUT REJECTED

5.1 RIVER HERRING/SHAD (RH/S) CATCH CAPS

Several possible alternatives were considered by the Council. The PDT provided some initial input about some of the challenges with alternative ways to set RH/S catch caps in this fishery at this time. That input is provided here as well as part of the rationale for rejecting these as alternatives in this action. The PDT has also provided some general input on RH/S catch caps that is summarized here after several years under catch caps.

1. Setting bycatch catch caps for RH/S in the herring fishery is problematic without an estimate of RH/S biomass or an index of relative abundance. The rationale used in Framework 3 was that the catch caps implemented would serve as a precautionary place mark to limit RH/S total removals by the fishery to a historical average. This management measure was to be in place until a biomass based assessment because available for RH/S. Since the updated assessment in 2017 could not produce biomass based estimates, the PDT recommends the Committee may want to explore other ways to minimize RH/S bycatch and reduce incentive to catch RH/S. Other measures, such as time/area closures, may be more effective for minimizing RH/S bycatch, given the lack of information available about the size and status of RH/S populations. The PDT has explored the idea of potential time area closures and triggers in the past and these analyses would require work to update and/or modify. Finally, the proposed MWT prohibition area approved by the Council in Amendment 8 may have limited benefits for RH/S bycatch, but would not address potential impacts of BT fishing effort.
2. Observer coverage rates are lower now than when these catch caps were set in Framework 3; therefore, there is less data available to inform potential caps. Observer coverage and monitoring is expected to improve again in near future after IFM implementation, but for the time being there is very limited data to inform this issue.
3. An effective measure that has indirect benefits for reducing bycatch is reducing the ACL of target species. FY2019-2021 will have greatly reduced herring ACLs compared to previous years and that is expected to have positive impacts on bycatch compared to bycatch associated with recent herring allocations and catch levels. Setting bycatch catch caps for RH/S in the herring fishery is problematic without an estimate of RH/S biomass or an index of relative abundance. The rationale used in Framework 3 was that the catch caps implemented would serve as a precautionary place mark to limit RH/S total removals by the fishery to a historical average. This management measure was to be in place until a biomass based assessment because available for RH/S. Since the updated assessment in 2017 was not able to produce biomass based estimates, the PDT

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The PDT recommends the Cmte consider including the RH/S catch cap alternatives that were considered at the March and April meetings in the Considered and Rejected Section, with PDT input.

Please review and consider including this section.

recommends the Committee may want to explore other ways to minimize RH/S bycatch and reduce incentive to catch RH/S. Other measures, such as time/area closures, may be more effective for minimizing RH/S bycatch, given the lack of information available about the size and status of RH/S populations. The PDT has explored the idea of potential time area closures and triggers in the past and these analyses would require work to update and/or modify. Finally, the proposed MWT prohibition area approved by the Council in Amendment 8 may have limited benefits for RH/S bycatch, but would not address potential impacts of BT fishing effort.

4. Observer coverage rates are lower now than when these catch caps were set in Framework 3; therefore, there is less data available to inform potential caps. Observer coverage and monitoring is expected to improve again in near future after IFM implementation, but for the time being there is very limited data to inform this issue.
5. An effective measure that has indirect benefits for reducing bycatch is reducing the ACL of target species. FY2019-2021 will have greatly reduced herring ACLs compared to previous years and that is expected to have positive impacts on bycatch compared to bycatch associated with recent herring allocations and catch levels.

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.

Rational for rejection: The Council does not support consideration of this as an alternative at this time. 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, no 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.

Rational for rejection: The Council does not support consideration of this as an alternative at this time. This alternative is not consistent 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 at this time. 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 16 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 16. 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

Rational 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

Develop an alternative similar to 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 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 at this time. 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.

6.1 TARGET SPECIES (ATLANTIC HERRING)

[to be completed]

- Paragraph about 2018 assessment
- Paragraph about Amendment 8 and timing
- Paragraph about 2018 and 2019 in-season adjustments
- Paragraph about change in assessment schedule for foreseeable future – next one scheduled for spring 2020, so the specs for 2021 in this action will likely be replaced by subsequent action (specs for 2021-2023).
- Reference NMFS letter about approaching overfished and requirements to rebuild overfished fisheries: Section 104-297

6.2 NON-TARGET SPECIES (BYCATCH)

[to be completed]

6.3 PHYSICAL ENVIRONMENT AND ESSENTIAL FISH HABITAT

[to be completed]

6.4 PROTECTED RESOURCES

[to be completed]

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 Amendment 8 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 to the A. herring FMP (Section 3.6).

MSFCMA 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 (Figure 2, p. 31). 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 always fully used, 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 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 18 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 2014b, Section 3.6.1).

Atlantic herring catch estimate methods:

1. *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.
2. *2007-2009:* based on IVR data supplemented with dealer data. Reported herring discards are included in the totals.
3. *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 2003-2014, averaging about 91,925 mt, but has declined in more recent years (43,789 mt in 2018; Table 17). 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 18).

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 summarized in Section 4.2.2.1.

Table 17. 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 18. 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%

Year	Sub-Area	sub-ACL (mt)	Catch (mt)	% Harvested
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

6.5.1.2 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 19). 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 19. 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 20) (NEFMC 2018, Section 3.6.1.4). This includes a decrease in the limited access directed fishery vessels (Categories A and B), with 79 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 20). 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 21).

Table 20. 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 active vessels listed in parentheses
 *Confidential vessel activity data

Table 21. 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.

6.5.1.3 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 22) (NEFMC 2018, 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.

Table 22. Atlantic herring landings by fishing gear type and area, 2012-2014. (still updating)

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

Source: VTR database. August 2015.
 Note: Data include all vessels that landed one pound or more of Atlantic herring. Single and pair midwater trawl data are combined due to data confidentiality restrictions.

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 23). No BT was used from 2008-2010, but some amount was used in 2011-2013.

Table 23. Use of border transfer, 1994-2018. (still updating)

Year	BT use (mt)	Year	BT use (mt)	Year	BT use (mt)
1994	2,456	2003	1,311	2012	788
1995	2,117	2004	184	2013	838
1996	3,690	2005	169	2014	???
1997	1,280	2006	653	2015	???
1998	1,093	2007	53	2016	???
1999	839	2008	0	2017	???
2000	1,546	2009	0	2018	???
2001	445	2010	0		
2002	688	2011	946		

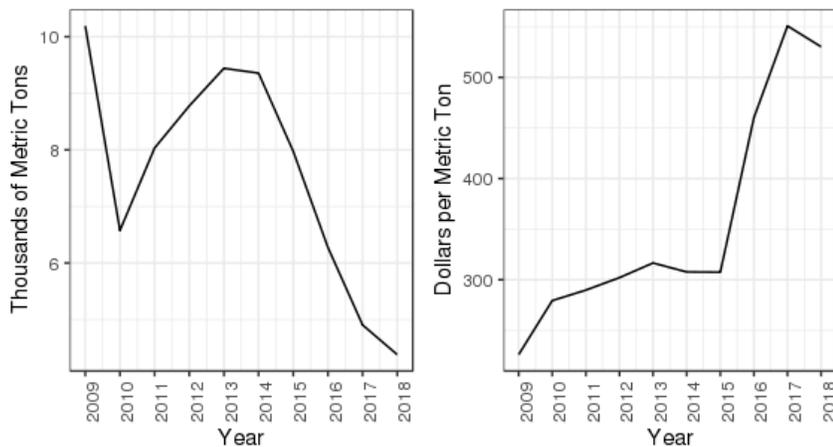
Source: NMFS/GARFO.

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 2018, 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 3). Fishery value peaked in 2013 at about \$30M and has been above \$20M per year since 2011.

Figure 3. 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. Other uses of herring include aquaculture feed, canned pet food, livestock food, and industrial and biomedical purposes. According to NMFS dealer data, 77% of the Atlantic herring landed from 2012-2014 was sold as bait; most of the rest was used for human consumption. Ports in Maine (61%) and Massachusetts (36%) landed 97% of all herring used for bait.

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. In the bait market, Atlantic menhaden is one substitute for Atlantic herring. Use of menhaden for bait has increased in importance relative to fish meal and oil. From 2001 to 2012, the percent of total menhaden landings that were used for bait rose from 13% to a high of 28% in 2012 (63,540 mt). In 2013, bait harvest was about 22% of the total menhaden harvest. Menhaden landings for bait have recently dipped due to reductions in allowable catch; landings in 2013 were 35,043 mt, 34% below the average landings during 2010-2012 (52,900 mt; ASMFC 2015). During 2008-2011, *ex-vessel* menhaden prices ranged from \$139-\$169 per mt. This is about 33-50% lower than *ex-vessel* herring prices. If the quantity of Atlantic herring supplied into the bait market declines dramatically, more menhaden may be used as bait, moderating the increases in herring prices. Menhaden is primarily used to produce fish meal and oil. However, the Atlantic Herring FMP prohibits use of herring for fish meal, so herring is not a substitute in the production of those goods. 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.”

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 2018, 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 2018, 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 24).
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 24). 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 2018, Section 3.6.3.2.2).

Table 24. 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

This action evaluates the potential impacts using the criteria in Table 25.

Table 25. 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 (+)

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 would update the overfishing definition to be more consistent with the 2018 assessment and Amendment 8. Both alternatives are primarily administrative and direct impacts on the resource are not expected. However, Alternative 2 may be more flexible and responsive to more updated assessment information, so there may be indirect low positive impacts on the resource as a result.

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 was set in a separate action. The projections assume that the ABC allocated in 2019 will be the catch for that year, which is typical for a bridge year like this to assume the ABC allocation is the catch. The results of the projections are in Table 26 through Table 28 and discussed below relative to each alternative under consideration for the 2019-2021 fishery specifications. The major focus of these analyses will be on FY2020, since this action for the most part is a one year action. Measures will be set for FY2021 as well, but it is likely a subsequent action will replace those specifications after a 2020 herring assessment is completed.

Table 26 is a projection for Alternative 1 (No Action) for OFL/ABC; if the 2019 OFL/ABC values rolled over for 2020 and 2021. Under this alternative, 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 27 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 expressed concern 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. The estimate of F and P(overfishing) are both lower for this alternative compared to No Action (Alternative 1), but the differences are not substantial since the ABC is only about 4,000 mt lower. Note these projections are not directly comparable because Table 27 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 and the differences were very minor.

Table 28 has been developed by the PDT more recently 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 compared to 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 now 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% compared to 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 similar low levels of probability of overfishing (1-2%) and probability of overfished (83-84%).

Table 26. 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/SSBmsy	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 27. 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/SSBmsy	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 28. 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/SSBmsy	0.40	0.26	0.30	0.67

* For 2018, this value is estimated landings, not ABC. Estimated catch from the terminal year (2018) is used to calculate OFL and ABC projections for 2019-2021.

**Note the updated estimate of OFL for 2019 from the projections is 29,024 mt, but the OFL adopted in the 2019 in-season adjustment 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 Fmsy to SSB

is 29,024 mt. This is a relatively small difference with essentially no difference in terms of probability of overfished.

*** For 2021 the PDT recommends that ABC remain at the 2020 level (14,265 mt) consistent with previous SSC advice not to increase ABC in 2021 due to concerns about the assumptions regarding future recruitment. The projected ABC from the model has strike through text (29,835 mt), but the PDT recommendation is to reduce 2021 ABC to be equivalent to 2020 ABC.

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 Fmsy (0.58 for updated 2018 projections compared to a Fmsy 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 Fmsy. For all three alternatives the projection of F for 2020 is less than Fmsy (range of 0.16 to 0.25). The probability of overfished is still high because the biomass is relatively low (ratio of SSB to SSBmsy is estimated to be roughly 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 stockwide Atlantic herring ACL/OY, i.e., the maximum amount of total annual removals from the U.S. fishery under each of the alternatives. Alternatives that allow for higher annual removals from the U.S. fishery are considered to be less precautionary with respect to the risk of overfishing (exceeding the OFL). Because the difference in ABC between the alternatives is minor, the differential impacts of the alternatives are expected to be **negligible**. However, because the stock size is relatively low, if more biomass is left in the system there may be a greater chance the stock could recover more quickly.

The Atlantic herring ABC specifications under consideration in this action are substantially lower than the previous 2016-2018 package (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 more status quo fishing levels.

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 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). 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 sufficient to account for that mortality. However, NB weir catch has been highly variable and uncertain and catches are equally likely to be much 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. The differences between these alternatives is relatively minor, so any differential impacts are negligible.

7.1.4 Border Transfer Alternatives

This action is considering a range of 0mt to 250 mt for border transfer, fish allowed to be harvested by US 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 Other measures that do not have alternatives

The specifications that do not have alternatives in this package are: DAH, DAP, USAP, sub-ACL allocations by herring management area, seasonal sub-ACL allocations, RSA, FGSA, and RH/S catch caps. This list of measures are not expected to have any measurable impacts on the herring resource. The potential impacts of these specifications have been analyzed in previous actions and no additional impacts are expected.

7.2 IMPACTS ON NON-TARGET SPECIES (BYCATCH)

Similar to previous action. Will include some discussion of potential impacts on RH/S from catch cap specification.

7.3 IMPACTS ON PROTECTED SPECIES

Similar to previous actions.

7.4 IMPACTS ON PHYSICAL ENVIRONMENT AND ESSENTIAL FISH HABITAT

Similar to previous actions.

7.5 IMPACTS ON HUMAN COMMUNITIES

The analysis of impacts on human communities characterizes the magnitude and extent of the economic and social impacts likely to result from the alternatives under consideration. National Standard 8 requires the Council to consider the importance of fishery resources to affected communities and provide those communities with continuing access to fishery resources, but it does not allow the Council to compromise the conservation objectives of the management measures. Thus, continued overall access to fishery resources is a consideration, but not a guarantee that fishermen will be able to use a gear type, harvest a species of fish, fish in an area, or fish during a certain time of the year.

A fundamental difficulty exists in forecasting economic and social change relative to fishery management alternatives when communities or other societal groups are constantly evolving in response to numerous external factors, such as market conditions, technology, alternate uses of waterfront, and tourism. Certainly, management regulations influence the direction and magnitude of economic and social change, but attribution is difficult with the tools and data available. While this analysis focuses generally on the economic and social impacts of the proposed fishing regulations, external factors may also influence change, both positive and negative, in the affected communities. In many cases, these factors contribute to a community's vulnerability and ability to adapt to new or different fishing regulations.

When examining potential economic and social impacts of management measures, it is important to consider impacts on the following: the fishing fleet (vessels grouped by fishery, primary gear type, and/or size); vessel owners and employees (captains and crew); 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).

7.5.1 Overfishing/Overfished Definition

7.5.1.1 No Action (Alternative 1)

Alternative 1 would keep the current overfishing definition for the Herring FMP.

Alternative 1 (No Action) is 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 stock assessment, it may not reflect the best available science, leading to an indirect negative impact on the attitudes and beliefs of fishermen and other stakeholders towards management.

7.5.1.2 Updated overfishing definition (Alternative 2)

Alternative 2 would update the overfishing definition for the Herring FMP.

Alternative 2 is administrative and would have no direct impacts on human communities, positive or negative. Since Alternative 2 encompasses other possible scenarios resulting from a stock assessment, it would reflect the best available science, leading to an indirect positive impact on the attitudes and beliefs of fishermen and other stakeholders towards management. The impacts of Alternative 2 would be low positive relative to Alternative 1.

7.5.2 2019-2021 Atlantic herring specifications with alternatives

7.5.2.1 Overfishing Limit and Acceptable Biological Catch

7.5.2.1.1 No Action OFL/ABC (Alternative 1)

Under No Action (Alternative 1), the 2019 Atlantic herring OFL and ABC implemented by the 2019 in-season adjustment would be maintained (Table 3). Atlantic herring ABC would be 21,266 mt for 2019-2021, which is higher than the SSC recommendation for 2020 and 2021.

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 (in addition to the stability provided by a three-year specifications process). The size and demographic characteristics of the fishery-related workforce would likely be unchanged, as would the dependence on and participation in the fishery – relative to the conditions currently expected for 2019. However Alternative 1 would continue substantially reduced catch and revenue relative to recent years.

In the short term, Alternative 1 may prevent a viable herring fishery such that businesses may fail. 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. Using the average annual prices per metric ton of herring for 2016-2018 (Section 6.5.1.5), expected total landings revenue under Alternative 1 is between \$7.741M and \$8.875M per year for 2020 and 2021, depending upon the chosen management uncertainty buffer.

In the long term, the impacts of Alternative 1 are expected to be mixed. Because the ABC (and ACL) is substantially below the overfishing limit, it is expected to result in greater herring biomass available for future years and contribute to rebounding of the stock. However, the OFL and ABC in 2020 and 2021 exceed the SSC recommendations, so Alternative 1 has more long-term risk relative to Alternatives 2A and 2B. However, if businesses fail in the short term, they would receive no long-term benefit from these restrictions.

7.5.2.1.2 OFL and ABC consistent with the proposed Amendment 8 ABC control rule (Alternative 2a)

Under Alternative 2a, 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 4). 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).

The social and economic impacts of Alternative 2a 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 2020 would be lower by about 24% relative to Alternative 1. There would be a degree of predictability for fishing industry operations provided by a three-year specifications process, but the size and demographic characteristics of the fishery-related workforce would likely be reduced, as would the dependence on and participation in the fishery – relative to the conditions currently expected for 2019. Additionally, Alternative 2a would continue substantially reduced catch and revenue relative to recent years.

In the short term, Alternative 2a 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 may adversely affect permitted entities with larger percentages of annual revenue from herring. In 2017, small entities with Category A permits derived an average of 50% of their annual revenue from herring landings. These entities may be more adversely impacted by a 24% decrease in the ABC than many Category B and C permitted entities, which derived an average of 3.4% of annual revenue from herring landings. 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. Using the average annual prices per metric ton of herring for 2016-2018, expected total landings revenue under Alternative 2a is between \$5.103M and \$6.237M per year for 2020 and 2021 (about \$2.6M/year lower than Alternative 1), depending upon the chosen management uncertainty buffer.

In the long term, the impacts of Alternative 2a are expected to be mixed. Because the ABC (and ACL) is substantially below the overfishing limit, it is expected to result in greater herring biomass available for future years and contribute to rebounding of the stock. Alternative 2a has less long-term risk relative to Alternative 1, which exceeds the SSC recommendations for OFL and ABC. However, if businesses fail in the short term, they would receive no long-term benefit from these restrictions.

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

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 5).

The social and economic impacts of Alternative 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 2020 would be lower by about 33% relative to Alternative 1. There would be a degree of predictability for fishing industry operations provided by a three-year specifications process, but the size and demographic characteristics of the fishery-related workforce would likely be reduced, as would the dependence on and participation in the fishery – relative to the conditions

currently expected for 2019. Additionally, Alternative 2b would continue substantially reduced catch and revenue relative to recent years. Relative to Alternative 2a, impacts would be more negative; Alternative 2b would result in the lowest ABC of the alternatives under consideration.

In the short term, Alternative 2b 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 may adversely affect permitted entities with larger percentages of annual revenue from herring. In 2017, small entities with Category A permits derived an average of 50% of their annual revenue from herring landings. These entities may be more adversely impacted by a 33% decrease in the ABC than many Category B and C permitted entities, which derived an average of 3.4% of annual revenue from herring landings. 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. Using the average annual prices per metric ton of herring for 2016-2018, expected total landings revenue under Alternative 2b is between \$4.044M and \$5.278M per year for 2020 and 2021 (about \$3.6M/year and \$1M/year lower than Alternatives 1 and 2a, respectively), depending upon the chosen management uncertainty buffer.

In the long term, the impacts of Alternative 2b are expected to be mixed. Because the ABC (and ACL) is substantially below the overfishing limit, it is expected to result in greater herring biomass available for future years and contribute to rebounding of the stock. Alternative 2b has the least long-term risk relative to Alternatives 1 and 2A. However, if businesses fail in the short term, they would receive no long-term benefit from these restrictions.

7.5.2.2 Management uncertainty options and associated ACLs

7.5.2.2.1 No Action (management uncertainty buffer used in FY2019)

Under No Action, the management uncertainty buffer for 2020-2021 would remain as set for 2019, 6,200 mt.

The social and economic impacts of No Action on herring fishery-related businesses and communities are expected to be uncertain but potentially low negative. The management uncertainty buffer would help prevent Atlantic herring catch from exceeding the ABC, avoiding overage deductions (and revenue losses) in future years. A buffer of 6,200 mt may be more conservative than necessary to account for the sources of uncertainty included in the buffer. However, since the New Brunswick weir fishery caught about 11,502 mt in 2018 alone (Table 8), there is a chance that No Action may result in the fishery exceeding its ABC, given the overall low ABC values. However, NB weir catch is very variable with no apparent trends, thus impacts are somewhat uncertain.

7.5.2.2.2 3-year moving average (2016-2018) (Option 1)

Under Option 1, the management uncertainty buffer for 2020-2021 would be 5,888 mt.

The social and economic impacts of Option 1 on herring fishery-related businesses and communities are expected to be uncertain but potentially low positive. The management uncertainty buffer would help prevent Atlantic herring catch from exceeding the ABC, avoiding

overage deductions (and revenue losses) in future years. Impacts would be slightly low positive relative to No Action, as 312 mt more herring would be available to the fishery (a slightly higher ACL). However, since the New Brunswick weir fishery caught about 11,502 mt in 2018 alone (Table 8), there is a chance that No Action may result in the fishery exceeding its ABC, given the overall low ABC values. However, NB weir catch is very variable with no apparent trends, thus impacts are somewhat uncertain.

7.5.2.2.3 5-year moving average (2014-2018) (Option 2)

Under Option 2, the management uncertainty buffer for 2020-2021 would be 3,992 mt.

The social and economic impacts of Option 2 on herring fishery-related businesses and communities are expected to be uncertain but potentially low positive. The management uncertainty buffer would help prevent Atlantic herring catch from exceeding the ABC, avoiding overage deductions (and revenue losses) in future years. 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). However, since the New Brunswick weir fishery caught about 11,502 mt in 2018 alone (Table 8), there is a chance that No Action may result in the fishery exceeding its ABC, given the overall low ABC values. However, NB weir catch is very variable with no apparent trends, thus impacts are somewhat uncertain.

7.5.2.2.4 10-year moving average (2009-2018) (Option 3)

Under Option 3, the management uncertainty buffer for 2020-2021 would be 4,560 mt.

The social and economic impacts of Option 3 on herring fishery-related businesses and communities are expected to be uncertain but potentially low positive. The management uncertainty buffer would help prevent Atlantic herring catch from exceeding the ABC, avoiding overage deductions (and revenue losses) in future years. 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. Since the New Brunswick weir fishery caught about 11,502 mt in 2018 alone (Table 8), there is a chance that No Action may result in the fishery exceeding its ABC, given the overall low ABC values. However, NB weir catch is very variable with no apparent trends, thus impacts are somewhat uncertain.

7.5.2.3 Border Transfer

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.

The impacts on the Atlantic herring fishery of setting BT at 0 mt are expected to *negligible to low negative*. Setting BT at a value above 0 would have *low positive* impacts relative to No Action. 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 trading partnerships between U.S. and Canadian fisheries, importing or exporting bait for lobster fisheries and 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 more 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.

7.5.3 2019-2021 Atlantic herring specifications without alternatives

The formulas for the following specifications for 2019-2021 would remain unchanged from 2016-2018: domestic annual harvest, domestic annual processing, U.S. at-sea processing, management area sub-ACLs, seasonal (monthly) sub-ACL divisions, Research Set-Aside, and the river herring/shad catch caps. Thus, the impacts of these specifications are not expected to differ from what was considered in prior actions and are not discussed here.

7.5.3.1 Fixed Gear Set-Aside (FGSA)

The Atlantic Herring FMP allows up to 500 mt of the Atlantic herring sub-ACL to be set-aside until November 1 for fixed gear fishermen fishing West of Cutler, Maine. This set-aside (FGSA) is returned later in the year if it is not used. The FGSA was set at 39 mt for 2019, down from 298 in 2018, proportional to other reductions implemented for 2019. The FGSA for 2020 and 2021 would be set at a level that is proportional to the reduction in herring quota.

The impacts of the FGSA on the herring fishery-related businesses and communities is 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.

7.6 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's 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 noted 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 25.

Temporal Scope of the VECs

While the effects of historical fisheries are considered, the temporal scope of past and present actions for regulated groundfish stocks, non-groundfish species, habitat and the human environment is primarily focused on actions that have taken place since implementation of the initial ??? FMP in 1977. 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. For future actions, this analysis examines the period between the expected implementation of this action (???, 20??) and 20??.

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 ??? 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

7.6.3 Baseline Conditions for Resources and Human Communities

7.6.4 Cumulative Effects Analysis

To be completed when the final proposed action is selected.

8.0 REFERENCES

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