FINAL
AMENDMENT 4
to the
Fishery Management Plan (FMP)
for
Atlantic Herring

Including the
Environmental Assessment (EA),
Regulatory Impact Review (RIR), and
Initial Regulatory Flexibility Analysis (IRFA)

Prepared by the
New England Fishery Management Council

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

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Executive Summary

This amendment document and Environmental Assessment (EA) presents and evaluates management measures and alternatives to achieve specific goals and objectives for the Atlantic herring fishery. This document was prepared by the New England Fishery Management Council and its Herring Plan Development Team (PDT), in consultation with the National Marine Fisheries Service (NMFS, NOAA Fisheries), the Atlantic States Marine Fisheries Commission (ASMFC), and the Mid-Atlantic Fishery Management Council (MAFMC). This amendment was developed in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the National Environmental Policy Act (NEPA), the former being the primary domestic legislation governing fisheries management in the U.S. Exclusive Economic Zone (EEZ).

Although this FMP amendment has been prepared primarily in response to the requirements of the MSA and NEPA, it also addresses the requirements of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). When preparing a Fishery Management Plan or FMP amendment, the Council also must comply with the requirements of the Regulatory Flexibility Act (RFA), the Administrative Procedures Act (APA), the Paperwork Reduction Act (PRA), the Information Quality Act (IQA), the Coastal Zone Management Act (CZMA), and Executive Orders 13132 (Federalism) and 12866 (Regulatory Planning). These other applicable laws and executive orders help ensure that in developing an FMP/amendment, the Council considers the full range of alternatives and their expected impacts on the marine environment, living marine resources, and the affected human environment. This integrated document contains all required elements of the FMP amendment, including an EA as required by NEPA and information to ensure consistency with other applicable laws and Executive Orders.

A scoping document was originally prepared and distributed on May 8th, 2008, to inform the public of the Council's intent to gather information necessary for the preparation of Amendment 4 and ask for suggestions and information on the range of issues to be addressed in this amendment. Measures to address issues such as catch monitoring program, river herring bycatch measures, criteria for midwater trawl access to groundfish closed areas, and measures to address interactions with the Atlantic mackerel fishery were originally developed in tandem with this amendment. In June of 2009, however the Council split the document so that annual catch limits (ACLs) and accountability measures (AMs) can be implemented more expeditiously for implementation by the 2011 fishing year, as is mandated by the MSA. As a result, Amendment 4 only addresses measures regarding the ACL/AM implementation, which, due to the procedural nature, will be evaluated using an EA rather than an EIS, as per the NOI published on December 28th, 2009. Amendment 5 should be referenced for additional information pertaining to the other measures.

The Council considered four management alternatives in Amendment 4. A no action alternative for ACLs was considered as well as a no action alternative for AMs (i.e., status quo conditions in the herring fishery if this amendment is not completed). The Council also considered a management alternative which would establish ACLs and another which would establish Accountability Measures AMs in the fishery. The Proposed Action consists of these two

alternatives, which are described in Section 3.0 and analyzed in detail throughout this amendment, and can be summarized as follows:

- Establish ACLs in the fishery, a measure which consists of four components:
    - Define those terms which would bring the Atlantic Herring FMP into compliance with the MSA, which included setting an interim ABC control rule
    - Eliminate Joint Venture Processing (JVP), Internal Waters Processing (IWP), Total Allowable Level of Foreign Fishing (TALFF) and Reserve specifications from the process (the council decided upon this sub-option as opposed to the status quo sub-option which would have retained JVP, IWP, TALFF and Reserve in the specifications process)
    - Establish the possibility of sub-ACLs in the fishery, along with possible corresponding AMs or other sub-ACL measures
    - Establish the Atlantic Herring Fishery Specification Process which utilizes the elements being established within Amendment 4
- Establish Accountability Measures in the fishery, three of which were chosen by the Council:
    - Institute the current management measures, which close the fishery when 95% of the sub-ACL is projected to be reached, as an AM
    - Create a consequential AM that can apply to ACLs or sub-ACLs for overages by subtracting the amount of the overage from subsequent ACLs
    - Create a haddock catch cap which complies with current management

This amendment and EA document builds on the Draft EA prepared by the Council in December 2009 and provides additional information and analysis relative to the specific management actions proposed in this amendment. Consistent with the requirements of the National Environmental Policy Act (NEPA), the Final EA document:

- Contains all of the required components of both the Draft and Final EA;
- Updates herring stock and fishery information through 2008 to the extent possible;
- Responds to substantive comments received on the Draft EA from the public and other agencies;
- Identifies and discusses remaining areas of controversy and issues to be resolved;
- Provides the Council's rationale for the proposed management action.

This document also includes an Initial Regulatory Flexibility Analysis (IRFA) and responds accordingly to the requirements of the Regulatory Flexibility Act (RFA) and Executive Order 12866, as well as other applicable laws.

Summary of Impact Analysis

Analyses of the Proposed Action as well as all management alternatives and independent management measures considered during the development of this amendment are provided in this document across a series of valued ecosystem components, or VECs. VECs represent the resources, areas, and human communities that may be affected by a proposed management action

or alternatives, and by other actions that have occurred or will occur outside the Proposed Action. VECs are the focus of an EA since they are the "place" where the impacts of management actions are exhibited. An analysis of impacts is performed on each VEC to assess whether the direct/indirect effects of an alternative adds to or subtracts from the effects that are already affecting the VEC from past, present and future actions outside the Proposed Action (i.e., cumulative effects). The VECs identified for Amendment 4 include: the Atlantic herring resource, Non-target/bycatch species, habitat and EFH, protected resources, non-target/bycatch species, and fishery-related economic and social issues.

The descriptive and analytic components of this document are constructed in a consistent manner. The Affected Environment section of this document traces the history of each VEC and consequently addresses the impacts of past actions. The Affected Environment section (Section 6.0) is designed to enhance the readers' understanding of the historical, current, and near-future conditions (baselines and trends) in order to fully understand the anticipated environmental impacts of the management alternatives and independent measures under consideration in this amendment.

Impacts on the Atlantic Herring Resource (Section 7.1.1)

By establishing ACLs this alternative brings the Atlantic Herring FMP into compliance with the MSA and NS1 Guidelines. The current specifications process will remain largely unchanged, aside from the adjustments to comply with the MSA, such as including the OFL, ABC, ACL, and AMs in the specifications process and specifying how the PDT and SSC will guide the recommendation process for the reference points within the specifications packages. The removal of the setting of JVP, IWP, TALFF and a TAC reserve from the specifications process is also included. The alternative is mostly administrative and therefore the establishment of terms and changes to the process should not have a direct biological impact. It should, however, have indirect positive biological effects by standardizing the specifications setting process, which includes explicitly defining an OFL, scientific uncertainty, an ACL, and management uncertainty. The implementation of the resulting specifications are likely to have some positive benefit over the status quo process by possibly creating a more sustainable fishery, however this amendment does not set the specifications themselves, and the direct impact of will be evaluated further when the corresponding numbers are established. The setting of the interim ABC control rule may also be beneficial indirectly, but the definition of the rule itself will have no direct impact on the target or not-target species, and the 2010-2012 specifications package addresses the direct impacts of the ABC value.

Overall the establishment of AMs in the Atlantic Herring FMP is procedural, and no direct biological impact is expected for the herring resource. The proposed ACL overage deduction, a reactive AM designed to provide consequences for area quota overages, could have positive biological impacts, however current management measures have prevented overfishing, so the impacts of the AM are expected to be negligible. The proposed haddock catch cap AM could also have a positive biological impact, however management measures are already in place enforcing it, so this measure re-defines the procedure as an AM rather than altering it. The biological impact on the herring fishery and haddock resource is therefore expected to be nil. Indirectly, however, both measures may benefit the herring resource by increasing accountability.

Impacts on Habitat and EFH (Section 7.1.2)
The EFH final rule specifies that measures to minimize impacts should be enacted when adverse effects that are more than minimal and not temporary in nature are anticipated.
However, this action brings the Atlantic herring FMP into compliance with the MSA by redefining catch levels and thresholds to comport with ACL requirements and by formalizing/establishing AMs. This includes defining new terms, re-defining old terms, removal of JVP, IWP, TALFF, and the Reserve from the specifications and defining two new AMs: the reactive ACL overage payback provisions, and the haddock catch cap. Such measures are procedural and administrative, and therefore are not expected to have a direct impact on EFH. In addition, the herring fishery continues to have no more than minimal and temporary impacts on EFH and as a result of the Proposed Action, based on the previous finding that the fishery, as it existed in 2005, was not having more than minimal or temporary impacts on EFH.

Impacts on Protected Resources (Section 7.1.3)
Similar to the biological impacts, defining the new terms is unlikely to have any effect on protected species. Setting the interim ABC control rule should not alter the process in a way that would increase or decrease benefits to protected species, as it would only change the way the number is derived. The administrative adjustments, such as including the OFL, ABC, ACL, and AMs in the specifications process, the guidance provided by the administrative portion of the specifications process, and the removal of setting JVP, IWP, TALFF and a TAC reserve should not increase or decrease interactions of protected species with the fishery. Nor should defining sub-ACLs or re-defining the term "stocks in the fishery". Overall the measures in the Proposed Action are administrative in nature, and the specifications process will set the values, which will be evaluated at a later time. The impact to protected species is therefore expected to be negligible.

The addition of AMs to the process is also not expected to impact protected species. Although the fishery will consistently be held accountable for overages and required to adhere to a haddock catch cap, similar measures already in place in the fisheries make the impact of the AMs negligible on the fishery. By extension, shifts in timing, gear types, and location of the fishery will most likely not result, and there should not be an impact on protected species.

Impacts on Non-Target/Bycatch Species (Section 7.1.4)
The Proposed Action is mostly administrative and the establishment of terms and changes to the process should not have a direct biological impact. The Proposed Action may indirectly benefit non-target/bycatch species, however, by making the process explicit and incorporating the SSC into the specification process which, in turn, may better prevent their catch.

Administrative adjustments, such as including the OFL, ABC, ACL, and AMs in the specifications process and removal of JVP, IWP, TALFF and the TAC reserve, are administrative and should have a neutral impact on non-target/bycatch species. The alteration of the specification process is procedural and is expected to have no biological impact as a result of implementation. Indirectly this could benefit the non-target/bycatch species by improving the management process, potentially reducing the catch as a result. The interim ABC control rule could likewise provide ancillary benefits to the afore mentioned species as the ABC was reduced

as a result of the rule. This amendment does not set the specifications themselves, however, and the direct impact on non-target/bycatch species will be evaluated further during the process of setting the specific value. Similarly, defining "stocks in the fishery" to include non-target species in the specifications process in the future could have positive biological impacts on non-target species in the future, however this amendment does not specify any other species besides Atlantic Herring as a "stock", and so no impact is expected.

The overall effect of the ACL Overage Deduction AM on non-target/bycatch species is expected to be neutral as well. Although the AM is reactive and designed to provide consequences for area quota overages during a fishing year, the overages do not apply to non-target/bycatch species. An indirect benefit to the species may come from the potential prevention of the herring fishery exceeding OFL, however such indirect benefits are likely to be limited. Current management measures have prevented overfishing in recent years, so the effects on fishing behavior and subsequent interactions with non-target/bycatch species should be negligible. The Haddock Catch Cap AM could have a positive biological impact to the herring stock by reducing incidental haddock mortality, but the measure was put in place in the herring fishery with Framework Adjustment 43 to the Northeast Multispecies FMP in 2006. This amendment re-defines the procedure as an accountability measure rather than altering it, and the establishement of this measure as an AM should therefore not be expected to have an effect on non-target/bycatch species. Indirectly, however, both measures may benefit the herring resource by increasing accountability.

Economic Impacts (Section 7.2.1)

The overall impact of the Proposed Action will be mostly procedural and is expected to have negligible economic impacts for the herring fishery. The new definitions, in addition to the re-definition of old terms, are not expected to produce direct economic benefits as they only establish the definitions. Likewise, the administrative adjustments and removal of JVP, IWP, TALFF and a TAC reserve from the specifications is not expected to produce an effect, as in recent years the specifications packages have set the four specifications to 0. The timing of the release of information regarding the specifications could be important for financial planning for the following years and the process may be more time-consuming for the Council and NMFS. Therefore it will be important to try to develop the specifications well in advance of the following fishing year so that the industry can make financial plans according to the upcoming ACLs, sub-ACLs, and AMs. Such timing should not be tremendously difficult to adhere to, however, and therefore the impact of the timing should be negligible.+-

A potential negative economic impact could occur in the future if requests for TALFF took a long time to be granted approval; there may be a negative effect on US employment and revenues in both the processing and harvesting sectors. For example, if a TALFF were requested with the intent of US processors processing the landed herring and the request was delayed or denied then US processors could experience an economic impact, although the possibility of this occurring is remote. The Proposed Action is therefore not likely to have a direct economic impact.

The setting of the interim ABC control rule is not expected to have any direct economic impact either. The economic effects of setting the actual number for the ABC are addressed in the 2010-

2012 specifications package. The interim control rule, by comparison, is being defined in this amendment and will not set a number directly, therefore it can be expected to have no economic impact.

Some indirect, positive economic effect could result from these new definitions, however. The process will become more explicit, which could result in more appropriate quotas and by extension, could act to ensure the longevity of the fishery as an economic resource.

While the establishment of the two AMs in the Proposed Action may provide some indirect economic benefit by increasing accountability, the direct effects should not be felt economically because of current measures already in place which already prevent overfishing. In summation, this process is in compliance with the MSA, whereas the No Action Alternative is not, and therefore may be more preferable. Indirect benefits may result from making the process explicit and incorporating the SSC and PDT into the specification process, thereby presenting the opportunity to better preventing overfishing and possibly creating a more sustainable fishery. This amendment does not set the specifications themselves, however, and the direct impact will be evaluated further when the numbers are set.

Social and Community Impacts (Section 7.2.2)

The measures proposed in this Amendment are not expected to have a social impact to the herring fishery, as they are primarily administrative and procedural in nature. The definition of the new terms and re-definition of the old terms is not expected to have a social impact, as they are purely administrative changes. Likewise, the fishery specification changes, such as removal of the four specifications and inclusion of the new terms into the specifications process (including suggesting how the PDT and SSC will interact to bring suggestions for reference points to the Council) should not socially affect the fisheries or their communities. Timing, however, is important in terms of providing the industry with sufficient information to make business arrangements and plans for the following years. The proposed ACL/AM process is more complicated and may be more time-consuming for the Council and NMFS. It will be important to try to develop the specifications well in advance of the following fishing year so that the industry has sufficient notice as to what the upcoming ACLs, sub-ACLs, and AMs may be.

The setting of the interim ABC control rule is not expected to have any direct social impact either. The social effects of setting the actual number for the ABC are addressed in the 2010-2012 specifications package. The interim control rule, by comparison, is being defined in this amendment and will not set a number directly, therefore it can be expected to have no social impact.

Similar to the economic impacts, a potential negative social impact could exist for fishermen and the fishing community if requests for TALFF took a long time to be granted approval. Loss of US employment and revenues in both the processing and harvesting sectors would subsequently produce social impacts. As was described in the economic section, however, the possibility of this occurring is remote and the Proposed Action is therefore not likely to have a large direct social impact.

The AMs in the Proposed Action are likewise expected to be neutral. The ACL overage deduction AM is designed to provide consequences for overages during a fishing year and the consequences are enforced in the year after the final catch is tallied. There should not be a social impact as a result of this delay since measures already exist to prevent overages; when the AM takes effect it should not alter the behavior of the fishermen and therefore should have no consequence. The proposed Haddock Catch Cap AM is consistent with the establishment of the catch cap as a sub-ACL in the groundfish fishery (Amendment 16) and consistent with current regulations regarding the catch cap. There would therefore be no expected additional social impacts for the herring fishery as a result of this proposed option, and overall there are no expected social impacts of the implementation of AMs.

Summary Table – Impacts Across All VECs

The following summary table characterizes the potential impacts of the management measures proposed in this amendment, as well as the alternatives that the Council considered during the amendment development on each of the six VECs. It helps to provide a general understanding of the impacts of the Proposed Action and forms a basis for comparing alternatives to the no action alternative. Measures that the Council ultimately rejected and/or eliminated from further consideration in Amendment 4 are not included in the following table, as this table relates only to the Proposed Management Action and its alternatives. The measures that were eliminated from consideration are described and analyzed throughout this document, however, to provide additional perspective on the impacts of the Proposed Action.

Executive Summary – Impacts of the Proposed Action (Shaded) and Other Alternatives on the Six VECs Identified for Consideration

	Atlantic Herring Resource	Habitat and EFH	Protected Resources	Non-Target/ Bycatch Species	Economic	Social
PROPOSED ACTION (ACLs)	**Potentially Positive** –mostly procedural/ administrative but indirect benefits from improving process may result	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature	**Potentially Positive** –mostly procedural/ administrative but indirect benefits from improving process may result	**Potentially Positive** –mostly procedural/ administrative but indirect benefits from improving process may result	**Neutral** – the measure is administrative and procedural in nature
No Action Alternative	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature
PROPOSED ACTION (AMs)	**Potentially Positive** –mostly procedural/ administrative but indirect benefits from improving process may result	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature	**Potentially Positive** –mostly procedural/ administrative but indirect benefits from improving process may result	**Potentially Positive** –mostly procedural/ administrative but indirect benefits from improving process may result	**Neutral** – the measure is administrative and procedural in nature
No Action Alternative	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature	**Neutral** – the measure is administrative and procedural in nature

Table of Contents

INTRODUCTION **1**
1.0 BACKGROUND AND PURPOSE **1**
1.1 Management History and Context **1**
1.1.1 Annual Catch Limits (ACLs) 2
1.1.1.1 Important Considerations 4
1.1.1.1.1 Scientific Uncertainty and Stock Assessment Issues 5
1.1.1.1.2 Impacts of Canadian Fishery for Atlantic Herring 8
1.1.1.1.3 State/Federal ACL Issues 9
1.1.1.1.4 Atlantic Herring Discards 11
1.1.2 Accountability Measures (AMs) 12
1.1.3 Congruence with 2010-2012 Herring Fishery Specifications 13
1.2 Purpose and Need for Action **15**
1.3 Notice of Intent and Scoping **16**
2.0 GOALS AND OBJECTIVES **18**
2.1 Objectives **18**
3.0 PROPOSED MANAGEMENT ACTION **19**
3.1 Establishing Annual Catch Limits (ACLs) **19**
3.1.1 The ACL/AM Process (Fishery Specifications) 19
3.1.1.1 Definitions 19
3.1.1.2 Elimination of JVP, IWP, TALFF, and Reserve Specifications 23
3.1.1.3 Sub-ACLs 25
3.1.1.4 Administration: Atlantic Herring Fishery Specification Process 26
3.2 Establishing Accountability Measures (AMs) **28**
3.2.1 Establishment of Current AM 29
3.2.2 Additional AMs 30
3.2.2.1 ACL Overage Deduction 30
3.2.2.2 Haddock Catch Cap 31
3.2.3 Other Factors 31
3.2.3.1 In-season Adjustments to TACs 31
3.2.3.2 Acknowledgement of ASMFC Management Measures 32
4.0 ALTERNATIVES TO THE PROPOSED ACTION **32**
4.1 Non-preferred alternatives **33**
4.1.1 ACL No Action Alternative (Non-Preferred) 33
4.1.2 Option 1 – Current Specifications with Minor Changes (Non-Preferred) 33
4.1.3 AM Alternative 1 - No Action (Current AMs) (Non-Preferred) 34
4.2 Measures Considered but rejected **35**
4.2.1 Closure of a management area at a lower percentage of the ACL 36
4.2.2 Establishment of a threshold/trigger for an in-season adjustment to the ACL 36
4.2.3 Closure of a management area at a projection of 100% of the ACL 36
4.2.4 Establishment of a lower trigger to close fishery in following year 36
4.2.4.1 Direct Deduction in Following Fishing Year 37
4.2.4.2 Determination of Negative Biological Impact of Overage Prior to Deduction 37
5.0 RATIONALE FOR THE PROPOSED MANAGEMENT ACTION **38**
5.1 Annual Catch Limits **38**

5.1.1 Definitions ... 38
5.1.2 Elimination of JVP, IWP, TALFF, and Reserve Specifications ... 42
5.1.3 Sub-ACLs and Other Possible ACL Sub-Components ... 43
5.1.4 Administration: Atlantic Herring Fishery Specification Process ... 43
5.2 Accountability Measures ... 44
5.2.1 ACL Overage Deduction ... 44
5.2.2 Haddock Catch Cap ... 44
6.0 AFFECTED ENVIRONMENT ... 44
6.1 Biological Environment ... 44
6.1.1 Atlantic Herring Resource ... 44
6.1.1.1 Updated Trawl Surveys ... 45
6.1.1.1.1 NMFS Trawl Survey – All Strata ... 45
6.1.1.1.2 Trawl Survey Data – Inshore Only ... 47
6.1.1.1.3 NMFS Trawl Survey – Inshore Only ... 50
6.1.1.1.4 MA DMF Inshore Trawl Survey ... 52
6.1.1.1.5 ME DMR Inshore Trawl Survey ... 60
6.1.1.2 TRAC Stock Assessment – Summary of Stock Status ... 61
6.1.1.3 Herring Overfishing Definition – Stock Status ... 64
6.1.1.4 The Important Role of Atlantic Herring in the Northeast Region Ecosystem ... 64
6.1.2 Habitat and EFH ... 67
6.1.2.1 Physical and Biological Environment ... 67
6.1.2.1.1 Gulf of Maine ... 68
6.1.2.1.2 Georges Bank ... 71
6.1.2.1.3 Mid-Atlantic Bight ... 73
6.1.2.2 Essential Fish Habitat ... 77
6.1.2.2.1 Atlantic Herring EFH ... 78
6.1.2.2.2 EFH for Other Species ... 83
6.1.3 Protected Resources (Marine Mammals and Protected Species) ... 92
6.1.3.1 Species Present in the Area ... 92
6.1.3.2 Species Potentially Affected ... 93
6.1.3.2.1 Sea Turtles ... 93
6.1.3.2.2 Large Cetaceans ... 94
6.1.3.2.3 Small Cetaceans ... 95
6.1.3.2.4 Pinnipeds ... 95
6.1.3.3 Species Not Likely to be Affected ... 96
6.1.3.4 Interactions Between Gear and Protected Resources ... 98
6.1.3.5 Actions to Minimize Interactions with Protected Species ... 101
6.1.3.5.1 Atlantic Trawl Gear Take Reduction Team/Atlantic Trawl Gear Take Reduction Strategy ... 102
6.1.3.5.2 Harbor Porpoise Take Reduction Plan ... 102
6.1.3.5.3 Atlantic Large Whale Take Reduction Plan ... 103
6.1.4 Non-target and Bycatch Species ... 103
6.1.4.1 Spiny Dogfish ... 103
6.1.4.1.1 Life History ... 103
6.1.4.1.2 Population Management and Status ... 104
6.1.4.2 Mackerel ... 104

6.1.4.2.1 Life History 104
6.1.4.2.2 Population Management and Status 104
6.1.4.3 Haddock 104
6.1.4.3.1 Life History 105
6.1.4.3.2 Population Management and Status 105
6.1.4.3.3 Haddock Incidental Catch 105
6.1.4.3.4 The management measures in Framework 43 to the Northeast Multispecies FMP established a catch cap for haddock in the Atlantic herring fishery, based on the following provisions: 105
6.1.4.4 Atlantic Herring 106
6.2 Human Environment 106
6.2.1 Atlantic Herring Fishery 107
6.2.1.1 Herring IVR Landings 107
6.2.1.2 Landings from State Waters 111
6.2.1.3 Herring Fishery – Economic Factors 112
6.2.1.4 2008 Atlantic Herring Revenues 113
6.2.1.5 Updated Observer Data 121
6.2.1.6 Canadian Herring Fisheries 133
7.0 ENVIRONMENTAL IMPACTS OF MANAGEMENT ALTERNATIVES 138
7.1 Biological Impacts 138
7.1.1 Impacts on the Atlantic Herring Resource 138
7.1.1.1 Herring Resource Impacts of Establishing ACLs– *Alternative 1/No Action* (Non-Preferred) 138
7.1.1.2 Herring Resource Impacts of Establishing ACLs – *Alternative 2* (Proposed Action) 138
7.1.1.3 Herring Resource Impacts of Establishing AMs – *Alternative 1/No Action* (Non-Preferred) 140
7.1.1.4 Herring Resource Impacts of Establishing AMs – *Alternative 2* (Proposed Action) 140
7.1.2 Habitat and EFH 141
7.1.3 Impacts on Protected Species 142
7.1.3.1 Protected Species Impacts of Establishing ACLs – *Alternative 1/No Action* (Non-Preferred) 143
7.1.3.2 Protected Species Impacts of Establishing ACLs – *Alternative 2* (Proposed Action) 143
7.1.3.3 Protected Species Impacts of Establishing AMs – *Alternative 1/No Action* (Non-Preferred) 144
7.1.3.4 Protected Species Impacts of Establishing AMs – *Alternative 2* (Proposed Action) 145
7.1.3.5 Monitoring 145
7.1.3.6 Forage Species Availability 145
7.1.4 Impacts on Non-Target Bycatch Species 146
7.1.4.1 Impacts of Establishing ACLs on Non-Target/Bycatch Species – *Alternative 1/No Action* (Non-Preferred) 146
7.1.4.2 Impacts of Establishing ACLs on Non-Target/Bycatch Species – *Alternative2* (Proposed Option) 146

7.1.4.3 Impacts of Establishing AMs on Non-Target/Bycatch Species – *Alternative 1/No Action* (Non-Preferred) ... 147
7.1.4.4 Impacts of Establishing AMs on Non-Target/Bycatch Species – *Alternative 2* (Proposed Action) ... 148
7.2 Human Impacts ... 149
7.2.1 Economic Impacts ... 149
7.2.1.1 Economic Impacts of Establishing ACLs – *Alternative 1/No Action* (Non-Preferred) ... 149
7.2.1.2 Economic Impacts of Establishing ACLs – *Alternative 2* (Proposed Option) 149
7.2.1.3 Economic Impacts of Establishing AMs – *Alternative 1/No Action* (Non-Preferred) ... 151
7.2.1.4 Economic Impacts of Establishing AMs – *Alternative 2* (Proposed Action) . 151
7.2.2 Social and Community Impacts ... 151
7.2.2.1 Social Impacts of Establishing ACLs – *Alternative 1/No Action* (Non-Preferred) ... 152
7.2.2.2 Social Impacts of Establishing ACLs – *Alternative 2* (Proposed Action) ... 152
7.2.2.3 Social Impacts of Establishing AMs – *Alternative 1/No Action* (Non-Preferred) 153
7.2.2.4 Social Impacts of Establishing AMs – *Alternative 2* (Proposed Action) ... 153
7.3 Cumulative Effects ... 154
7.3.1 Atlantic Herring Resource ... 156
7.3.2 Habitat and EFH ... 158
7.3.3 Protected Resources (Marine Mammals and Protected Species) ... 159
7.3.4 Non-Target Species (Bycatch) ... 161
7.3.5 Atlantic Herring Fishery ... 163
7.3.6 Non-Fishing Effects: Past, Present, Reasonably Foreseeable Future Actions ... 165
8.0 CONSISTENCY WITH APPLICABLE LAWS ... 167
8.1 Magnuson-Stevens Fishery Conservation and Management Act ... 167
8.2 National Environmental Policy Act (NEPA) ... 168
8.2.1 Environmental Assessment ... 168
8.2.2 Finding of No Significant Impact (FONSI) ... 168
8.3 Marine Mammal Protection Act (MMPA) ... 173
8.4 Endangered Species Act (ESA) ... 173
8.5 Paperwork Reduction Act (PRA) ... 174
8.6 Information Quality Act (IQA) ... 174
8.7 Impacts on Federalism/E.O. 13132 ... 176
8.8 Administrative Procedures Act (APA) ... 177
8.9 Coastal Zone management Act (CZMA) ... 177
8.10 Regulatory Flexibility Act/E.O. 12866 ... 177
8.10.1 Regulatory Impact Review and Initial Regulatory Flexibility Analysis (IRFA) 177
8.10.2 Description of Management Objectives ... 178
8.10.3 Description of the Fishery ... 178
8.10.4 Statement of the Problem ... 178
8.10.5 Description of the Alternatives ... 178
8.10.6 Economic Analysis ... 178
8.10.7 Determination of Significance Under E.O. 12866 ... 178

8.10.8 Initial Regulatory Flexibility Analysis 179
8.10.8.1 Reasons for Considering the Action 179
8.10.8.2 Objectives and Legal Basis for the Action 180
8.10.8.3 Description and Number of Small Entities to Which the Rule Applies 180
8.10.8.4 Recordkeeping and Reporting Requirements 181
8.10.8.5 Duplication, Overlap, or Conflict with Other Federal Rules 181
8.10.8.6 Economic Impacts on Small Entities Resulting from the Proposed Action 181
9.0 LIST OF PREPARERS AND CONTRIBUTORS 181
10.0 LIST OF ACRONYMS 182
11.0 GLOSSARY 185
12.0 REFERENCES 193
12.1 General References 193
12.2 Referneces for Essential Fish Habitat 196
12.3 References for Protected Resources 198
13.0 LIST OF PUBLIC MEETINGS 202

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List of Tables

Table 1 2008 Atlantic Herring Landings by Non-Federally-Permitted Vessels 10
Table 2 Relationship Between Proposed 2010-2012 Specifications and Measures Proposed in Amendment 4 15
Table 3 Overview of New Definitions used in Proposed ACL Process 23
Table 4 Proposed Changes to Atlantic Herring Fishery Specifications 24
Table 5 Option 1 – Proposed Changes to Atlantic Herring Fishery Specifications 34
Table 6 NMFS Trawl Survey – Herring Catch Per Tow (Mean Number and Weight in kg), 1990-2008 .. 46
Table 7 NMFS Winter Trawl Survey – Herring Catch Per Tow (Mean Number and Weight in kg), 1992-2007 47
Table 8 2009 TRAC Assessment – General Outlook for 2009-2011 at Current F (0.14) 64
Table 9 Gulf of Maine Benthic Assemblages as Identified by Watling (1988) 70
Table 10 Demersal Fish Assemblages of Georges Bank and the Gulf of Maine 71
Table 11 Sedimentary Provinces and Associated Benthic Landscapes of Georges Bank 73
Table 12 Mid-Atlantic Habitat Types as described by Pratt (1973) and Boesch (1979) with Characteristic Macrofauna as identified in Boesch (1979) 77
Table 13 Major Recurrent Demersal Finfish Assemblages of the Mid-Atlantic Bight During Spring and Fall as determined by Colvocoresses and Musick (1984) 77
Table 14 EFH Designation of Estuaries and Embayments for Atlantic Herring 79
Table 15 – Demersal Species/Lifestages for which Designated EFH Overlaps with the Atlantic Herring Fishery, Listed Alphabetically by Common Name 85
Table 16 Listing of Sources for Original EFH Designation Information 91
Table 17 Description of the Tier 2 Fishery Classification Categories 99
Table 18 Marine Mammal Impacts Based on Herring Gear and Herring Fishing Areas (Based on 2010 List of Fisheries) 100
Table 19 Number of Incidental Takes Recorded by Fisheries Observers 101
Table 20 Total Allowable Catches (TACs) for 2008 Fishing Year 107
Table 21 Total IVR Landings of Atlantic Herring, 2000-2008 108
Table 22 IVR Herring Catch for 2008 Fishing Year 108
Table 23 Differences in IVR Herring Catch by Management Area, 2007-2008 110
Table 24 2009 IVR Herring Catch Through September 24, 2009 110
Table 25 2008 Atlantic Herring Landings by Non-Federally-Permitted Vessels 112
Table 26 Amendment 1 Limited Access Permits Issued as of April 2009 112
Table 27 Number of Vessels by Principal Gear and Permit Category (VTR Data, 2005-2008) 114
Table 28 2008 Herring Landings (mt) by Gear and Amendment 1 Permit Category (VTR Data) 115
Table 29 Number of Trips and Days Absent by 2008 Permit Category 116
Table 30 Number of Trips and Days Absent by 2008 Permit Category 117
Table 31 Number of Trips and Days Absent by 2008 Permit Category 118
Table 32 2008 Trips by Port and Permit Category 119
Table 33 2008 Atlantic Herring Landings by Port and Permit Category 120
Table 34 Observer Program Coverage Rates for Trips Landing Greater than 2,000 pounds of Herring, 2007-2009 YTD 122
Table 35 Catch and Discards of All Species on 18 Observed Bottom Trawl Trips, 2007-2009, Permit Categories A & B 123
Table 36 Catch and Discards of All Species on 6 Observed Bottom Trawl Trips, 2007-2009, Permit Categories C & D 124
Table 37 Catch and Discards of All Species on 13 Observed Midwater Trawl Trips, 2007-2009, Quarter 1, Permit Category A 125

Table 38 Catch and Discards of All Species on 7 Observed Midwater Trawl Trips, 2007-2009, Quarter 2, Permit Category A 126
Table 39 Catch and Discards of All Species on 10 Observed Midwater Trawl Trips, 2007-2009, Quarter 4, Permit Category A 127
Table 40 Catch and Discards of All Species on 41 Observed Pair Trawl Trips, 2007-2009, Quarter 1, Permit Category A 128
Table 41 Catch and Discards of All Species on 16 Observed Pair Trawl Trips, 2007-2009, Quarter 2, Permit Category A 129
Table 42 Catch and Discards of All Species on 4 Observed Pair Trawl Trips, 2007-2009, Quarter 3, Permit Category A 130
Table 43 Catch and Discards of All Species on 21 Observed Pair Trawl Trips, 2007-2009, Quarter 4, Permit Category A 131
Table 44 Catch and Discards of All Species on 9 Observed Purse Seine Trips, 2007-2009, Quarter 2, Permit Category A 132
Table 45 Catch and Discards of All Species on 22 Observed Purse Seine Trips, 2007-2009, Quarter 3, Permit Category A 132
Table 46 Catch and Discards of All Species on 3 Observed Purse Seine Trips, 2007-2009, Quarter 4, Permit Category A 133
Table 47 Historical Series of Nominal and Adjusted Annual Landings (t) by Major Gear Components and Seasons of the 4WX Herring Fishery, 1963-2008 135
Table 48 Revised Monthly Weir Landings (t) for Weirs Located in New Brunswick, 1978 to 2008 136
Table 49 Overall Effort from New Brunswick and Nova Scotia Weirs for Catch (t), Number of Active Weirs and Catch per Weir (t), 1978 – 2008 137
Table 50 Comparison of status quo and proposed Atlantic herring fishery specifications, options 1 and 2. 141
Table 51 Number of Vessels by Principal Herring Gear 2005-2008 180

List of Figures

Figure 1 NMFS Trawl Survey Strata 48
Figure 2 MA DMF Inshore Trawl Survey Strata 49
Figure 3 Herring Catch/Tow (Number) Indices from the NMFS Autumn Bottom Trawl Survey Strata 26-27,38-40 (Inshore GOM Area), 1963-2008 50
Figure 4 Herring Catch/Tow (Kilograms) Indices from the NMFS Autumn Bottom Trawl Survey Strata 26-27,38-40 (Inshore GOM Area), 1963-2008 51
Figure 5 Herring Catch/Tow (Number) Indices from the NMFS Spring Bottom Trawl Survey Strata 26-27,38-40 (Inshore GOM Area), 1968-2008 51
Figure 6 Herring Catch/Tow (Kilograms) Indices from the NMFS Spring Bottom Trawl Survey Strata 26-27,38-40 (Inshore GOM Area), 1968-2008 52
Figure 7 MADMF Spring Survey Mean Number per tow for Strata 25-36 53
Figure 8 MA DMF Fall Survey Mean Number per tow for Strata 25-36 54
Figure 9 Number of MA DMF Spring (1978-2009) and Fall (1978-2008) Survey Tows that Encountered Herring, as a Proportion of Total Tows for strata 25-36 55
Figure 10 Stratified Mean Number per tow at Length for MA DMF Spring Survey, 1978-2009 56
Figure 11 Proportion of Total Mean Number per tow at Length for MA DMF Spring Survey (strata 25-36) for 1978-2008 57
Figure 12 Stratified Mean Number per tow at Length for MA DMF Fall Survey, 1978-2008 58
Figure 13 Proportion of Total Mean Number per tow at Length for MA DMF Autumn Survey (strata 25-36), 1978-2008 59
Figure 14 ME DMR Fall Inshore Bottom Trawl Survey Catch (# Fish) Per Tow 60
Figure 15 ME DMR Spring Inshore Bottom Trawl Survey Catch (# Fish) Per Tow 61
Figure 16 Retrospective Pattern Associated with SSB in TRAC 2009 Atlantic Herring Update Assessment 63
Figure 17 Herring Catch Relative to Removals from Natural Mortality (M) 66
Figure 18 Northeast U.S Shelf Ecosystem 67
Figure 19 EFH Designation for Atlantic Herring Eggs 80
Figure 20 EFH Designation for Atlantic Herring Larvae 81
Figure 21 EFH Designation for Juvenile Atlantic Herring 82
Figure 22 EFH Designation for Adult Atlantic Herring 83
Figure 23 Geographic Extent of the Atlantic Herring Fishery 84
Figure 24 Cumulative Total Catch of Atlantic Herring in All Management Areas by Week, 2004-2008 (IVRs) 109
Figure 25 Cumulative Total Catch of Atlantic Herring in Area 1A by Week, 2004-2008 (IVRs) 109

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INTRODUCTION

The New England Fishery Management Council (Council) is developing an amendment to the Fishery Management Plan (FMP) for Atlantic herring (*Clupea harengus*) under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), recently reauthorized as part of the Magnuson-Stevens Reauthorization Act of 2007 (MSRA).

This amendment document and Environmental Assessment (EA) proposes and evaluates a suite of management measures designed to achieve specific goals and objectives for the Atlantic herring fishery (Section 2.0). This document was prepared by the New England Fishery Management Council and its Herring Plan Development Team (PDT), in consultation with the National Marine Fisheries Service (NMFS, NOAA Fisheries), the Atlantic States Marine Fisheries Commissionn(ASMFC), and the Mid-Atlantic Fishery Management Council (MAFMC).

This amendment is being developed in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Herring Fishery Management Plan (FMP), as amended. The proposed amendment is also consistent with the provisions contained in the Magnuson-Stevens Reauthorization Act (MSRA, January 2007).

This document also contains information and supporting analyses required under other applicable law, namely the National Environmental Policy Act (NEPA), the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). When preparing a Fishery Management Plan or FMP amendment, the Council also must comply with the requirements of the Paperwork Reduction Act (PRA), the Information Quality Act (IQA), and Executive Orders 13132 (Federalism), and 12866 (Regulatory Planning). These other applicable laws and executive orders help ensure that in developing an amendment, the Council considers the full range of alternatives and their expected impacts on the marine environment, living marine resources, and the affected human environment.

1.0 BACKGROUND AND PURPOSE

1.1 MANAGEMENT HISTORY AND CONTEXT

The MSA was reauthorized in 2007 and requires the establishment of annual catch limits (ACLs) and accountability measures (AMs) in order to end and/or prevent overfishing in all FMPs.

Section 302 (h)(6) of the MSA states:

> *(Each Council shall) develop annual catch limits for each of its managed fisheries that may not exceed the fishing level recommendations of its Scientific and Statistical Committee or the peer review process established.*

Section 303 (a)(15) of the MSA states:

> *(Any FMP shall) establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability.*

NMFS has provided input on what these new requirements may entail through Agency guidance on how Councils can comply with National Standard 1 and the new MSA requirements. The Proposed Rule for the revised National Standard guidelines was published by NMFS on June 9, 2008, and the comment period on the Proposed Rule extended through September 22, 2008. Following a review of public comments, NMFS published a Final Rule with guidelines on complying with the MSA and the National Standards, including the implementation of ACLs and AMs to meet National Standard 1 (preventing overfishing) on January 16, 2009.

The guidelines include details about how FMPs must prevent overfishing while achieving optimum yield (OY) on a continuing basis. There are general definitions of several new and existing terms. The Final Rule also describes what is required in an FMP related to National Standard 1 – prevent overfishing. The Council's Scientific and Statistical Committee (SSC) is required to recommend a level of acceptable biological catch, from which the Council is required to establish annual catch limits for the fishery. There is guidance on what is a "fishery" and which stocks are and are not required to have ACLs and AMs. There are also detailed descriptions of exceptions to these requirements, guidance for international fisheries, and various requirements for describing data collection and estimation methods.

The Atlantic Herring FMP is required to be in compliance with the new provisions of the MSA by 2011 because the Atlantic herring fishery is not subject to overfishing at this time. The Atlantic herring fishery has been managed using a hard Total Allowable Catch (TAC) since the 2000 fishing year. The TACs are developed through the fishery specification process and are based on an *Allowable Biological Catch* (abc) that is based on MSY and has been reduced to OY based on biological, economic, ecological, and other considerations. The Herring FMP has already laid the foundation for complying with the ACL and AM requirements of the MSA, although additional accountability measures are being considered.

The measures proposed in this amendment are modifications to the fishery specification process (the process that will be used to establish *annual catch limits,* as opposed to the specifications package, which sets the actual amounts in numbers), measures to ensure the effectiveness of the ACLs, and/or measures to address ACL overages (*accountability measures*). These issues are discussed in more detail, and options are proposed for consideration in Section 3.2.

1.1.1 Annual Catch Limits (ACLs)

As described in the previous section, 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 a buffer between ABC and the ACL). NMFS recommends that an ABC control rule be established for each stock when possible. The ABC control rule should be a specified approach to setting ABC for a stock as a function of the scientific uncertainty in the estimate of OFL. The Final Guidelines published by NMFS do not specify that an Annual Catch Threshold (ACT) or ACT control rule be established (unlike the Proposed Guidelines). However, NMFS encourages the use of ACTs in the management system to ensure that ACLs are not exceeded. The Final Rule retains the concept of an ACT and an ACT control rule as an option for managing fisheries and suggests that "for fisheries without in-

season management control to prevent the ACL from being exceeded, AMs should utilize ACTs that are set below ACLs so that catches do not exceed ACLs" (50 CFR 600.310(g)(2)). NMFS suggests that two sources of management uncertainty be accounted for when establishing AMs: (1) uncertainty in the ability of the management program to constrain catch at or below the ACL; and (2) uncertainty in quantifying true catch amounts (estimation errors, reporting lag times, etc.).

During ACL-setting process, the Council's SSC will provide guidance on the ABC control rule as part of its recommendations for ABC. In general, ACLs and AMs should be established such that the risk of exceeding ABC is minimized. There are several steps that must be specified to set ACLs:

- Appropriate fishing mortality references should be identified.
- Current stock size should be estimated.
- Available catch should be estimated for the appropriate fishing mortality reference at current, or projected, stock size, taking into account biological and management uncertainty and risk.
- Available catch should be allocated to different components of the fishery, or to other fisheries as appropriate.
- Council decisions should be reviewed, discussed, and published.

In some cases, the MSA requires certain steps to be performed by specific entities (generally either the Council or the SSC). These requirements will be discussed in more detail later in this section.

Several modifications to the specification process are required to bring the Atlantic Herring FMP into compliance with the MSA, most notably the introduction of new terminology, changes to the ABC specification, the addition of the Council's SSC to the process for setting ABC, and separate consideration of scientific and management uncertainty during the ACL-setting process. Based on the new MSA requirements, once scientific uncertainty is accounted for and the OFL for Atlantic herring (F_{MSY} if the stock is not subject to overfishing) is adjusted accordingly to a level corresponding to *acceptable biological catch* (ABC) based on recommendations from the Council's SSC, an ACL for the stock complex may be established, and the ACL can be divided into TACs or sub-ACLs, which can be specified for each management area. The sub-ACLs (TACs for the management areas) should be set such that the risk of overfishing a stock component is minimized to the extent possible. This process is described in more detail in the following sections.

In addition, the current overfishing limit for the Atlantic herring fishery is specified as *allowable biological catch*, which is based on the most recent scientifically-accepted estimate of MSY for the stock complex. Note that this specification of abc, the *allowable biological catch*, is different from the MSA's requirement to specify ABC, the *acceptable biological catch*. The MSA's interpretation of ABC includes consideration of biological uncertainty (stock structure, stock mixing, and other stock assessment issues, for example), and recommendations for ABC should come from the Council's SSC.

1.1.1.1 Important Considerations

The Atlantic Herring FMP authorizes the Herring PDT, in consultation with the Herring Committee, Advisory Panel, and other interested parties, to utilize the most appropriate analytical approach for determining the distribution of area-specific ACLs during the fishery specification process, provided the PDT justifies its approach. Depending on stock/fishery conditions as well as the quality and resolution of available information, the most appropriate approach for calculating the distribution of area-specific ACLs may be the approach currently outlined in the Herring FMP, a "catch scenario analysis" approach, an approach that utilizes assessment information specific to individual stock components (currently not available, but may be in the future), or another analytical approach. These provisions for the fishery specification process grant the Herring PDT flexibility to utilize all available information to determine the most appropriate analytical approach as part of the specification process. These provisions also will form the basis of the sub-ACL-setting process in this FMP. The herring fishery specification process was changed to a three-year process in Amendment 1 to the Herring FMP, and it is assumed that sub-ACL-setting will follow the same general approach.

The specification of OY for the Atlantic herring fishery is still required by the MSA and will remain an important part of the process. OY is derived from maximum sustainable yield (MSY) and relates to the geographic distribution of the selected total allowable catches (TACs, which will become sub-ACLs), the relative risk of overfishing individual stock components, and the extent to which development of the offshore fishery should be encouraged, among other factors.

OY, as defined by the MSA: *means the amount if fish which is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor*

The Herring FMP also states that the establishment of OY will include consideration of relevant economic, social, or ecological factors. For this reason OY may be less than ABC – Canadian catch, because the Council retains the ability to set aside an additional factor for any of the above reasons. For instance, the Council may determine that a buffer between ABC and OY is appropriate because of the status of the inshore component of the resource, the importance of recruitment and ensuring strong year classes in the future, and/or the potential impact of any increase in the Canadian fisheries for herring, particularly the NB weir fishery, which tends to catch more juvenile fish from the inshore component of the resource, or any other justifications which fall under the MSA definition. If the Council chooses such a buffer it would not be a part of management or scientific uncertainty, but rather a specific allocation for the issue being addressed.

The role of herring in the ecosystem could also be an important consideration that the Council decides to consider. Although forage issues may be considered by the SSC as a part of m uncertainty when setting the ABC, if the Council decides to incorporate an additional buffer to specifically address the role of herring as forage, then it can do so between the ABC and OY, because OY includes consideration of social, economic, and ecological factors, and forage is an

ecological factor. The additional buffer would not be included as a part of management uncertainty, but rather an allocation set by the council when specifying OY.

The fishery specification process will include discussion of these factors, as appropriate, when the PDT develops its recommendations for both ABC and ACLs for the SSC to consider.

1.1.1.1.1 Scientific Uncertainty and Stock Assessment Issues

Atlantic herring (*Clupea harengus*) range geographically from Labrador to Cape Hatteras, with major spawning areas restricted to the northern regions of resource distribution. However, clear understanding of herring stock structure has varied over time, and the delineation of stock component boundaries has been challenging due to the degree of inter-seasonal mixing between components. The movement and seasonal distribution of the stock components has also had a significant impact on the assessment of stock status, on how fishing effort has been assigned, on the development of a catch-at-age matrix and on the management of several herring fisheries.

Assumptions regarding the seasonal movement, intermixing, and spawning of the individual stock components used in the assessment and management of the Atlantic herring stock complex have changed over the years. As a result, assessment of the Atlantic herring resource remains complex-wide at this time. Until such time when separate assessments of the stock components become available, biological reference points like MSY and abc are established for the stock complex as a whole. Management reference points like ACLs, however, can be established based on the need to protect individual stock components, and with adequate consideration of fishing patterns and other factors affecting the fisheries. Uncertainty regarding stock structure and stock component mixing is an important issue that must be factored into decisions regarding the specification of scientific and management reference points under the new provisions of the MSA.

Although the Atlantic herring stock is assessed as one meta-complex, most scientists recognize two sub-components; the inshore Gulf of Maine (GOM) and offshore Georges Bank/Nantucket Shoals component. Both of these components are separated during spawning, but mix while on feeding (Area 1A and 1B) and over-wintering grounds (Area 2). Evidence of mixing either in Area 3 or during spawning season in any location other than 1B (August- November) is lacking and herring caught in Area 3 are assumed to come entirely from the offshore component of the resource. The herring management area boundaries were modified in Amendment 1 to better reflect the distribution of the offshore component in Area 3. Mixing of both stock components occurs in other management areas. Uncertainty associated with the mixing of herring stock components is a critical scientific issue that must been addressed to the extent possible when establishing sub-ACLs to ensure that overfishing does not occur on an individual stock component. Without a separate stock assessment for the inshore stock component, the appropriate target and threshold fishing mortality rates remain unknown. In 2004, the Herring PDT identified three primary sources of uncertainty associated with mixing ratios:

1. the mix of catch in the New Brunswick weir fishery (assumed to be 100% from the inshore component);
2. the mix of catch from Area 1A in the summer; and
3. the seasonal mix of catch from Area 2, particularly in the winter fishery.

Scientific uncertainty is *currently* addressed through the herring fishery specifications by setting OY for the herring fishery at a level lower than MSY, and the TACs are set for each management area such that the sum of the management area TACs equal available U.S. OY for the fishery. The Herring PDT also incorporates uncertainty when assessing the impacts of the TACs and developing recommendations regarding how to divide the TACs by management area while minimizing the risk of overfishing any individual stock component.

Uncertainty associated with the mixing of herring stock components has been addressed in previous years' specifications through a "risk assessment" conducted by the Herring PDT, primarily by considering removals of the inshore component across the entire range of mixing scenarios instead of relying on a few specific mixing rate combinations. The risk assessment analysis evaluates relative risk (as it relates to exploitation rates on the individual stock components) associated with the Proposed Action and other TAC alternatives by estimating removals from the inshore component across all possible mixing rate combinations, which can then be compared to "historical" removals (1995-2005 in the last round of specifications) under the same mixing ratios. More risk is associated with TAC alternatives that project higher removals from the inshore component than the historical average.

As an example, during the development of the 2007-2009 specifications, the Council established a buffer of 29,000 mt between abc (allowable biological catch) and OY for the following reasons:

- At the 2006 TRAC Assessment Meeting, scientists identified a significant **retrospective pattern** in the model utilized to estimate Atlantic herring biomass and fishing mortality. The retrospective pattern overestimates SSB (averaging + 14.5%/year, and ranging between 1-24%) and underestimates fishing mortality; this is a concern that should be considered in the context of allowing the herring fishery to expand significantly and/or rapidly above current levels. It is clear that current levels of removals from the stock complex (around 100,000 mt for the last 15 years) are sustainable and should not cause concern relative to the health of the resource. The retrospective pattern in the assessment model suggests that the Council may want to be cautious about allowing removals to increase rapidly to levels significantly above what has been observed in the fishery over the last 15 years. While a buffer still provides opportunities to expand the fishery in the appropriate areas, allowing removals from the fishery to increase all the way to abc (allowable biological catch) may be detrimental to the stock complex over the long-term, given the retrospective pattern.
- **Recruitment** for Atlantic herring is highly dependent on favorable environmental conditions. While recruitment in 1994, 1998, and 2001 appears to have been stronger than average, it is noted that other years, particularly the 1999 and 2003 year classes, have produced year classes weaker than expected. Recent strong year classes should not be considered the "norm" for this stock. Variability around the stock-recruitment relationship is common for many clupeids (other examples include menhaden and river herring). A buffer between abc (allowable biological catch) and OY may help to ensure that adequate SSB is available to produce strong and healthy recruitment in fluctuating and unpredictable environmental conditions.

- The **importance of herring as a forage species** for other Northeast region fish, mammals, and birds is another reason that a buffer between abc (allowable biological catch) and OY may be appropriate at this time. One of the objectives of the Herring FMP is to "provide for long-term, efficient, and full utilization of the optimum yield from the herring fishery...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." Consequently, OY should be specified such that the Council remains confident in the fishery's ability to fully utilize the yield while continuing to address the needs of the ecosystem in which herring is an important component.

The Herring PDT will continue to incorporate uncertainty in the specifications process following the implementation of the provisions in this amendment. This will continue to minimize the risk of overfishing individual stock components and act as a tool for specifying sub-ACLs. It will be important, however, to clearly characterize this uncertainty and where/how it is addressed in the new specifications process. While some sources scientific uncertainty will be accounted for when setting ABC (from OFL), additional precautions that may be taken when distributing ACLs among management areas should be identified and described thoroughly. There are many avenues in the proposed process to account for uncertainty, and it will be important to identify the steps that are taken to address these issues throughout the development of the fishery specifications and ACLs.

As part of the process proposed in this amendment to establish ABC and ACLs consistent with the MSA, scientific uncertainty will be addressed primarily when setting the ABC and may require a deduction from the OFL to the ABC. According to the NMFS Guidelines for National Standard 1, incorporation of scientific uncertainty by reducing OFL to ABC will provide for consideration of the uncertainty around OFL, such as uncertainty around the estimate of a stocks biomass. This will allow for incorporation of the various forms of scientific uncertainty that a stock assessment models have associated with them, such as retrospective patterns. The recommendation of OFL and ABC levels to the council comes from the SSC and is set by the Council, however, and as such the decision is at their discretion.

For example, the 2009 TRAC report identified considerable uncertainty in its assessment. In the development of the 2010-2012 specifications the SSC endorsed the TRAC report and suggested that two uncertainty aspects would influence the derivation of ABC from OFL:

> *(1) The assessment has a strong 'retrospective pattern' in which estimates of stock size are sequentially revised downward as new data are added to the assessment; and (2) Maximum sustainable yield reference points estimated from the biomass dynamics model are inconsistent with the age-based, stochastic projection; such that fishing at the current estimate of F_{MSY} is expected to maintain equilibrium biomass that is less than the current estimate of B_{MSY}.*

The SSC was able to define the OFL based on these uncertainties and the existing overfishing definition. Initially the deduction from OFL to ABC was based on the aforementioned uncertainties and the uncertainty in OFL, and was recommended by the SSC to be 40%. Given the magnitude of these uncertainties, however, the SSC was unable to derive an ABC control

rule, and recommended that a new benchmark assessment be produced as soon as possible. After further consideration of the status of the stock (not overfished and overfishing not occurring) the SSC revised its recommendation and suggested that ABC be limited to recent catch, thereby not allowing catches to increase based on the considerable uncertainty. The Council accepted this advice, and ABC for 2010-2012 was based on recent catch, and an interim control rule was established based on this advice.

1.1.1.1.2 Impacts of Canadian Fishery for Atlantic Herring

Although herring currently is not managed jointly through a Resource Sharing Agreement with Canada, the stock assessment is conducted jointly through the Transboundary Resource Assessment Committee (TRAC), and Canadian landings of the Atlantic herring resource must be factored into decisions about U.S. herring fishery specifications and, in the future, accounted for as an element of management uncertainty, to further ensure that the ABC for the stock complex is not exceeded. Catch of the Atlantic herring stock complex in Canadian waters consists primarily of fish caught in the New Brunswick (NB) weir fishery. The DFO does not regulate the catch of Atlantic herring in the NB weir fishery through any sort of quota. The NB weir fishery is a historical fishery with catches that have been more variable in recent years, but have totaled more than 30,000 mt of herring in past years. In general, it is assumed that juvenile fish (age 1 and 2) caught in the NB weir fishery are from the inshore (GOM) component of the Atlantic herring stock complex, while adult fish (age 3+) caught in the NB weir fishery are from the SW Nova Scotia stock complex (4WX). Detailed information about catch in the NB weir fishery can be found in Section 6.1.1 of this document.

It is also assumed that fish caught in the NB weir fishery are from the inshore component of the herring resource that U.S. fishermen catch in the Gulf of Maine (and partially in Area 2 during the winter). In the past, when determining U.S. fishery specifications and TACs, managers have incorporated a catch of 20,000 mt from the NB weir fishery. However, Amendment 1 to the Herring FMP included provisions to allow for this assumption to be modified by the Herring PDT during the specification process, based on recent patterns and landings in the NB weir fishery.

The assumed catch is currently subtracted from the available yield from the inshore component of the resource *before* TACs (sub-ACLs) are determined for management areas in the U.S. Exclusive Economic Zone (EEZ). In the process proposed to establish ACLs in this amendment (see below), catch in the NB weir fishery will be subtracted or removed from consideration after specifying ABC and before establishing ACLs for the U.S. fishery. Therefore, the Canadian catch becomes part of the management uncertainty that the Council must address after specifying ABC and before determining ACLs for the management areas. Based on the proposed provisions (below), this means that assumptions about Canadian catch are deducted prior to setting the stock-wide ACL, which will become the U.S. OY.

As the Canadian catch deduction becomes a part of the management uncertainty, at the discretion of the Council and Herring Committee, it becomes subjective and is analyzed in the risk analysis for assessing and comparing the ACL options. As an example, in the development of the 2010-2012 specifications the average 2+ catch from the NB weir fishery from 1995-2008 was utilized.

The average NB weir catch during this time period was assumed to come from the inshore component of the stock and is deducted from the ABC as inshore removals in all TAC scenarios that are evaluated in the risk assessment. The Herring PDT chose to apply 2+ catch for consistency with the TRAC assessment, which is based on 2+ biomass only. The mean was chosen because the mean represents the average expected value over the time series. The mean 2+ catch from the NB weir fishery from 1995-2008 was 16,300 mt.

The Herring Committee and Council examined recent trends in catch from the NB weir fishery and determined that for management uncertainty, the Canadian catch deduction would be 14,825 mt. This represents the average 2+ landings from 1999-2008 when eliminating the highest year of the time series – 2007 – and the lowest year of the time series – 2008. The Council expects that this deduction will adequately account for NB weir catch during the 2010-2012 fishing years. Moreover, 2009 NB weir catch to date is about 3,143 mt (through September 28, 2009).

The Council could consider addressing the interaction of the U.S. and Canadian herring fisheries in a more direct manner in the future (perhaps through joint management or formal resource sharing).

1.1.1.1.3 State/Federal ACL Issues

NMFS Guidelines suggest that for stocks that have harvest in state or territorial waters, FMPs should include an ACL for the overall stock that may be further divided. For example, the overall ACL could be divided into a Federal ACL and a State ACL. When stocks are co-managed by Federal and State Agencies, the goal should be to develop collaborative conservation and management strategies, and scientific capacity to support such strategies, to prevent overfishing of shared stocks, and to ensure their sustainability.

Atlantic herring continues to be managed by the NEFMC in Federal waters and the ASMFC in State waters. However, the vast majority of the Atlantic herring resource is harvested in Federal waters. Catch by Federal permit holders that occurs in State waters is reported and counted against the TACs. 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 TACs. While it may be something that the Council would want to consider in the future, it does not appear that there is a need at this time for a separate ACL to manage landings in State waters. The majority of Atlantic herring landings from State waters occurs in the State of Maine. Landings by non-federally permitted vessels comprise a small amount of overall landings and made up only 243 metric tons in 2008 accounting for 2.9% percent of total U.S. landings (83,600 mt) in 2008.

Table 1 2008 Atlantic Herring Landings by Non-Federally-Permitted Vessels

State	Live Pounds	Metric Tons
CT*		
DE*		
MD*		
ME	392,999	178.26
NJ*		
NY	107,295	48.67
VA	5,258	2.38
Total	**536,036**	**243.14**

Provided by ACCSP for non-federally-permitted vessels.
**Indicates data are confidential.*

Current regulations for the herring fishery allow for up to 500 mt of the Area 1A TAC to be set aside for the fixed gear fisheries in Area 1A (weirs and stop seines, all in State waters) that occur west of Cutler, Maine. It is assumed that the set-aside for fixed gear fisheries will remain an option that the Council and ASMFC can consider during the specifications process. The 500 mt set-aside for fixed gear fisheries in Area 1A will be part of the ACL for Area 1A, just held in reserve by NMFS for fixed gear fishing until November 1.

As a part of the process proposed for establishing ACLs/AMs in this amendment (described in detail below) management uncertainty must be subtracted from the ABC to determine the stock-wide ACL. Management uncertainty is an adjustment that may be made for the catch that is expected to be harvested by Canadian fisheries (primarily the NB weir fishery) and/or other considerations, such as the uncertainty about assumptions pertaining to the fisheries within state waters by vessels that are not subject to the federal FMP. Such deductions for uncertainty about landings from State waters is likely to be small, and the ASMFC and the Council will continue to work closely to establish the annual TACs in four management areas and sub-areas through the joint specification process. While ASMFC is not bound by the ACL/AM requirements of the MSA, both agencies will continue to collaborate on management of the herring resource, consistent with the spirit and intent of the MSA.

For example, in the development of the 2010-2012 specification the Herring Committee concluded that closing the directed herring fishery when 95% of a TAC (sub-ACL) has been harvested (or 92% in areas with a research set-aside), establishing a large buffer between OFL and ABC, managing a 500 mt set aside for West of Cutler fixed gear fishermen, and the ASMFC's requirement that fixed gear fishermen must report through IVR (and therefore have catch counted against the TAC) would reduce any management uncertainty associated with State waters landings to an insignificant amount. This is consistent with the Herring PDT's recommendations regarding State waters catch as part of management uncertainty. As such, the Committee recommended and the Council voted that no additional reduction in ABC to account for state waters landings was necessary when setting TACs or sub-ACLs.

1.1.1.1.4 Atlantic Herring Discards

According to NMFS guidelines, the establishment of ACLs must account for all catch, including Atlantic herring discards. Discards could either be monitored on a real-time basis and counted against the ACL, or they could be addressed through an adjustment to the ABC for management uncertainty, and by extension, be a part of management uncertainty, in which case the ACL would serve as a landings limit.

Total catch levels, including both landings and discards, can be difficult to estimate accurately in a real-time manner. The need for a discard adjustment during the ACL-setting process will depend in large part on the ability to accurately estimate discards of herring at the time when ACLs are set. It will also depend on how discards are treated in future stock assessments for Atlantic herring. The catch monitoring program under development in Amendment 5 may also provide discard information sufficient to eliminate the need to adjust for discards prior to setting the ACLs, in which case the ACLs can be monitored as total catch limits.

Currently, there are three primary sources of discard information; an Annual Discard Report as specified in the Standardized Bycatch Reporting Methodology (SBRM) and self-reported discards data (VTRs and IVRs). The Omnibus Standardized Bycatch Reporting Methodology (SBRM) Amendment to the Council's FMPs specified that:

> "*Once each year, the Science and Research Director will present to the Councils a report on catch and discards occurring in Northeast Region fisheries, as reported to the NEFOP by at-sea fisheries observers*."

The Annual Discard Report is a comprehensive summary of the data collected on observed trips by NEFSC trained at-sea observers.

Additionally, herring harvesters are required to report discards in addition to landed catch through independent methods. The harvester fills out a hard copy report for each catch by trip (VTR) and is required to send in these reports monthly (NMFS Gloucester). Harvesters are also required to report weekly via telephone (IVR; NMFS Gloucester) the amount of herring caught (landed and discarded) from each management area.

VTR data has a lengthy processing period from the time the reports are sent in to when the data is entered into the database, however VTRs do give very specific information on catch and are more precise. VTRs contain landings and discards for all fishermen who encounter Atlantic Herring, rather than just limited access permit holders. The IVR system is an automated, phone-based reporting method. Although harvesters are required to report catches with VTR forms, near real-time data is obtained through the IVR system allowing the TACs to be monitored. The IVR system only shows landings and discards for those vessels required to report though this system.

Discard adjustment may warrant no consideration in the ACL-setting process if it is determined that discards have been accounted for elsewhere. For instance, in the development of the 2010-2012 specification process the Council reviewed all available information regarding discards of Atlantic herring in the herring fishery and determined that no additional reduction was necessary to account for herring discards. The available information suggested that Atlantic herring

discards in the herring fishery appeared to be very low and largely insignificant relative to the landings in the fishery and the ability to prevent the TACs/ACLs from being exceeded. Even without an additional deduction to account for discards as part of management uncertainty, it was determined that at this time, it would be likely that herring discards would be accounted for within the additional 5% of the TAC that remains available for incidental catch once the directed fishery in a management area closes.

More specifically, the decision was made because all three sources of the herring discard information was considered by the Herring PDT and Council (observer data, VTR, and IVR) and were determined to be generally consistent with each other and suggest that discard rates of Atlantic herring in the herring fishery are currently low. Furthermore self-reported discard information through the VTRs were included in the catch-at-age matrix, and therefore the current assessment of Atlantic Herring. It was therefore determined that any further deductions for discarding to account for management uncertainty would need to reflect concerns that discards of herring may increase above the levels that have been observed in recent years for the fishery, or concerns that discards are not being adequately documented through the current observer program and self-reporting.

The above example from the 2010-2012 specifications illustrates one approach to how discards may be accounted for through the ACL-setting process. This amendment provides the Herring PDT and the Council with flexibility to consider different approaches depending on information available at the time and the future ability to monitor discards on a real-time basis.

It is important to note that discard deductions as part of management uncertainty represent buffers for uncertainty around the discard estimates and not the actual discards themselves. The actual discards will be accounted for during the ACL setting process, which will depend on where the information on discards is coming from, as was noted above. Such a buffer is not required for inclusion into management uncertainty, but is an example of a component that, if it is deemed important enough, could be incorporated

1.1.2 Accountability Measures (AMs)

NMFS' Guidelines state that accountability measures (AMs) are management controls implemented for stocks such that exceeding the ACL is prevented, where possible, and corrected or mitigated if it occurs. The Guidelines suggest three kinds of AMs that could be considered: (1) those that can be applied in-season, designed to prevent the ACL from being reached; and (2) those that are applied after the fishing year, designed to address the operational issue that caused the ACL overage and ensure that it does not happen in subsequent fishing years, and, as necessary, address any biological harm to the stock; and (3) those that are based on multi-year average data which are reviewed and applied annually. AMs should address and minimize the frequency and magnitude of overages and should be designed so that if an ACL is exceeded, specific adjustments are effective in the next fishing year or as soon as possible. The Guidelines also suggest that multi-year specifications (like those for the Atlantic herring fishery) should include AMs that provide for automatic adjustments in the subsequent year's harvest if an ACL is exceeded in one year.

The two AMs which are being proposed in this amendment fall into the first and second category. In addition, the current management measures for the Atlantic herring fishery already provide a framework for addressing the AM requirements of the MSA, as some types of accountability measures already exist in the fishery. The Atlantic Herring FMP includes measures that close a management area to directed fishing when 95% of the TAC is projected to be reached to minimize the risk of a TAC overage in any area while still allowing for incidental catch (areas with set-asides for cooperative research close to directed fishing when 92% of the TAC is projected to be reached). The current AM in the Herring FMP is discussed in more detail in Section 4.1.3 of this document, and would fall into the first category.

The current AM in the Atlantic herring fishery is primarily a type of management measure that is designed to prevent the ACL from being reached. The proposed AMs in this amendment (Section 3.2.3) would address ACL overages if they were to occur in the future. All three of the AMs could be modified in the future through a framework adjustment to the Herring FMP or through the herring fishery specification process.

1.1.3 Congruence with 2010-2012 Herring Fishery Specifications

The fishing year during which the Council and NMFS will transition into the ACL/AM framework established in this amendment falls within the range of the 2010-2012 specifications package. This amendment is scheduled to be finalized by the Council in early 2010 and implemented prior to the start of the 2011 fishing year. Due to the timing the specifications package will be based on the current formulas for specifications as well as the process/provisions currently included in the Herring FMP. The specifications package will also provide the necessary elements for a transition to the new ACL/AM process that will be implemented in this amendment, as it will be developed in accordance with the provisions and new requirements of the MSA, including the requirement to establish a process for and specifications for ACLs and AMs for Atlantic herring by 2011. The following is a discussion and clarification of terms to facilitate this transition.

The Atlantic herring fishery has been managed using hard TACs since the 2000 fishing year. The TACs are developed through the fishery specification process and are based on an *Allowable Biological Catch* (abc) that is based on MSY and has been reduced to OY based on biological, economic, ecological, and other considerations.

The current and future specifications processes utilize two different ABCs. To differentiate between them the acronyms will appear throughout this document in two forms; ABC and abc. The former, ABC will stand for the future phrase *acceptable biological catch* while the latter, abc, will stand for the previous phrase *allowable biological catch* (until the implementation of Amendment 4).

The new formulas proposed in this document related to the specification of the overfishing limit, acceptable biological catch, and the annual catch limits, as mandated by the MSA, are described below and are effective for the specifications package upon the implementation of this amendment.

The "overfishing limit" (OFL) identified in the MSA essentially corresponds to a maximum sustainable yield (MSY) value for the fishery. NMFS recommends that ABC and an annual catch limit (ACL) be established as well. The ABC should be set lower than the OFL to account for scientific uncertainty as necessary:

OFL>=ABC>=ACL

OFL – Scientific Uncertainty = ABC (Determined by SSC)

ABC – Management Uncertainty = Stock-wide ACL = OY

Where management uncertainty may include Canadian catch and uncertainty about assumptions such as the state waters catch, landings, discards, etc.

The most notable changes in the 2010-2012 herring fishery specifications when this amendment is implemented include the specification for OFL (based on F_{MSY}) and re-specification of the current abc (*allowable biological catch*) to the MSA-defined ABC (*acceptable biological catch*) that accounts for scientific uncertainty. The Atlantic herring fishery is and will continue to be managed by hard TACs. 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 a buffer between ABC and the ACL) (see Table 2).

Table 2 Relationship Between Proposed 2010-2012 Specifications and Measures Proposed in Amendment 4

PROPOSED 2010-2012 SPECIFICATIONS	PROPOSED AMENDMENT 4 SPECIFICATIONS
Allowable Biological Catch (abc)	Overfishing Limit (OFL)
	Acceptable Biological Catch (ABC)
U.S. Optimum Yield (OY)	OY/Stock-wide ACL
Domestic Annual Harvesting (DAH)	Domestic Annual Harvesting (DAH)
Domestic Annual Processing (DAP)	Domestic Annual Processing (DAP)
Total Joint Venture Processing (JVPt)	Total Joint Venture Processing (JVPt)*
Joint Venture Processing (JVP)	Joint Venture Processing (JVP)*
Internal Waters Processing (IWP)	Internal Waters Processing (IWP)*
U.S. At-Sea Processing (USAP)	U.S. At-Sea Processing (USAP)*
Border Transfer (BT)	Border Transfer (BT)
Total Allowable Level of Foreign Fishing (TALFF)	Total Allowable Level of Foreign Fishing (TALFF)*
RESERVE	RESERVE*
TAC Area 1A	Sub-ACL Area 1A
TAC Area 1B	Sub-ACL Area 1B
TAC Area 2	Sub-ACL Area 2
TAC Area 3	Sub-ACL Area 3
Research Set-Aside	Research Set-Aside
Fixed Gear Set-Aside in 1A	Fixed Gear Set-Aside in 1A

**Specifications that are starred may be eliminated in Amendment 4 (see below).*

1.2 PURPOSE AND NEED FOR ACTION

The overall need for this amendment is to implement new management measures to address the new applicable provisions of the MSA. These provisions are intended to better manage the species and prevent overfishing. The new measures reflect an update of the original MSA and retain key provisions of the Sustainable Fisheries Act (1996) while making adjustments to the legislation designed to improve national compliance with the Act. One specific focus of this amendment will be the MSA requirements that NMFS and the Councils establish Annual Catch Limits (ACLs) such that overfishing does not occur in the fishery, and Accountability Measures (AMs) for the overages of harvest levels. The MSA directs the Councils to follow the recommendations of its Scientific and Statistical Committee (SSC) in setting catch limits for every federally-managed fishery that is not subject to overfishing by the year 2011. The Herring FMP is required to be in compliance with these new regulations by 2011 because the Atlantic herring fishery is not subject to overfishing at this time.

The Atlantic herring fishery has been managed using hard TACs since the 2000 fishing year. The TACs are developed through the fishery specification process and are based on an abc (allowable biological catch) that has been reduced to an Optimum Yield OY based on biological, economic, ecological, and other considerations. The Herring FMP, therefore, has already laid the foundation for complying with the ACL and AM requirements of the MSA. The related measures considered in this amendment are therefore refinements to the fishery specification process, measures to ensure the effectiveness of the TACs, and measures to address TAC overages.

Accordingly, the two primary purposes of this amendment are to establish ACLs and AMs within the specifications process. Under the establishment of ACLs the secondary purposes of this amendment are to:

1. Establish new definitions for terms used in when setting specifications which change the process, allow for further considerations of non-target stocks, and establish an ABC control rule based on guidance from the SSC.
2. Make administrative adjustments which alter the process by manipulating where calculations for the specifications package will be performed, although the factors considered remain the same
3. Prevent overfishing on a sub-component level by specifying sub-ACLs
4. Guide the administrative steps and timing involved in setting specifications

The secondary purposes of the this amendment for the setting of AMs are to:

1. Modify the current regulations to serve more effectively as accountability measures
2. Establish a reactive AM which provides consequences for overages within during a fishing year
3. Provide an AM for the current haddock catch cap

The purposes and needs for this amendment are expected to advance the goals and objectives of the herring management program, as modified in Section 2.0. The proposed management measures are intended to achieve both the goals and objectives of the management program.

1.3 NOTICE OF INTENT AND SCOPING

The New England Fishery Management Council published a Notice of Intent (NOI) to announce its intent to develop this amendment and prepare an EIS to analyze the impacts of the proposed management alternatives on May 8th, 2008. A second, Supplementary NOI was published on December 28th, 2009 to announce the intent to prepare an EA for Amendment 4 and EIS for Amendment 5, after the two amendments were split. The purpose of both of the NOIs was to alert the interested public to the commencement of the scoping process and to provide for public participation in the development of this amendment, consistent with the requirements of NEPA.

NEPA provides a mechanism for identifying and evaluating the full spectrum of environmental issues associated with Federal actions and for considering a reasonable range of alternatives to avoid or minimize adverse impacts to the extent practicable. The scoping process is the first and

best opportunity for members of the public to raise issues and concerns for the Council to consider during the development of an amendment. The Council relies on public input during the scoping process both to identify management issues and develop alternatives that meet the Herring FMP objectives. Public comments early in the amendment development process help the Council to address issues of concern in a thorough and appropriate manner.

A scoping document was prepared and distributed to inform the public of the Council's intent to gather information necessary for the preparation of Amendment 4 and ask for suggestions and information on the range of issues to be addressed in this amendment. During the scoping period for Amendment 4 (May 8th – June 30th, 2008), four scoping meetings were conducted, and numerous written comments were received. These comments can be found on the NEFMC website, on the Herring FMP page (http://www.nefmc.org/herring/index.html). Comments received during the scoping process were considered carefully by the Council when developing the management alternatives under consideration in this amendment.

The measures proposed in this amendment were originally developed as part of Amendment 4 to the Atlantic Herring FMP, but Amendment 4 was split in June 2009 so that the Council could develop annual catch limits (ACLs) and accountability measures (AMs) for implementation for the 2011 fishing year (as mandated by the MSA). The ACL/AM component was designated to be part of Amendment 4, and other measures under consideration (catch monitoring program, river herring bycatch measures, criteria for midwater trawl access to groundfish closed areas, measures to address interactions with the Atlantic mackerel fishery) required additional work/discussion and will be developed in Amendment 5. As such, the EIS work and public comments which address the other measures under consideration which were originally intended for Amendment 4 will be completed and addressed in Amendment 5. Amendment 4 therefore only addresses the comments regarding the ACL/AM implementation, which were gathered during the original scoping process and, due to the procedural nature, will be evaluated using an EA rather than an EIS, as per the NOI published on December 28th, 2009. Public hearings which will discuss this amendment and provide opportunities for public comment were conducted on the 6th, 7th and 11th of January 2010. In addition, comments could be mailed or emailed from Tuesday, December 15th until 5pm on Wednesday, January 13th.

The Herring Committee, Advisory Panel, and Plan Development Team considered all the scoping comments during the development of the range of alternatives in this amendment as well as during the selection of the final measures. The major issues that were identified in regards to ACLs and AMs that were identified and discussed during the scoping process for the EIS are generally summarized below. This summary is not intended to reflect every comment that was received, and the letters and scoping meeting summaries should be referenced to gain a better perspective on individual comments, ideas and suggestions.

- Some commenters noted that the TACs, which under this amendment become sub-ACLs, are already conservative numbers, and would like that to change. This is an issue which will be addressed in future specifications setting processes.

- Support was voiced by some commenters for the involvement of the SSC in the setting of the ACLs and AMs during the specifications process. They also voiced support for the

SSC providing input on predator-prey relationships. Section 3.1.1.1 of this document addresses the role of the SSC in the ACL setting process, and Section 6.1.1.4 addresses the role of herring in the ecosystem in regards to the specifications setting process.

- In a related comment, some commenters wanted more accounting for the role of herring as a forage species in stock assessments and during the setting of the ACL during the specifications process. Although this accounting could not be addressed in the stock assessment process through this amendment, its role in the ACL setting process was addressed in Section 1.1.1.1, as this issue was identified as being an important part of this amendment.

- Some commenters felt that other species caught in the herring fishery should be considered as stocks in the fishery during the specifications process, and therefore should receive their own ACLs. The Council considered these comments during the development of the amendment and chose to include Atlantic Herring as the sole stock in the fishery. The rationale for this decision can be found in Section 5.1.1.

- Options for AMs that the public wanted considered included (but were not limited to) in-season adjustments, fishery closures, and paybacks or corrections for overages. These scoping comments were considered during the development of the proposed AMs in this amendment and the rationale for the proposed can be found in Section 5.2 while those options which were considered but rejected can be found in Section 4.2.

- Some industry members voiced the need for options to encourage full utilization of OY. The Council acknowledges that the NS 1 states that conservation and management measures will achieve optimum yield from each fishery and that this is an important issue which it will continue to address it to the best of its abilities during future actions.

- Some commenters expressed concern about the timing of the NS 1 Guidelines in relation to the development of this amendment, as the scooping process took place before they were published. The Guidelines were published on January 16th, 2009, before the finalization of this amendment, and the final measures that were developed during this amendment are consistent with the rule.

2.0 GOALS AND OBJECTIVES

The council has one goal and three objectives for the changes to the specifications process that are being implemented in Amendment 4. **The primary goal is to develop an amendment to the Herring FMP to ensure compliance with the new requirements of the MSA.**

2.1 OBJECTIVES

1. To implement Annual Catch Limits (ACLs) and Accountability Measures (AMs) consistent with the MSA;
2. To implement other management measures as necessary to ensure compliance with the new provisions of the MSA;

3. In the context of Objectives above, to consider the health of the herring resource and the important role of herring as a forage fish and a predator fish throughout its range.

3.0 PROPOSED MANAGEMENT ACTION

This section describes the two management measures proposed to be implemented in Amendment 4 to the Atlantic herring FMP. The first measure would establish ACLs and has four sub-components which address new definitions of fishery-related terms, fishery specification changes, the division of the ACL into sub-ACLs, and the process for setting the specifications. The changes to the fishery specifications sub-component had two options for the Council to choose between; the option which was chosen is presented in this section, and the other option, which can be seen in Section 4.0.

While there is only one alternative proposed to modify the specifications process to ensure compliance with the MSA, there are two options which were chosen by the council for establishing accountability measures (AMs) in the context of the administrative changes that are proposed.

3.1 ESTABLISHING ANNUAL CATCH LIMITS (ACLS)

3.1.1 The ACL/AM Process (Fishery Specifications)

The Proposed Action will modify the current fishery specification process for Atlantic herring to ensure the Herring FMP's compliance with the new requirements of the MSA relative to the requirement to establish ACLs and AMs in the fishery. New definitions, proposed changes to the administrative process for establishing fishery specifications, and new provisions, including consideration of accountability measures as part of the specification process, are discussed in detail in the following subsections.

3.1.1.1 Definitions

The following definitions define new terms used in this section.

Catch: Catch is defined in the NS1 Guidelines as the total quantity of fish, measured in weight or numbers of fish, taken in commercial, recreational, subsistence, tribal, and other fisheries. Catch includes fish that are retained for any purpose, as well as mortality of fish that are discarded. The ACLs established for the herring fishery should relate to total catch in the fishery, including landings and discards.

Stocks in the Fishery: Stocks in a fishery may be grouped into stock complexes as appropriate, and NMFS suggests groupings of "target stocks," "non-target stocks," and "ecosystem component (EC) species," as appropriate. Target stocks are defined as stocks that fishers seek to catch for sale or personal use, including "economic discards" as defined in the MSA. Any stocks that are formally identified as "stocks in the fishery" should be managed under the FMP and will require status determination criteria, other reference points, ACLs, and AMs.

The final NS1 Guidelines do not require the Council or the Secretary to include all target and non-target species as "stocks in a fishery." They do not mandate the use of EC species and do not require inclusion of particular species in an FMP. The determination as to how a particular fishery should be defined remains within the authority and discretion of the Council.

For the purposes of this amendment and the Atlantic Herring FMP, the stock in the fishery is the target stock – **Atlantic herring**. While there are other species that are caught incidentally when fishing for Atlantic herring, the focus of the ACL/AM process in this amendment will be the stock directly managed by the Atlantic Herring FMP. Bycatch in the herring fishery will continue to be addressed and minimized to the extent possible, consistent with other requirements of the MSA.

There may be non-target stocks that warrant consideration in the future when developing ACLs and AMs for the herring fishery, and the Council retains the ability to consider these for inclusion in this management program at a later date. At this time, the Herring FMP will not identify non-target species for management through ACLs until the primary FMP that manages the species in question identifies a sub-ACL that should be considered for the herring fishery.

OFL: Overfishing Level. 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. Catches that exceed this amount would be expected to result in overfishing. The annual OFL can fluctuate above and below MSY depending on the current size of the stock. This specification will replace the current specification of *allowable biological catch* in the herring fishery.

ABC: Acceptable Biological Catch. The maximum catch that is recommended for harvest, consistent with meeting the biological objectives of the management plan. ABC can equal but never exceed the OFL. ABC should be based on F_{MSY} or its proxy for the stock if overfishing is not occurring and/or the stock is not in a rebuilding program, and should be based on the rebuilding fishing mortality (F_{reb}) rate for the stock if it is in a rebuilding program. The specification of ABC will consider scientific uncertainty and will be recommended to the Council by its Scientific and Statistical Committee.

OFL>=ABC>=ACL

OFL – Scientific Uncertainty = ABC (Determined by SSC)

ABC Control Rule. 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 the specifications package or framework adjustments to the Herring FMP (in addition to future amendments), as appropriate.

Background (2010-2012 Specifications)
The ABC control rule will be contingent on the stock assessments providing adequate information. During the 2010-2012 specifications process the SSC pointed out two of sources of considerable scientific uncertainty:

> *(1) The assessment has a strong 'retrospective pattern' in which estimates of stock size are sequentially revised downward as new data are added to the assessment; and (2) Maximum sustainable yield reference points estimated from the biomass dynamics model are inconsistent with the age-based, stochastic projection; such that fishing at the current estimate of F_{MSY} is expected to maintain equilibrium biomass that is less than the current estimate of B_{MSY}.*

Given this magnitude of uncertainty the SSC was unable to provide final guidance. As such, an interim ABC has been set until a new benchmark assessment can be produced, and an interim ABC control rule has been set to reflect the decision.

The SSC recommended that the ABC be set based on recent catch, and asked that the Council determine the desired risk tolerance in setting the ABC. The Council considered the SSC advice, and, consistent with it, considered three options for defining recent catch:

- One-year (most recent, 2008) – 90,000 mt; and
- Three-year (2006 – 2008) average – 106,000 mt; and
- Five-year (2004 – 2008) average – 108,000 mt.

The three-year average catch (2006-2008, 106,000 mt) was selected by the Council to form the basis of the ABC specification for 2010-2012 for several reasons:

- A three-year average is commonly used to reflect "recent" levels of landings, biomass, fishing mortality, trawl survey results, and other factors that are utilized to evaluate trends in a fishery or stock status. The Council's approach is consistent with this approach and appears to be technically-sound. It also falls within the range of approaches suggested by the SSC and is therefore consistent with SSC advice and the best available scientific information.
- A one-year approach was not utilized because 2008 catch was one of the lowest on record for many years and may not adequately or accurately address the true level of "recent" catch. While there may be a variety of reasons that 2008 catch was lower, the specific reasons remain unknown (market conditions, fish availability, lower Area 1A TAC, etc.). Canadian catch (NB weir fishery) was particularly low in 2008, while 2007 landings were the highest of the time series. Variability in catch from year to year should be considered when defining recent catch, and variability is not addressed through a one-year approach.
- The Council considered other factors identified by the SSC, including recruitment, biomass projections, and the importance of herring as a forage species. The three-year approach was chosen instead of a five-year approach with consideration of these and other factors. The Council's proposed approach for specifying ABC provides for a technically-sound way to address annual variability in catch and fishing effort while remaining consistent with SSC advice and slightly more conservative than the five-year option that was considered.

- The proposed specification of ABC (106,000 mt) provides a 27% buffer from the proposed F_{MSY}-based catch in 2010 (145,000 mt) to account for scientific uncertainty associated with the 2009 TRAC updated herring assessment, particularly the retrospective pattern in the assessment model. This should ensure that the risk of exceeding F_{MSY} for the stock complex is minimized, despite any uncertainties associated with the assessment results. The Council supports the SSC recommendation that a benchmark assessment for Atlantic herring is needed as soon as possible and will revisit this issue with the SSC when such an assessment occurs. Until then, the proposed approach is consistent with SSC advice and based on the best available and most recent information.

Interim ABC Control Rule

On January 25th, 2010, the Council decided that the interim control rule for ABC would be based on the SSC recommendations. **The interim ABC control rule is:**

ABC = Average Catch (2006-2008)

The interim control rule serves as a placeholder until a more appropriate control rule is developed. In addition to the ABC advice, the SSC also recommended that a new benchmark assessment should be scheduled as soon as possible, preferably in advance of the next management cycle. This would allow the SSC to create an ABC control rule for the next specifications process. In the future the SSC will develop the ABC control rule when further information becomes available.

ACL: Annual Catch Limit. The catch level selected such that the risk of exceeding the ABC is consistent with the management program. ACL can be equal to but can never exceed the ABC. ACL should be set lower than the ABC as necessary due to uncertainty over the effectiveness of management measures. The ACL serves as the level of catch that determines whether accountability measures (AMs) become effective.

ABC – Management Uncertainty = Stock-wide ACL = OY

AM: Accountability Measure(s). 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.

Table 3 Overview of New Definitions used in Proposed ACL Process

Acronym	Definition	Considerations
OFL	Catch at F_{MAX}	Current stock size
ABC	Catch at F_{MSY} or $F_{rebuild}$ <=OFL	Biological uncertainty over current stock size, estimate of F, or other parameters (stock mixing ratios, recruitment, etc.)
ACL	<=ABC	Uncertainty from other sources, evaluation of risk to achieving management goals if ABC is exceeded
AM	Accountability Measures	(1) minimizing risk of exceeding ACL during the fishing year; (2) addressing ACL overages, if they occur

Section 303(a)(4) of the MSA also requires FMPs to assess and specify:

- The capacity and the extent to which fishing vessels of the U.S., on an annual basis, will harvest the optimum yield specified in the FMP (domestic annual harvest, DAH);
- The portion of OY which, on an annual basis, will not be harvested by fishing vessels of the U.S. and can be made available for foreign fishing (total allowable level of foreign fishing, TALFF); and
- The capacity and extent to which U.S. fish processors, on an annual basis, will process that portion of OY that will be harvested by U.S. fishing vessels (domestic annual processing, DAP).

Part of OY may be held as a reserve to allow for factors such as uncertainties in estimates of stock size and DAH.

3.1.1.2 Elimination of JVP, IWP, TALFF, and Reserve Specifications

According to the Atlantic Herring FMP, Joint Venture Processing (JVP) and Internal Waters Processing (IWP) operations are very similar; in each, a foreign processing vessel is contracted to process fish which are harvested by domestic vessels. The only difference is where the processing vessel is located and under whose authority the JVP or IWP is granted. JVP vessels process fish in federal waters while IWP vessels process fish in state waters. The amount available for use by foreign processing vessels is the total joint venture allocation—JVPt. TALFF is essentially self explanatory; when the specification is set Total Allowable Level of Foreign Fishing dictates how much fish is removable from US waters by foreign vessels.

The Proposed Action would retain the general provisions for establishing specifications for the Atlantic herring fishery but would eliminate the specification of JVP, IWP, and a TAC reserve, as well as eliminate the need to specify TALFF on an annual basis. While TALFF would not have to be considered by the Council during the specifications process, countries interested in foreign fishing for herring may still request TALFF allocations from NMFS, and these requests would be addressed as they arise. Minor adjustments would be made to bring the additional specifications into compliance with the new provisions of the MSA, consistent with Option 1 above. The only difference between this Proposed Action and the non-preferred action (Section

4.1.2) is that the preferred eliminates the need for the Council to specify JVP, IWP, TALFF, and a TAC reserve on an annual basis.

The most notable changes to the specifications in this preferred action include the addition of a specification for OFL, elimination of the current abc (allowable biological catch) specification and addition of the MSA-defined ABC specification (acceptable biological catch), and the adjustments to AMs. The Atlantic herring fishery is and will continue to be managed by hard TACs. A stock-wide ACL will be established, and the specification of sub-ACLs will relate to the management area TACs (see Table 4).

Table 4 Proposed Changes to Atlantic Herring Fishery Specifications

CURRENT SPECIFICATIONS	PROPOSED (AMENDMENT 4) SPECIFICATIONS
Allowable Biological Catch (abc)	Overfishing Limit (OFL)
	Acceptable Biological Catch (ABC)
U.S. Optimum Yield (OY)	U.S. Optimum Yield (OY) (Stock-Wide ACL)
Domestic Annual Harvesting (DAH)	Domestic Annual Harvesting (DAH)
Domestic Annual Processing (DAP)	Domestic Annual Processing (DAP)
Total Joint Venture Processing (JVPt)	
Joint Venture Processing (JVP)	
Internal Waters Processing (IWP)	
U.S. At-Sea Processing (USAP)	U.S. At-Sea Processing (USAP)
Border Transfer (BT)	Border Transfer (BT)
Total Allowable Level of Foreign Fishing (TALFF)	
RESERVE	
TAC Area 1A	TAC Area 1A (sub-ACL)
TAC Area 1B	TAC Area 1B (sub-ACL)
TAC Area 2	TAC Area 2 (sub-ACL)
TAC Area 3	TAC Area 3 (sub-ACL)
Research Set-Aside	Research Set-Aside (and/or Other Set-Aside)

In the process proposed to establish ACLs in this amendment, catch in the Canadian (NB) weir fishery will be subtracted or removed from consideration after specifying ABC and before establishing ACLs for the U.S. fishery. Uncertainty related to future catch from the NB weir fishery, state waters landings, and discards may be factored into "management uncertainty."

Furthermore, Section 201(d) of the MSA states that:

> The total allowable level of foreign fishing, if any, with respect to any fishery subject to the exclusive fishery management authority of the United States, is that portion of the optimum yield of such fishery which cannot, or will not be harvested by vessels of the United States, as determined in accordance with this Act. Allocations of the total allowable level of foreign fishing are discretionary, except that the total allowable level shall be zero for fisheries determined by the Secretary to have adequate or excess domestic harvest capacity.

The Council developed a limited access program for the Atlantic herring fishery in Amendment 1 because it determined that harvesting capacity in the fishery is more than adequate to fully utilize the available yield. While markets and other factors may influence the actual catch on an annual basis, capacity exists in the fishery to fully utilize the OY.

The rationale for a limited access program in the herring fishery is provided in Section 6.1 of the Amendment 1 document. The capacity analysis in Amendment 1 suggests that keeping the fishery open-access would result in potential landings ranging from 170,087 metric tons to 209,368 mt (currently, the TACs for the herring fishery total 145,000 mt across all management areas). The limited access program implemented in Amendment 1 was projected to allow harvesting capacity to range from 161,030 mt to 198,710 mt, which is still higher than the total available OY for the fishery. This capacity will likely remain in the fishery, therefore eliminating the need to consider specifications for TALFF on a continuing basis.

The Proposed Action would make it so the Council would still specify DAH and DAP as part of the multi-year fishery specifications. The Council, however, has determined that DAH will be high enough that regular consideration of TALFF is not necessary, and DAP will be high enough that regular consideration of JVP is not necessary. Information to support DAH and DAP specifications will continue to be provided in the specifications package.

3.1.1.3 Sub-ACLs

While it is widely recognized that the herring resource is composed of different stock components (primarily inshore Gulf of Maine and offshore Georges Bank/southern New England components), assessment of the Atlantic herring resource remains complex-wide; data are not available at this time to generate a biomass estimate, apply a target fishing mortality rate, and estimate an appropriate level of yield specifically from the inshore component of the resource. Therefore, an ACL for the Atlantic herring stock complex as a whole should be established, which is based on the most recent stock assessment, accounts for scientific uncertainty, and is intended to prevent overfishing.

However, once an ACL for the Atlantic herring resource is specified, the Council may divide the ACL into ***sub-ACLs***. These sub-ACL will facilitate management of the catch of the resource and its stock components across the range of the stock. This will allow catch limits to be established to ensure that overfishing does not occur on individual stock components. This is the intent of the current process for establishing management area TACs in the herring fishery. These TACs will be rolled over into the definition of sub-ACLs. The sub-ACLs can also provide for accountability measures to be implemented in the specific portions of the fishery that may be

responsible for excessive catch, should an ACL be exceeded in that portion. AMs for sub-ACLs are not mandatory, however, and different AMs need not be developed for each management area unless the Council specifically chooses this approach. One suite of AMs may apply to all sub-ACLs. The AMs will be specified in this amendment and may be modified as part of the specifications package, along with supporting information and analysis. Modifications and additions to AMs for either the total ACL or any sub-ACLs may be included in the fishery specifications package.

Other ACL elements or sub-ACLs may be adopted by the Council as part of this process for several reasons. Dividing the overall Atlantic herring ACL into smaller portions that are attributed to specific management areas (sub-ACLs) assures that the risk of overfishing individual stock components is minimized because the sub-ACLs can be subject to AMs. It is important to note that management controls on the portion of the fishery subject to accountability measures must be sufficient to prevent overfishing on the resource as a whole, which is highly likely to be the case for the Atlantic herring fishery at this time. Any non-ACL sub-components that are identified by the Council can be revised through either the fishery specifications process or the Herring FMP's framework adjustment process and will be analyzed in a separate environmental analysis.

3.1.1.4 Administration: Atlantic Herring Fishery Specification Process

This section delineates changes to the administrative steps for setting specifications and establishing ACLs and AMs for the Atlantic herring fishery. In this Proposed Action the ACL process will become an element of the existing fishery specification process, which is a three-year process in the Atlantic Herring FMP. The process will continue to be a three-year process.

The Atlantic herring fishery specification process requires the Herring PDT to prepare a stock assessment and fishery evaluation (SAFE) Report every three years. While a SAFE Report will only be prepared every three years, the Herring PDT is required to meet at least once during interim years to review updated scientific information and evaluate the status of the stock relative to the overfishing definition. Council action is not required on an annual basis to maintain the same specifications for all three fishing years, but the Council also has flexibility to adjust the specifications during the interim years based on recommendations from the Herring PDT or for other reasons that may be identified. These provisions will remain unchanged.

Under the Proposed Action, as part of the specification process, the Herring PDT will develop recommendations for ABC for the Atlantic herring resource over three fishing years based on the information provided in the SAFE Report. These recommendations form the basis for setting ACLs for the upcoming three fishing years. The Herring PDT recommendations will include the following elements:

- OFL estimates for the next three fishing years, based on the point estimates of F_{MAX} (or its proxy) and the point estimate of future stock size.
- ABC recommendations for the next three fishing years, based on either F_{MSY} (if the stock is not in a rebuilding program) or F_{reb} (if the stock is in a rebuilding program). If possible, the Herring PDT recommendation should report the catch that is expected to

result from the point estimates of the target fishing mortality rate and projected stock size (i.e., the OFL). If the PDT recommends reducing the ABC from this amount, the recommendation should include an explicit discussion of the scientific uncertainties that are taken into account in developing the recommendation. In order to evaluate these uncertainties, the PDT will develop an informal document that describes the issues that will be considered. This information will be provided for the consideration of the SSC and the Council and is not intended to be binding on either body.

- An evaluation whether the ABC and the ACLs have been exceeded in earlier years.

Scientific uncertainty should be identified and discussed in detail by the Herring PDT to assist the SSC during its deliberations regarding ABC. Several sources of scientific uncertainty may exist, and some of the sources that have been identified in the recent past are identified and discussed briefly in Section 1.1.1.1.1 of this document.

As part of its three-year review, the Herring PDT will then also develop a recommendation to the Council for setting ACLs for the upcoming fishing years. This report from the PDT should also include evaluation of current AMs and any suggested modifications to the AMs for upcoming fishing year. This alternative allows for adjustments to AMs to be made as part of the fishery specification process, however new AMs will have to be implemented through a framework or amendment process.

Similar to developing its recommendations regarding the specification of ABC, the Herring PDT will consider management uncertainties when developing the recommendation for ACLs, particularly relative to the AMs in the fishery. In order to evaluate these uncertainties, the Herring PDT will develop an informal document that describes the issues that will be considered. The Council may ask the SSC to comment on the PDT recommendations. The Herring PDT's ACL/AM recommendations should include:

- A summary indicating whether ABC and/or ACLs have been exceeded in recent years; as part of its evaluation, the Herring PDT may recommend changes to existing AMs to be included in the specifications for the upcoming three fishing years;
- Discussion of existing AMs in the fishery and their effectiveness;
- Recommendations for setting ACLs/AMs for the next three years – the Herring PDT will describe the uncertainties and risks considered when developing these recommendations.

In order to recommend ACLs for the next three years management uncertainty should be identified and discussed by the Herring PDT to assist the Council in setting them. Several sources of management uncertainty may exist, and some of the sources that have been identified in the recent past include (these examples are provided only to illustrate some of the factors the PDT may consider relative to management uncertainty):

- ***Catch in the NB Weir Fishery***. As previously noted, catch from the NB weir fishery in Canada is assumed to consist of fish from the inshore component of the resource and must be deducted from the ABC before the U.S. ACLs can be established. Uncertainty about future catches from this fishery should be addressed until a more direct approach to joint management and/or resource sharing is adopted by both the U.S. and Canada.

- ***Total Catch in the U.S. Fishery***. Total catch levels, including both landings and discards, can be difficult to estimate accurately in a real-time manner. Uncertainties regarding the amount of herring bycatch (discards) and the ability of managers to monitor the ACLs on a real-time basis should be considered when establishing ACLs and accounting for management uncertainty. Discard adjustments can be made prior to setting ACLs if warranted. It is important to note that discard deductions as part of management uncertainty represent buffers for uncertainty around the discard estimates and not the actual discards themselves. The actual discards will be accounted for during the ACL setting process, which will depend on where the information on discards is coming from, as was noted above. Such a buffer is not required for inclusion into management uncertainty, but is an example of a component that, if it is deemed important enough, could be incorporated
- ***Impact of ASMFC Management Measures on Fishing Patterns.*** The potential impact of ASMFC management measures such as spawning provisions (seasonal closures, for example) and days out provisions (to distribute the TAC/ACL across more of the fishing year) should be considered.

Evaluating the potential risk (of overfishing or exceeding the ABC or ACL) associated with a specific type of uncertainty (scientific or management) presents a new challenge for the PDT and SSC, which may be difficult to overcome. The trade-offs associated with various sources of uncertainty will need to be considered, and the SSC should provide information that describes how the sources of uncertainty are accounted for and addressed in the final recommendations. It will be very difficult, if not impossible, to quantify the impacts of and/or risk associated with many sources of uncertainty.

The specification process will also provide the Herring PDT with the flexibility to make adjustments, if necessary, to account for expected discards of herring when setting the ACLs. The need for a discard adjustment will depend in large part on the ability to accurately estimate discards of herring at the time when ACLs are set. It will also depend on how discards are treated in future stock assessments for Atlantic herring. A catch monitoring program proposed in Amendment 5 may provide discard information sufficient to eliminate the need to adjust for discards when setting the ACLs, in which case the ACLs will be implemented and monitored as total catch limits.

All Herring PDT recommendations and supporting information/analysis will be transmitted to the SSC for review, and the SSC will develop recommendations for ABC and provide comments/feedback on the PDT recommendations for establishing ACLs. If the SSC recommends an ABC that differs from that which was originally recommend by the Herring PDT, then the PDT will revise its ACL recommendations to be consistent.

3.2 ESTABLISHING ACCOUNTABILITY MEASURES (AMS)

The Proposed Action will establish two accountability measures that may be modified in the future as part of the herring fishery specifications process and/or the framework adjustment process.

NMFS' Guidelines state that accountability measures (AMs) are management controls implemented for stocks such that exceeding the ACL is prevented, where possible, and corrected or mitigated if it occurs. The Guidelines suggest three kinds of AMs that could be considered: (1) those that can be applied in-season, designed to prevent the ACL from being reached; and (2) those that are applied after the fishing year, designed to address the operational issue that caused the ACL overage and ensure that it does not happen in subsequent fishing years, and, as necessary, address any biological harm to the stock; and (3) those that are based on multi-year average data which are reviewed and applied annually. AMs should address and minimize the frequency and magnitude of overages and should be designed so that if an ACL is exceeded, specific adjustments are effective in the next fishing year or as soon as possible. The Guidelines also suggest that multi-year specifications (like those for the Atlantic herring fishery) should include AMs that provide for automatic adjustments in the subsequent year's harvest if an ACL is exceeded in one year.

The Proposed Action will establish two AMs in addition to the AM which is currently in place, all three of which are described below. The AMs proposed in this amendment are intended to apply to all herring ACLs that may be established during the fishery specification process (total Atlantic herring ACL and any management area sub-ACLs).

Establishment of new AMs in the future would require Council action, such as an Amendment. Any existing AMs, however, can be modified in the specifications package. All three AMs established in the Proposed Action can therefore be modified in the future through a framework adjustment to the Herring FMP or through the herring fishery specification process.

Currently, few consequential measures exist in the herring management program, however there are precautionary measures that already exist in the herring management program (in-season adjustments, management area closures, and framework adjustment provisions). The framework adjustment process could be utilized to address ACL overages, but timing is a challenge, and it is not certain that framework measures could be implemented during the following fishing year to address an overage in the prior year.

3.2.1 Establishment of Current AM

The current AM in the herring fishery is described below:

Management Area Closures: Currently, the directed fishery for herring in a given management area is closed when 95% of the TAC is projected to be reached; 5% is provided after the closure to account for incidental catch fishing under a 2,000 pound trip limit (in some areas an additional 3% for research set-aside results in closure when 92% is projected). Closing the directed fishery at a 95% projected catch level helps to minimize the risk of exceeding 100% of the TAC during the fishing year. Once the fishery is closed, all vessels are limited to 2,000 pounds of Atlantic herring, which is accounted for through the 5% set-aside or "buffer" that remains available. The current regulations are provided below:

> *(a) If NMFS determines that catch will reach 95 percent of the annual TAC allocated to a management area before the end of the fishing year, or 95 percent of the Area 1A TAC allocated to the first seasonal period as set forth in*

paragraph (f) of this section, NMFS shall prohibit vessels, beginning the date the catch is projected to reach 95 percent of the TAC, from fishing for, possessing, catching, transferring, or landing >2,000 lb (907.2 kg) of Atlantic herring per trip and/or >2,000 lb (907.2 kg) of Atlantic herring per day in such area pursuant to paragraph (e) of this section, except as provided in paragraphs (c) and (d) of this section. These limits shall be enforced based on a calendar day, without regard to the length of the trip.

This accountability measure was implemented in the Council's Atlantic Herring FMP (1999) and has helped to keep catch at or near management area TACs since that time. While some overages have been experienced, the frequency and degree of overage has not been significant enough to compromise the health of the resource complex as a whole. The rationale provided in the FMP for this provision states:

Closing the fishery when the TAC is reached will protect the resource and ensure long term sustainable catches are achieved. This provision also sends a signal to the industry that harvests should be controlled or the fishery may close. The set-aside for incidental catches in other fisheries reduces the likelihood that the overall TAC will be exceeded. This level can be reduced by the Regional Administrator, or can be increased through a framework adjustment measure, if it appears to misstate the incidental catch.

As was stated in the previous section, this amendment is revising the existing text in the FMP so that this AM can be modified through a framework adjustment to the Herring FMP or through the herring fishery specification process.

3.2.2 Additional AMs

3.2.2.1 ACL Overage Deduction

The Proposed Action will establish a process to address ACL/sub-ACL overages in the Atlantic herring fishery. Once the final total catch for a fishing year is determined during the subsequent fishing year using the best available information (including VTR reports to account for incidental catch in other fisheries), any ACL/sub-ACL overage would result in a reduction of the corresponding ACL/sub-ACL for the fishing year after the final total catch will be tallied. The ACL/sub-ACL deduction would be equal to the amount that was exceeded. NMFS would make these determinations and publish any changes to the ACLs in the *Federal Register* prior to the start of the fishing year during which the deduction would occur.

Example (Using Area 1A): In Year 1 (2011), the directed herring fishery in Area 1A closes when 95% of the sub-ACL is projected to be reached, and *all* vessels fishing in Area 1A are subject to a 2,000 pound trip limit for herring. This includes vessels with limited access herring permits and vessels participating in other fisheries and catching herring incidentally (some with limited access permits for herring, and some with open access permits for herring). During Year 2 (2012), VTR reports from all fisheries would be compiled to generate a final tally of all herring catch during Year 1 (likely around April of Year 2 given the VTR lag time). If the final tally indicates that there was a sub-

ACL overage during Year 1, the overage would be deducted from the Year 3 (2013) sub-ACL for Area 1A. NMFS would publish the Year 3 sub-ACLs with appropriate deductions prior to the start of the Year 3 fishing year.

As was stated in the previous section, this amendment is revising the existing text in the FMP so that this AM can be modified through a framework adjustment to the Herring FMP or through the herring fishery specification process.

3.2.2.2 Haddock Catch Cap

The Proposed Action will establish an AM for the current haddock catch cap, consistent with the establishment of the catch cap as a sub-ACL in the groundfish fishery (Amendment 16) and consistent with current regulations regarding the catch cap. When the Regional Administrator has determined that the haddock catch cap (§648.85(d)) has been caught, all vessels issued an Atlantic herring permit or fishing in the Federal portion of the GOM/GB Herring Exemption Area, will be prohibited from fishing for, possessing, or landing herring in excess of 2,000 lb per trip in or from the GOM/GB Herring Exemption Area unless the vessel has a multispecies permit and is fishing on a declared groundfish trip.

As was stated in the previous section, this amendment is revising the existing text in the FMP so that this AM can be modified through a framework adjustment to the Herring FMP or through the herring fishery specification process.

3.2.3 Other Factors

3.2.3.1 In-season Adjustments to TACs

Although the in-season adjustments to TACs cannot be considered an AM because they do not trigger a hardwired response when a limit is reached, consideration of this previous measure is important when considering AMs, as this management measure will remain in place to help prevent overfishing. Current regulations in the Atlantic herring fishery grant authority to the NMFS Regional Administrator to adjust any of the management area TACs for herring during the fishing year, after consultation with the Council. The Regional Administrator must publish notification in the Federal Register of any changes to the TACs, along with reasons for making the changes, which must be consistent with the Herring FMP objectives and management program, one of which is to prevent overfishing and manage the Atlantic herring fishery at long-term sustainable levels. The current regulations are provided below:

> *(1) The specifications and TACs established pursuant to this section may be adjusted by NMFS, after consulting with the Council, during the fishing year by publishing notification in the Federal Register stating the reasons for such action and providing an opportunity for prior public comment. Any adjustments must be consistent with the Atlantic Herring FMP objectives and other FMP provisions.*
>
> *(2) If a total allowable catch reserve (TAC reserve) is specified for an area, NMFS may make any or all of that TAC reserve available to fishers after consulting with the Council. NMFS shall propose any release of the TAC reserve*

in the Federal Register and provide an opportunity for public comment. After considering any comments received, any release of the TAC reserve shall be announced through notification in the Federal Register.

3.2.3.2 Acknowledgement of ASMFC Management Measures

The ASMFC Interstate FMP for Atlantic Herring includes management measures that are intended to control fishing effort under the TACs and extend the availability of herring for the fishery throughout more of the year. While these measures may not be formally considered as part of the existing AMs under the MSA provisions (because herring is not jointly managed by the Council and ASMFC), they are recognized as additional measures that may benefit the resource and fishery and may improve managers' ability to monitor ACLs and ensure that they are not exceeded. Measures intended to stretch available TAC across more of the fishing year and/or slow the race to fish in a particular management area may not directly serve as AMs, but they will allow managers to better gauge/predict when the fishery will come close to reaching an ACL in a given area.

"Days out" provisions are the primary effort control measures in the ASMFC's herring management program and are intended to prolong the entire TAC for times of the year when herring is typically in peak demand. If catch rates in an area are projected to get harvested early, States can implement 'days out' of the fishery to control effort. Fishermen are prohibited from landing herring during a day out but may still fish and catch them. Days out were designed to prolong the TAC in an area in order to ensure a steady supply of herring, giving fishermen and industry the ability to set long term business strategies and shift fishing pressure to other management areas. The Section has only needed to implement 'days out' in Area 1A to control catch rates, although they have the ability to set days out in the other management areas as well.

4.0 ALTERNATIVES TO THE PROPOSED ACTION

During the development of Amendment 4 the Council considered separate alternatives for ACLs and AMs. For ACLs the Council ultimately choose between two different alternatives; the Proposed Action listed above and the no action alternative, described in the following section. When the Council considered the Proposed Action, however, the section which addressed changes to the specifications had two options which the Council had to decide between. The preferred option is described in the Proposed Action and the non-preferred option will be described further in this section. There were no considered but rejected alternatives for ACLs.

For AMs the Council originally considered six alternatives, both precautionary and consequential, one of which had two options and four of which were considered but rejected by the Council. Both of the alternatives that were chosen by the Council are in the Proposed Action section, and the rejected alternatives as well as the no action alternative are described further in this section.

4.1 NON-PREFERRED ALTERNATIVES

4.1.1 ACL No Action Alternative (Non-Preferred)

Under this alternative, no action would be taken to modify the Atlantic herring fishery specification process and bring the Herring FMP into compliance with the new provisions of the MSA that relate to establishing ACLs and AMs. The herring fishery specification process would remain unchanged from the current process. The specifications process has been described in the Atlantic Herring FMP and was modified to a three year process in with Amendment 1. Under this alternative the current specifications process would remain in effect (Table 5):

- ABC would remain defined as Allowable Biological Catch and OFL would not be established
- OY would not become a stock wide ACL
- TACs would remain TACs and sub-ACLs would not be established.

The no action alternative is required by the National Environmental Policy Act (NEPA) and provides a benchmark, enabling decision makers to compare the magnitude of environmental impacts of other alternatives under consideration. In the context of setting ACLs/AMs, the no action alternative is not consistent with the MSA.

4.1.2 Option 1 – Current Specifications with Minor Changes (Non-Preferred)

This option, the non-preferred option for the proposed ACL action, would retain the general provisions for establishing specifications for the Atlantic herring fishery, including the specification of DAH, DAP, JVP, USAP, TALFF, and a TAC reserve, in addition to other specifications. Minor adjustments would be made to bring the current specifications into compliance with the new provisions of the MSA.

The assessments/specifications required by the MSA are made every three years as part of the Atlantic herring fishery specification process. The current process for establishing catch limits and quotas in the Atlantic herring fishery includes specifications for: abc (allowable biological catch) for the Atlantic herring resource, U.S. OY, domestic annual harvest (DAH), domestic annual processing (DAP), joint venture processing (JVP), internal waters processing (IWP), U.S. at-sea processing (USAP), border transfer (BT), total allowable level of foreign fishing (TALFF), a reserve, total allowable catches (TACs) for each of the herring management areas, and research set-asides (RSAs) in any or all of the herring management areas.

Under this option, the majority of these specifications will remain unchanged and will continue to be addressed regularly through the specifications process. The most notable changes to the specifications include the addition of a specification for OFL, elimination of the current abc (allowable biological catch) specification and addition of the MSA-defined ABC specification (acceptable biological catch), and the establishment of AMs. The Atlantic herring fishery is and will continue to be managed by hard TACs. A stock-wide ACL will be established, and the specification of sub-ACLs will relate to the management area TACs (see Table 5).

Table 5 Option 1 – Proposed Changes to Atlantic Herring Fishery Specifications

CURRENT SPECIFICATIONS	PROPOSED (AMENDMENT 4) SPECIFICATIONS
Allowable Biological Catch (abc)	Overfishing Limit (OFL)
	Acceptable Biological Catch (ABC)
U.S. Optimum Yield (OY)	U.S. Optimum Yield (OY) (Stock-Wide ACL)
Domestic Annual Harvesting (DAH)	Domestic Annual Harvesting (DAH)
Domestic Annual Processing (DAP)	Domestic Annual Processing (DAP)
Total Joint Venture Processing (JVPt)	Total Joint Venture Processing (JVPt)
Joint Venture Processing (JVP)	Joint Venture Processing (JVP)
Internal Waters Processing (IWP)	Internal Waters Processing (IWP)
U.S. At-Sea Processing (USAP)	U.S. At-Sea Processing (USAP)
Border Transfer (BT)	Border Transfer (BT)
Total Allowable Level of Foreign Fishing (TALFF)	Total Allowable Level of Foreign Fishing (TALFF)
RESERVE	RESERVE
TAC Area 1A	TAC Area 1A (sub-ACL)
TAC Area 1B	TAC Area 1B (sub-ACL)
TAC Area 2	TAC Area 2 (sub-ACL)
TAC Area 3	TAC Area 3 (sub-ACL)
Research Set-Aside	Research Set-Aside (and/or Other Set-Aside)

In the process proposed to establish ACLs in this amendment, catch in the Canadian (NB) weir fishery will be subtracted or removed from consideration after specifying ABC and before establishing ACLs for the U.S. fishery. Uncertainty related to future catch from the NB weir fishery, state waters landings, and discards may be factored into "management uncertainty."

4.1.3 AM Alternative 1 - No Action (Current AMs) (Non-Preferred)

This alternative would maintain the current suite of management measures in the Atlantic herring fishery that are considered AMs. These measures are designed primarily to prevent the management area TACs (sub-ACLs) from being exceeded during the fishing year, as well as improve the likelihood that the ACL can be caught on a continuing basis while preventing overfishing. The current AM in the herring fishery is described below.

Management Area Closures: Currently, the directed fishery for herring in a given management area is closed when 95% of the TAC is projected to be reached; 5% is provided after the closure to account for incidental catch fishing under a 2,000 pound trip limit (in some areas an additional 3% for research set-aside results in closure when 92% is projected). Closing the directed fishery at a 95% projected catch level helps to minimize the risk of exceeding 100% of the TAC during

the fishing year. Once the fishery is closed, all vessels are limited to 2,000 pounds of Atlantic herring, which is accounted for through the 5% set-aside or "buffer" that remains available. The current regulations are provided below:

> *(a) If NMFS determines that catch will reach 95 percent of the annual TAC allocated to a management area before the end of the fishing year, or 95 percent of the Area 1A TAC allocated to the first seasonal period as set forth in paragraph (f) of this section, NMFS shall prohibit vessels, beginning the date the catch is projected to reach 95 percent of the TAC, from fishing for, possessing, catching, transferring, or landing >2,000 lb (907.2 kg) of Atlantic herring per trip and/or >2,000 lb (907.2 kg) of Atlantic herring per day in such area pursuant to paragraph (e) of this section, except as provided in paragraphs (c) and (d) of this section. These limits shall be enforced based on a calendar day, without regard to the length of the trip.*

This accountability measure was implemented in the Council's Atlantic Herring FMP (1999) and has helped to keep catch at or near management area TACs since that time. While some overages have been experienced, the frequency and degree of overage has not been significant enough to compromise the health of the resource complex as a whole. The rationale provided in the FMP for this provision states:

> *Closing the fishery when the TAC is reached will protect the resource and ensure long term sustainable catches are achieved. This provision also sends a signal to the industry that harvests should be controlled or the fishery may close. The set-aside for incidental catches in other fisheries reduces the likelihood that the overall TAC will be exceeded. This level can be reduced by the Regional Administrator, or can be increased through a framework adjustment measure, if it appears to misstate the incidental catch.*

4.2 MEASURES CONSIDERED BUT REJECTED

The management alternatives under consideration in Amendment 4 were developed by the Council, Herring Committee, Herring Advisory Panel, and Herring PDT from July of 2008 (after scoping) until January of 2010, when the Council approved the management alternatives for inclusion in the amendment. Many different management measures were considered for the incorporation of ACLs and AMs into the Atlantic Herring FMP, and those that were eliminated from further consideration are discussed below, along with the Council's rationale for eliminating them at this time. No ACL measures were rejected, only potential AMs.

It is important to note that although the AMs described in the following subsections have been eliminated from further consideration in Amendment 4, the Council may reconsider any of them in a future action for Atlantic herring. In some cases, details and preliminary analyses have already been conducted, making reconsideration of these measures in the future less burdensome prospect.

4.2.1 Closure of a management area at a lower percentage of the ACL.

As was described in the proposed action, the directed fishery for herring in a given management area is closed when 95% of the sub-ACL is projected to be reached; the other 5% is provided after the closure to account for incidental catch fishing under a 2,000 pound trip limit. Once the fishery is closed, all vessels are limited to 2,000 pounds of Atlantic herring, which is accounted for through the 5% set-aside or "buffer" that remains available.

Depending on the degree of management uncertainty, the Council could have considered a lower percentage of the sub-ACL for closing the directed fishery. This would account for uncertainty regarding real-time monitoring and/or related estimates of the total catch. This management measure may or may not be necessary depending on the management measures implemented for the herring catch monitoring program. This option could therefore be considered in the context of the proposed catch monitoring program which will be addressed in Amendment 5.

4.2.2 Establishment of a threshold/trigger for an in-season adjustment to the ACL

As previously noted, current regulations in the Atlantic herring fishery grant authority to the NMFS Regional Administrator to adjust any of the management area TACs for herring during the fishing year, after consultation with the Council. During the development of Amendment 4 the Council considered establishing a threshold (% of ACL, for example) that would trigger a review by the RA to determine if in-season adjustments are necessary to ensure that the ACL in a management area is not exceeded during the fishing year. Had this option been selected the provisions would have had to state clearly what the trigger would be and what in-season actions/adjustments the RA may want to consider during the review.

4.2.3 Closure of a management area at a projection of 100% of the ACL

One of the AMs considered would have authorized NMFS to completely close the fishery in a management area when 100% of the ACL was projected to be reached, which would have been a precautionary measure. NMFS Guidelines suggest that provisions for in-season adjustments should include language that gives NMFS the ability to close a fishery if it determines, based on data that it deems sufficiently reliable, that an ACL has been exceeded or is projected to be reached, and that closure of a fishery is necessary to prevent overfishing. Closing the directed fishery at a 95% projected catch level helps to minimize the risk of exceeding 100% of the TAC during the fishing year. Once the directed fishery is closed, all vessels are limited to 2,000 pounds of Atlantic herring, which is accounted for through the 5% set-aside or "buffer" that remains available. This option would have allowed NMFS to completely close the fishery and prohibit all landings of herring if 100% of the ACL is projected to be reached. This would have served as a precautionary accountability measure to ensure that the ACL is not exceeded.

ACLs are meant to represent total catch, however. Therefore despite landings being prohibited when 100% of the ACL is caught, the potential for discards to in non-target fisheries would remain, meaning that mortality would continue to occur above 100% of the ACL. For this reason, the Herring PDT recommended that this measure be eliminated from further consideration, and the Committee supported the PDT's recommendation

4.2.4 Establishment of a lower trigger to close fishery in following year

During the development of Amendment 4 several AMs were considered to lower the trigger for closing the directed fishery in the following fishing year. This included a measure which would

reduce the trigger which would close the directed fishery in any management area where an ACL (or sub-ACL) overage occurs.

For example, the directed fishery in Area 1A currently closes when 95% of the TAC is projected to be reached – 5% remains for incidental catch. Under this AM and using this example, if the final data indicate the ACL in Area 1A was exceeded by 3% during the fishing year, then following fishing year's trigger for closure of the directed fishery would be 92% of the ACL instead of (currently) 95% of the ACL. NMFS would evaluate all available data and publish the change to the trigger in the Federal Register as soon as possible during the following fishing year. The directed fishery for herring in the area would close earlier to avoid exceeding the ACL in the following year, and the lowered trigger would essentially serve as a payback for the overage.

The PDT expressed concern that the ability to monitor the fishery to account for the overages, which are likely to be small, and may result in being reduced by less than a days worth of fishing. Given these concerns the Herring Committee recommended eliminating this AM in lieu of the two options discussed below.

4.2.4.1 Direct Deduction in Following Fishing Year

This option would have established a process to address ACL/sub-ACL overages in the Atlantic herring fishery. Once the final catch for a fishing year is determined using the best available information, any ACL or sub-ACL overage would result in a reduction of the corresponding ACL/sub-ACL for the following fishing year equal to the amount that was exceeded. NMFS would make these determinations and publish any changes to the ACLs in the *Federal Register* as early in the subsequent fishing year as possible. (The catch monitoring program established in this amendment may allow for determinations regarding overages to be made very quickly following the end of a fishing year.)

After further consideration by the committee this option was ultimately modified so that the deduction occurs in the year following the determination of an overage, thereby accounting for the time it takes to tally the catch. The modified version became a part of the Proposed Action, which is listed in Section 3.2.2.1 of this amendment.

4.2.4.2 Determination of Negative Biological Impact of Overage Prior to Deduction

This option would have established a process to address ACL/sub-ACL overages in the Atlantic herring fishery following a review of the impacts of the overage. Once the final catch for a fishing year was determined using the best available information, any ACL or sub-ACL overage would trigger a review by the Herring Plan Development Team to determine if a negative biological impact occurred from the overage, and if so, to what extent. The Herring PDT would then recommend ACL/sub-ACL adjustments to account for the overage based on this review. As part of its review, the Herring PDT would consider all potential biological impacts resulting from the overage, including impacts on individual stock components, spawning, productivity, and ecosystem impacts. The PDT may also recommend no adjustments if it determines that the overage did not result in a negative biological impact.

Similar to the previous options modification, this option would also require a one-year lag time to conduct the review and determine the appropriate adjustments. For example, if an overage occurs in Year 1, the PDT would review the impacts of the overage in Year 2 and recommend adjustments to the ACLs/sub-ACLs for Year 3. Changes to the ACLs/AMs for Year 3 would not

have required a Council action, but would be made by NMFS through publication in the *Federal Register*, following a recommendation by the Council after reviewing the Herring PDT's analysis.

Noting the time concerns and the possibility that the Herring PDT requirements would not be feasible, the PDT recommended the elimination of the option from consideration, and Committee recommended the same removal. This option would also have become obsolete with the implementation of the catch monitoring program; if an overage was large enough to indicate a measurable impact then the problem would have originated from the failure of the catch monitoring program to prevent the overage from occurring.

5.0 RATIONALE FOR THE PROPOSED MANAGEMENT ACTION

The action proposed in Amendment 4 to the Herring FMP was developed by the Council, Herring Committee, Herring Advisory Panel and the Herring PDT. Although the NS 1 Guidelines were not published until January of 2009, work on Amendment 4 began in May of 2008, with the scoping process. Work continued until January of 2010, when the Council approved the final management measures for inclusion in Amendment 4. Many different ACL and AM options were considered by the Council during this time.

In June of 2009, the Council decided to split the measures in Amendment 4 with the understanding that ACLs and AMs were mandated by the MSA to be in place by the 2011 fishing year for stocks that are not overfished, such as Atlantic herring. Amendment 5 was created to house those measures which did not relate directly to ACLs and AMs. Although some of these measures, such as catch monitoring and bycatch measures, could have aided the implementation of ACLs and AMs by providing information and more benefit to non-target species, the deadline given by the MSA was firm. Amendment 4 is therefore mostly administrative and procedural, implementing the basic ACL and AM requirements of the MSA by January 1, 2011, the start of the 2011 herring fishing year.

Development of the management action proposed in this amendment was an iterative, public process during which the measures therein were modified and some eliminated from consideration. The Council's rational for the action can be found in the suite of administrative records which were created during the development of this amendment, including meeting minutes and summaries, reports, public hearings and written comments and related correspondence. Those alternatives that were not a part of the Proposed Action or that were considered but rejected can be found in Section 4.0 of this document. The rationale for the Proposed Action is summarized in the following sub-sections.

5.1 ANNUAL CATCH LIMITS

5.1.1 Definitions

In this amendment there are seven definitions of new terms to be used in the Atlantic Herring FMP. The terms "catch", "OFL", "ABC", "ACL", and "AM" are being described in order to bring the herring FMP into compliance with the reauthorization of the MSA thereby specifically

addressing the primary goal of Amendment 4. Each term had a corresponding definition or requirement of establishment in the MSA and NS 1 guidelines:

Section 600.310 (f)(2)(i) of the NS 1 guidelines states:

> *Catch is the total quantity of fish, measured in weight or numbers of fish, taken in commercial, recreational, subsistence, tribal, and other fisheries. Catch includes fish that are retained for any purpose, as well as mortality of fish that are discarded.*

Section 600.310 (e)(2)(i)(D)of the NS 1 guidelines states:

> *Overfishing limit (OFL) means the annual amount of catch that corresponds to the estimate of MFMT applied to a stock or stock complex's abundance and is expressed in terms of numbers or weight of fish. The OFL is an estimate of the catch level above which overfishing is occurring.*

Section 600.310 (f)(2)(ii) of the NS 1 guidelines states:

> *Acceptable biological catch (ABC) is a level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL and any other scientific uncertainty, and should be specified based on the ABC control rule.*

Section 302 (h)(6) of the MSA guidelines states:

> *(Each Council shall) develop annual catch limits for each of its managed fisheries that may not exceed the fishing level recommendations of its scientific and statistical committee or the peer review process established*

Section 302 (a)(15) of the MSA guidelines states:

> *(Any FMP shall) establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability*.

Each quote above acts as the rational for the definitions that are contained within this amendment, as each quote establishes the need for definition of the terms in the herring FMP.

Two other terms were defined in this amendment. The term “stocks in the fishery” was defined specifically. The provision in the amendment specifies that, for the purposes of the amendment and the herring FMP, the stock in the fishery is the target stock, Atlantic herring. This provision is consistent with the all other FMPs in the Northeast. The initial decision to consider Atlantic herring as the only stock in the fishery was made by the Council, as the decision is at the discretion of the Council. Section 600.310 (d)(1) of the NS 1 guidelines states:

The relevant Council determines which specific target stocks and/or non-target stocks to include in a fishery. This section provides that a Council may, but is not required to, use an "ecosystem component (EC)" species classification. As a default, all stocks in an FMP are considered to be "in the fishery," unless they are identified as EC species through an FMP amendment process.

In accordance with this text, the Council made the decision that, for the purposes of this amendment, the stock would solely be defined as Atlantic herring. This decision was made so that this amendment could be implemented in the timeliest manner possible, in order to bring the Atlantic herring FMP into compliance with the MSA. The decision was also made with the knowledge that other mechanisms exists within the language to add other, non-target stocks and that the Council retains the ability to consider such non-target stocks with the further development of ACLs and AMs.

National Standard 9 states that bycatch must be minimized and that mortality of such bycatch must be minimized. As such, the Council made the decision to include only herring as a stock with the knowledge that other mechanisms exist to deal with non-targets species caught by the herring fishery. The amendment therefore specifies that bycatch is to be monitored and minimized accordingly. This amendment also includes the haddock catch cap, being implemented as an AM, which is another way in which bycatch is considered and minimized without the haddock stock being defined as a part of the fishery. Furthermore, one of the objectives of Amendment 5 to the Atlantic Herring FMP, which is under development, is to develop a program which effectively and efficiently monitors bycatch and potentially acts to reduce it with collaboration from the fishing industry. The measure maximizes the flexibility provided to the Council so that it can utilize the best scientific information available at the time when the new amendment is implemented. For these reasons the Council decided that until such time that evidence is brought to the Council which indicates that another species needs to be added to the definition of a stock within the herring FMP in order to be managed acceptably, Atlantic herring will be the only defined stock in the fishery.

The other term which was defined via a specific provision is the "ABC Control rule". The Council proposed to define the approach for setting the ABC, which is to be guided by the SSC, as per the NS 1 Guidelines, which state (in Section 600.310 (f)(2)(ii)):

For stocks and stock complexes required to have an ABC, each Council must establish an ABC control rule based on scientific advice from its SSC. The determination of ABC should be based, when possible, on the probability that an actual catch equal to the stock's ABC would result in overfishing. This probability that overfishing will occur cannot exceed 50 percent and should be a lower value. The ABC control rule should consider reducing fishing mortality as stock size declines and may establish a stock abundance level below which fishing would not be allowed. The process of establishing an ABC control rule could also involve science advisors or the peer review process established under Magnuson-Stevens Act section 302(g)(1)(E). The ABC control rule must articulate how ABC will be set compared to the OFL based on the scientific knowledge about the stock or stock complex and the scientific uncertainty in the estimate of OFL and any other scientific uncertainty. The ABC control rule should consider

uncertainty in factors such as stock assessment results, time lags in updating assessments, the degree of retrospective revision of assessment results, and projections. The control rule may be used in a tiered approach to address different levels of scientific uncertainty.

Language related to the development of an ABC control rule was developed in for the amendment in accordance with these guidelines, but until January of 2010, this amendment did not contain the ABC control rule itself.

In November of 2009, a degree of flexibility was incorporated into the language in the document to account for the SSC decision that an ABC control rule should not be specified for the 2010-2012 specifications package. Their decision was based on the lack of adequate information and considerable uncertainty in the herring assessment, which made the specification of a control rule for incorporation into this amendment difficult. The SSC couldn't provide advice, but did recommend a course of action for the specifications package until a new benchmark assessment could be produced.

The SSC recommended that the ABC be set based on recent catch, and asked that the Council determine its desired risk tolerance in setting the ABC. The Council considered the SSC advice, and, consistent with it, considered three options for defining recent catch:

- One-year (most recent, 2008) – 90,000 mt; and
- Three-year (2006 – 2008) average – 106,000 mt; and
- Five-year (2004 – 2008) average – 108,000 mt.

The three-year average catch (2006-2008, 106,000 mt) was selected by the Council in November of 2009 to form the basis of the ABC specification for 2010-2012 for several reasons:

- A three-year average is commonly used to reflect "recent" levels of landings, biomass, fishing mortality, trawl survey results, and other factors that are utilized to evaluate trends in a fishery or stock status. The Council's approach is consistent with this approach and appears to be technically-sound. It also falls within the range of approaches suggested by the SSC and is therefore consistent with SSC advice and the best available scientific information.
- A one-year approach was not utilized because 2008 catch was one of the lowest on record for many years and may not adequately or accurately address the true level of "recent" catch. While there may be a variety of reasons that 2008 catch was lower, the specific reasons remain unknown (market conditions, fish availability, lower Area 1A TAC, etc.). Canadian catch (New Brunswick weir fishery) was particularly low in 2008, while 2007 landings were the highest of the time series. Variability in catch from year to year should be considered when defining recent catch, and variability is not addressed through a one-year approach.
- The Council considered other factors identified by the SSC, including recruitment, biomass projections, and the importance of herring as a forage species. The three-year approach was chosen instead of a five-year approach with consideration of these and other factors. The Council's proposed approach for specifying ABC provides for a technically-sound way to

address annual variability in catch and fishing effort while remaining consistent with SSC advice and slightly more conservative than the five-year option that was considered.

- The proposed specification of ABC (106,000 mt) provides a 27% buffer from the proposed F_{MSY}-based catch in 2010 (145,000 mt) to account for scientific uncertainty associated with the 2009 TRAC updated herring assessment, particularly the retrospective pattern in the assessment model. This should ensure that the risk of exceeding F_{MSY} for the stock complex is minimized, despite any uncertainties associated with the assessment results. The Council supports the SSC recommendation that a benchmark assessment for Atlantic herring is needed as soon as possible and will revisit this issue with the SSC when such an assessment occurs. Until then, the proposed approach is consistent with SSC advice and based on the best available and most recent information.

Following this decision concerns were voiced over the lack of an ABC control rule within this amendment, and it was recommended that the SSC's approach to the 2010-2012 specifications be adopted as an interim control rule. The recommendation allowed compliance with the requirement that the ABC control rule be based on scientific advice from its SSC, but also allowed the flexibility for the Council to change the control rule when better information became available. It also allowed the ABC control rule to consider uncertainty the stock assessment results, as the NS 1 Guidelines suggest. Therefore in January of 2010 the text was modified by the Committee and Council to reflect the SSC recommendations, and it was decided that the interim ABC control rule was to be set only as a placeholder until a more appropriate control rule can be developed. Using the SSC advice, in accordance with the MSA, the interim ABC control rule was therefore based on the average catch from 2006-2008, using the most recent data available, for the above mentioned reasons.

5.1.2 Elimination of JVP, IWP, TALFF, and Reserve Specifications

Amendment 4 to the Atlantic Herring FMP proposes to eliminate the need for the Council to specify JVP, IWP, TALFF and a TAC reserve on an annual basis. The intent of the elimination of JVP, IWP, TALFF and the TAC was to streamline the regulatory process, reduce the amount of work and resources required to set specifications, and to enhance the stability of the regulations within the fishery. The measure still allows for TALFF requests to be made by foreign countries to NMFS and DAH and DAP would still be specified.

Amendment 4 to the Atlantic Herring FMP also proposes to bring the specifications into compliance with the requirements of the MSA using minor adjustments (Table 4). The minor adjustments include adding an OFL, eliminating abc (allowable biological catch) and establishing ABC (acceptable biological catch), the establishment of a stock-wide ACL and the adjustments of AMs. This section of the Proposed Action places these terms, which are also defined in this amendment, into the specifications process. The rationale for the definitions of OFL, ABC, ACL and AMs in the previous section included quotes from the NS 1 Guidelines; these quotes not only helped define the terms but also required that they be established within the ACL process. The implementation of the terms into the specifications process was therefore done to comply with the same set of these prior quotes, and the Proposed Action was developed to be in accordance with the provisions of the MSA, also ensuring that the measure specifically addresses the primary goal of Amendment 4 to the Atlantic Herring FMP..

5.1.3 Sub-ACLs and Other Possible ACL Sub-Components

This section of the Proposed Action defines sub-ACLs in accordance with the NS 1 Guidelines which state, in Section 600.310 (f)(5)(ii):

> *A Council may, but is not required to, divide an ACL into sector-ACLs. "Sector," for purposes of this section, means a distinct user group to which separate management strategies and separate catch quotas apply. Examples of sectors include the commercial sector, recreational sector, or various gear groups within a fishery. If the management measures for different sectors differ in the degree of management uncertainty, then sector ACLs may be necessary so that appropriate AMs can be developed for each sector.*

Although the assessment of the Atlantic herring resource has remained stock wide in previous years it has been divided into two subcomponents; an offshore and an inshore sub-component. Management area TACs have been used to prevent overfishing on these sub-components. The provision rolls over the current management area TACs and allows the Council to further prevent overfishing on individual stock components through management measures such as AMs for sub-ACLs.

5.1.4 Administration: Atlantic Herring Fishery Specification Process

Amendment 4 to the Atlantic Herring FMP proposes to change the administrative steps for setting specifications by establishing ACLs and AMs within the process. It does not change the timing of the process and seeks to incorporate the ACL process into the specifications process. The specific changes are described in full in Section 3.1.1.4. By incorporating the new administrative steps into the specifications process, this measure specifically addresses the primary goal of Amendment 4 to the Atlantic Herring FMP, which is to ensure compliance with the new measures of the MSA.

This section was needed to clarify where the new terms being established within this amendment were to be included within the specifications process. Most of the locations within the process have been dictated by the NS 1 Guidelines. For instance, the NS 1 Guidelines state, in Section 600.310 (f)(3):

> *Specification of ABC. ABC may not exceed OFL. Councils should develop a process for receiving scientific information and advice used to establish ABC. This process should: Identify the body that will apply the ABC control rule (i.e. calculates the ABC), and identify the review process that will evaluate the resulting ABC. The SSC must recommend the ABC to the Council.*

As such, the Council established, within the Proposed Action, that the herring PDT would first develop a recommendation for the ABC within the SAFE report, which is already a part of the specifications process. The series of calculations used to create the ABC estimate would also be in the SAFE report, which would then go the SSC for consideration. The SSC would then make a final recommendation to the Council, as per the provisions stated above. The ACL process is very similar in structure. All the new administrative steps established in the Proposed Action

were developed by the Council in a similar manner to the example, to explain how the specifications process would function in the future in order to insure compliance with the MSA.

5.2 ACCOUNTABILITY MEASURES

5.2.1 ACL Overage Deduction

This measure addresses Objective 1 for Amendment 4 by implementing an AM consistent with the MSA. The purpose of the AM is to hold the fishery accountable for overages that are incurred in one year by removing the equal amount of overage from the total ACL or sub-ACL in a later year. The Council developed this measure to consequentially enact deductions in order to prevent the ACL from being exceeded and to provide a mechanism to correct any overages of the ACL.

5.2.2 Haddock Catch Cap

This measure also addresses Objective 1 for Amendment 4 by implementing an AM consistent with the MSA. A catch cap sub-ACL already exists within the groundfish fishery, as per Amendment 16. The Council developed this measure to establish an AM within the herring fishery for consistency between the FMPs. More details can be found in Section 3.2.2.2. This measure also serves to limit bycatch when the catch cap is reached, thereby meeting NS 9 and ensuring compliance with the MSA.

6.0 AFFECTED ENVIRONMENT

This section therefore provides updated stock and fishery information for the Atlantic herring resource and fishery and was utilized to support the recommendations made by the Council for Amendment 4.

The following description of the affected environment is incorporated by reference from the Atlantic Herring FMP (March 1999), the Final Environmental Impact Statement (FEIS) for Minimizing Impacts of the Atlantic Herring Fishery on Essential Fish Habitat (NMFS, January 2005), and the Final EIS for Amendment 1 to the Herring FMP (May 3, 2006). Relevant information is presented below in summary form and is updated through the 2008 and 2009 fishing years wherever possible. All of the above documents, as well as the Environmental Assessment for the Essential Fish Habitat (EFH) components of the Herring FMP (October 1998), should be referenced for more complete information about the environment affected by the Atlantic herring fishery.

6.1 BIOLOGICAL ENVIRONMENT

6.1.1 Atlantic Herring Resource

Life History: Atlantic herring occur from North Carolina to the Canadian Maritime provinces and from inshore to offshore waters to the edge of the continental shelf. They can also be found in every major estuary from the Chesapeake Bay to the Gulf of Maine. They are most abundant north of Cape Cod (Kelly and Moring 1986) with the largest and oldest fish found in the

southern most portion of the range (Munro 2002). Adult herring undertake extensive migrations to areas where they feed, spawn, and overwinter. Spawning occurs in the summer and fall, starting earlier along the eastern Maine coast and southwest Nova Scotia (August – September) than in the southwestern Gulf of Maine (early to mid-October in the Jeffreys Ledge area) and as late as November – December on Georges Bank (Reid et al.1999). In U.S. waters, Atlantic herring reach a maximum length of about 39 cm (15.6 inches) and an age of about 15-18 years (Anthony 1972).

Population Management and Status: The NEFMC manages herring under the Atlantic Herring FMP. The stock complex is not overfished at this time, and overfishing is not occurring. A complete description of the Atlantic herring resource can be found in Section 7.1 of the FSEIS for Amendment 1 to the Herring FMP. The following subsections update trawl survey data through 2008 if possible and summarize results of the recently-completed updated stock assessment (TRAC 2009) for Atlantic herring.

6.1.1.1 Updated Trawl Surveys

Research trawl surveys are conducted region-wide by the National Marine Fisheries Service (NMFS) and in inshore areas by the Massachusetts Division of Marine Fisheries (MA DMF) as well as the Maine Department of Marine Resources (ME DMR). Available sources of information have been updated through 2008 when possible and are presented in the subsections below.

6.1.1.1.1 NMFS Trawl Survey – All Strata

Table 6 summarizes data (mean weight per tow in kilograms and mean number per tow) from the NMFS spring and autumn bottom trawl surveys from 1990 – 2008. Table 7 summarizes data from the NMFS winter bottom trawl survey from 1992 – 2007 (the winter survey ended in 2007, so no additional information is available).

The NEFSC trawl survey samples the range of the Atlantic herring resource in the U.S. Exclusive Economic Zone (EEZ). The 2007 fall survey numbers were slightly lower, but not substantially different from those seen in 2005 and 2006. The 2007 spring survey numbers dropped from 2006 levels but also are similar to those in 2005. The 2008 spring survey numbers were slightly higher than 2007, and the 2008 autumn survey numbers were almost identical to those observed in 2007. Overall, no trend is apparent in any of the surveys in recent years, although the long-term trend over the survey time series has been upwards.

Table 6 NMFS Trawl Survey – Herring Catch Per Tow (Mean Number and Weight in kg), 1990-2008

YEAR	SPRING SURVEY		AUTUMN SURVEY	
	number/tow	kg/tow	number/tow	kg/tow
1990	8.98	0.92	13.98	1.64
1991	25.40	2.29	20.75	2.95
1992	39.30	2.76	56.61	9.25
1993	68.52	7.68	16.81	2.51
1994	35.40	3.88	13.71	2.15
1995	27.57	3.14	125.75	13.12
1996	58.58	3.81	37.65	4.64
1997	64.66	4.08	37.06	4.87
1998	50.62	4.73	20.63	2.84
1999	84.52	9.45	13.52	1.84
2000	32.02	2.80	20.65	3.18
2001	33.72	3.22	25.33	3.69
2002	40.92	2.63	77.99	10.74
2003	19.71	1.87	94.76	6.23
2004	48.00	2.22	40.70	5.04
2005	19.87	1.49	25.70	3.37
2006	27.72	2.89	28.16	3.48
2007	17.34	1.72	22.97	3.17
2008	19.18	2.02	22.83	3.07

Table 7 NMFS Winter Trawl Survey – Herring Catch Per Tow (Mean Number and Weight in kg), 1992-2007

YEAR	WINTER Number/Tow	WINTER KG/Tow
1992	35.42	3.19
1993	49.77	6.56
1994	4.39	0.51
1995	17.60	2.60
1996	112.25	6.86
1997	54.53	8.47
1998	57.29	6.05
1999	56.01	6.77
2000	66.20	3.54
2001	77.09	7.56
2002	74.66	9.45
2003	42.78	4.49
2004	34.26	2.16
2005	98.06	9.08
2006	50.87	4.80
2007	55.26	6.37

6.1.1.1.2 Trawl Survey Data – Inshore Only

A selected subset of NMFS and MA DMF trawl survey strata were chosen to represent trends in the inshore herring component during 1963-2004. NMFS strata 26-27,38-40 and Mass DMF strata 25-29 (Cape Cod Bay) and 31-36 (Mass. Bay North) were used during spring and autumn (Figure 1, Figure 2).

Figure 1 NMFS Trawl Survey Strata

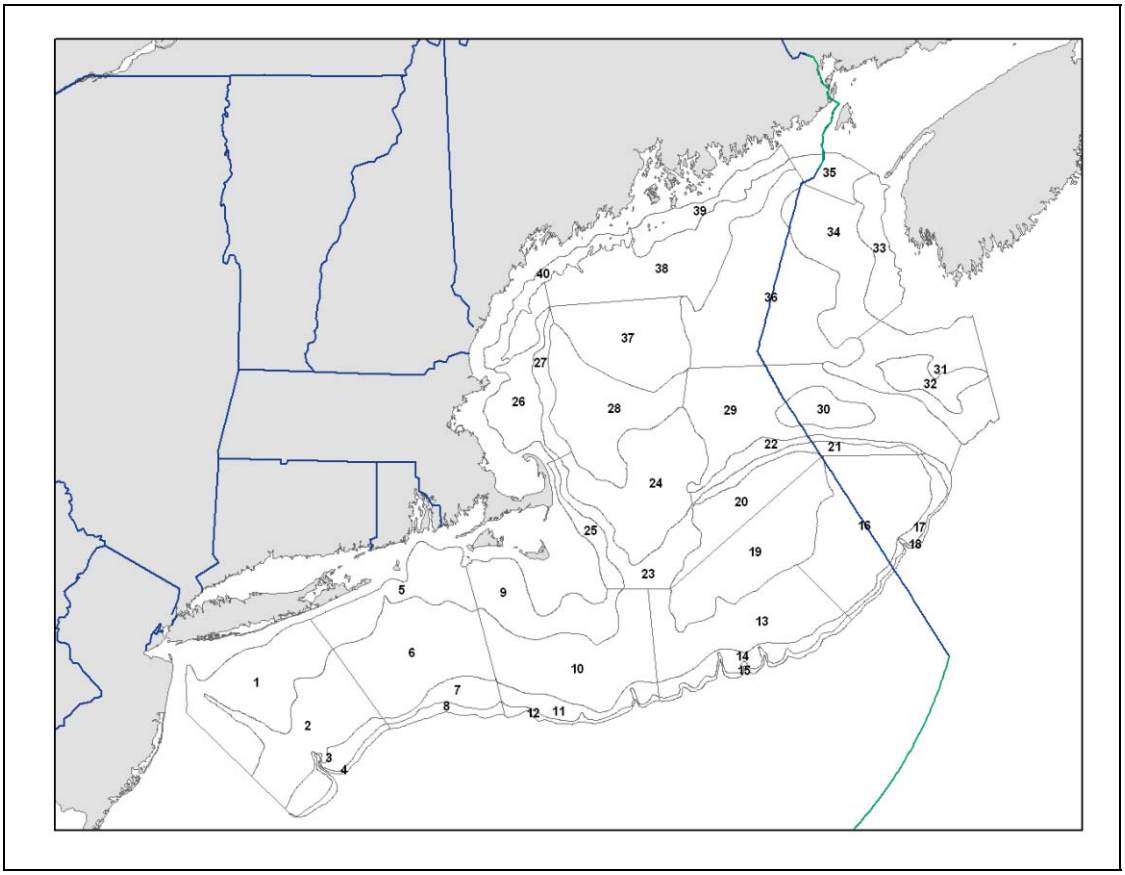
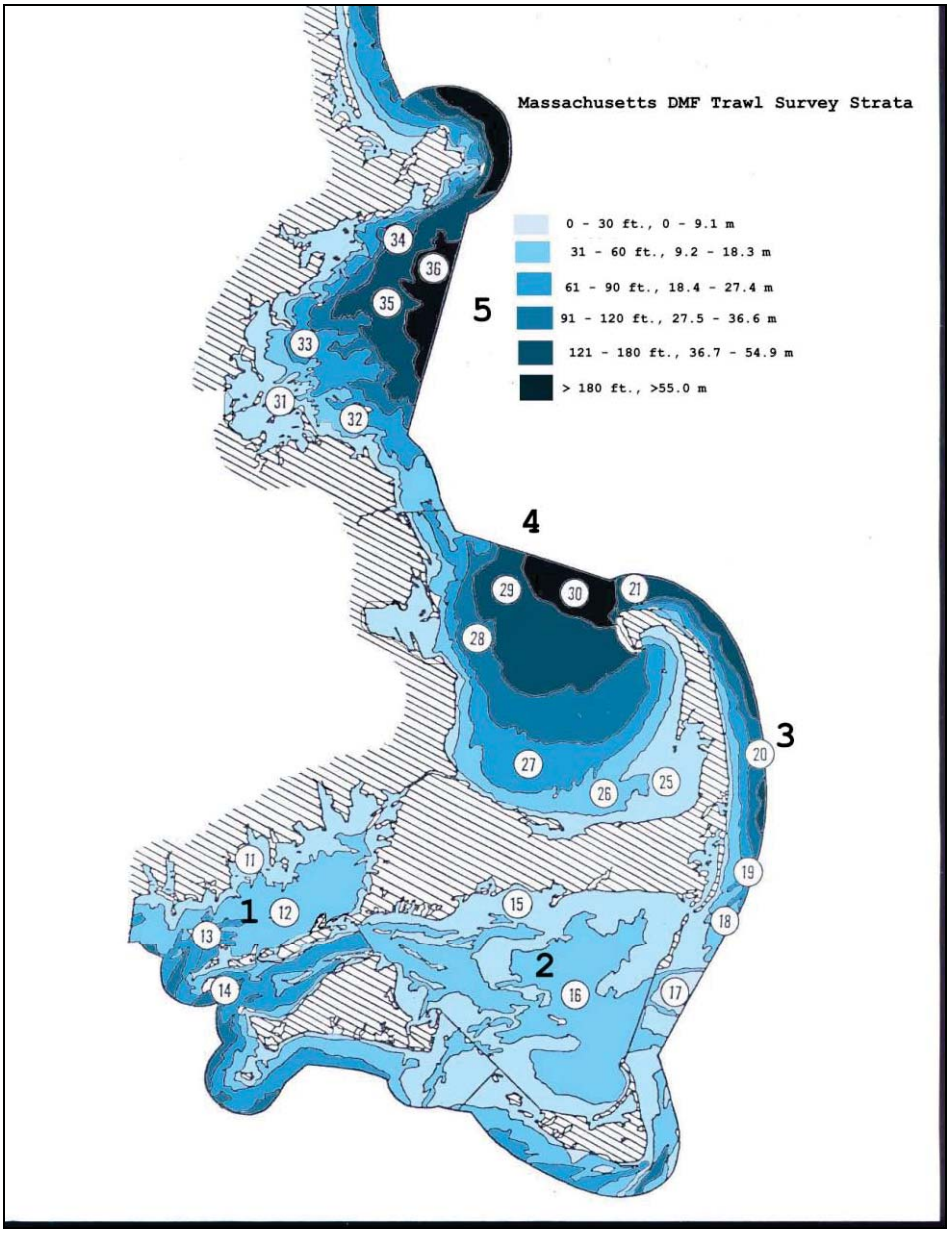


Figure 2 MA DMF Inshore Trawl Survey Strata



In addition, since Fall 2000, Maine DMR, in conjunction with the Gulf of Maine Research Institute and the State of New Hampshire, have been conducting an inshore bottom trawl survey. While this survey targets principal groundfish species from the NH/MA boarder to Canada, it has regularly sampled herring.

The data collected from these trawl surveys are utilized to evaluate trends in the abundance of Atlantic herring and are summarized in the following subsections.

6.1.1.1.3 NMFS Trawl Survey – Inshore Only

To examine trends in the inshore Gulf of Maine separately, NMFS survey strata 26, 27, and 38-40 were isolated because they include the majority of the area from this survey that represents the inshore Gulf of Maine. The NMFS fall survey and the spring survey were relatively flat, averaging very few fish per tow during the late 1960s through the early 1980s (Figure 3 – Figure 6). In the late 1980s, the indices increased significantly, and although variable, have remained relatively high.

The number of fish per tow from the survey in the inshore Gulf of Maine increased to a record high in the 2004 spring survey. A similar peak was observed in the fall survey in the previous year. Another relatively significant increase in numbers and weight per tow occurred during the fall of 2006, but this was not observed in the spring survey; the following 2007 spring survey increased slightly from very low levels, and 2008 levels are slightly lower than those observed in 2007. Throughout the more recent time series, the surveys in the inshore Gulf of Maine have been quite variable, and no trend is apparent. Overall, survey tows in the inshore GOM since 2004 are not as high in number or weight as those observed during the late 1990s and early 2000s. It should be noted that while the fall survey might be construed to represent mostly the Gulf of Maine spawning component, the same cannot be said for the Spring inshore survey.

Figure 3 Herring Catch/Tow (Number) Indices from the NMFS Autumn Bottom Trawl Survey Strata 26-27,38-40 (Inshore GOM Area), 1963-2008

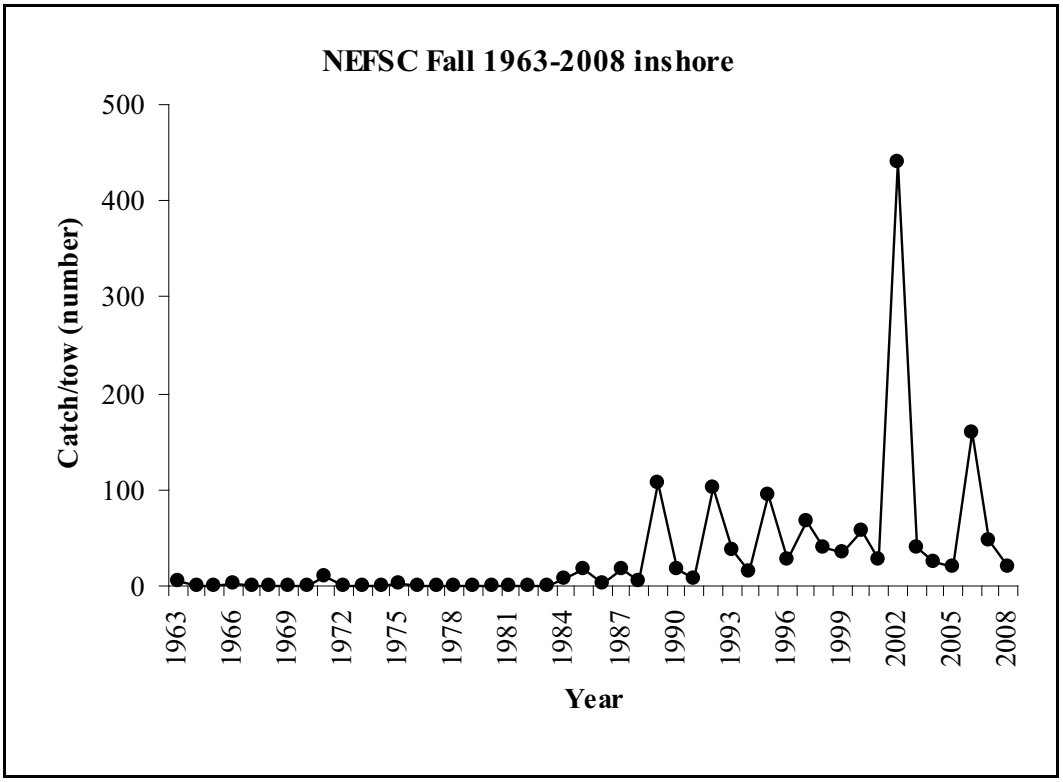


Figure 4 Herring Catch/Tow (Kilograms) Indices from the NMFS Autumn Bottom Trawl Survey Strata 26-27,38-40 (Inshore GOM Area), 1963-2008

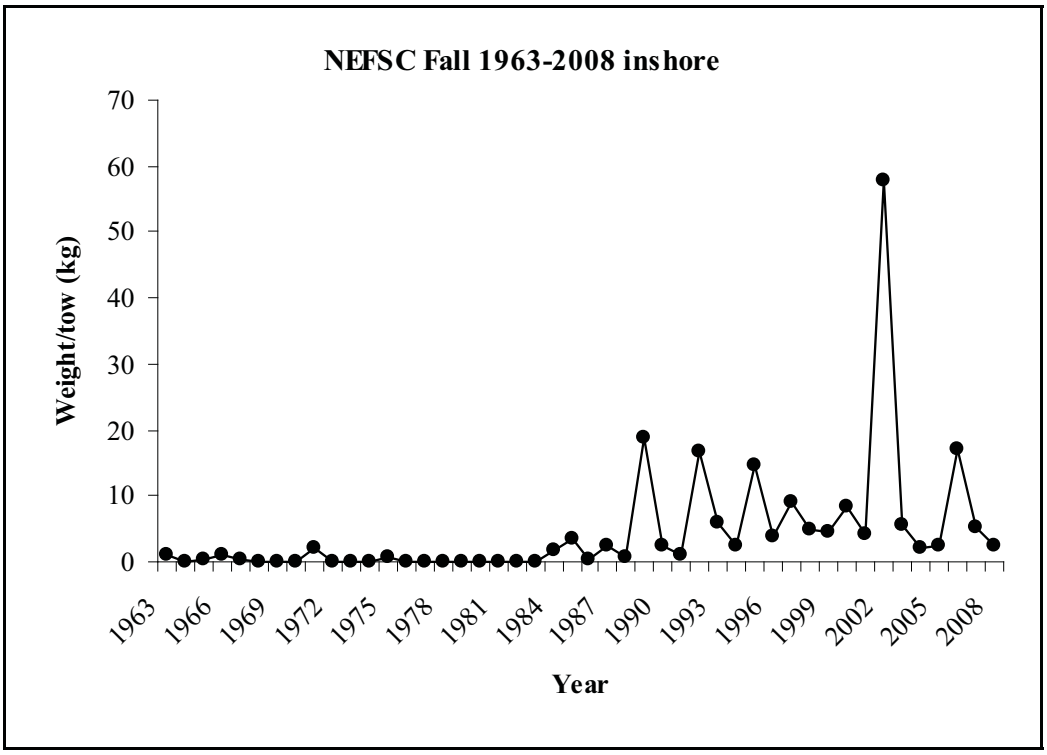


Figure 5 Herring Catch/Tow (Number) Indices from the NMFS Spring Bottom Trawl Survey Strata 26-27,38-40 (Inshore GOM Area), 1968-2008

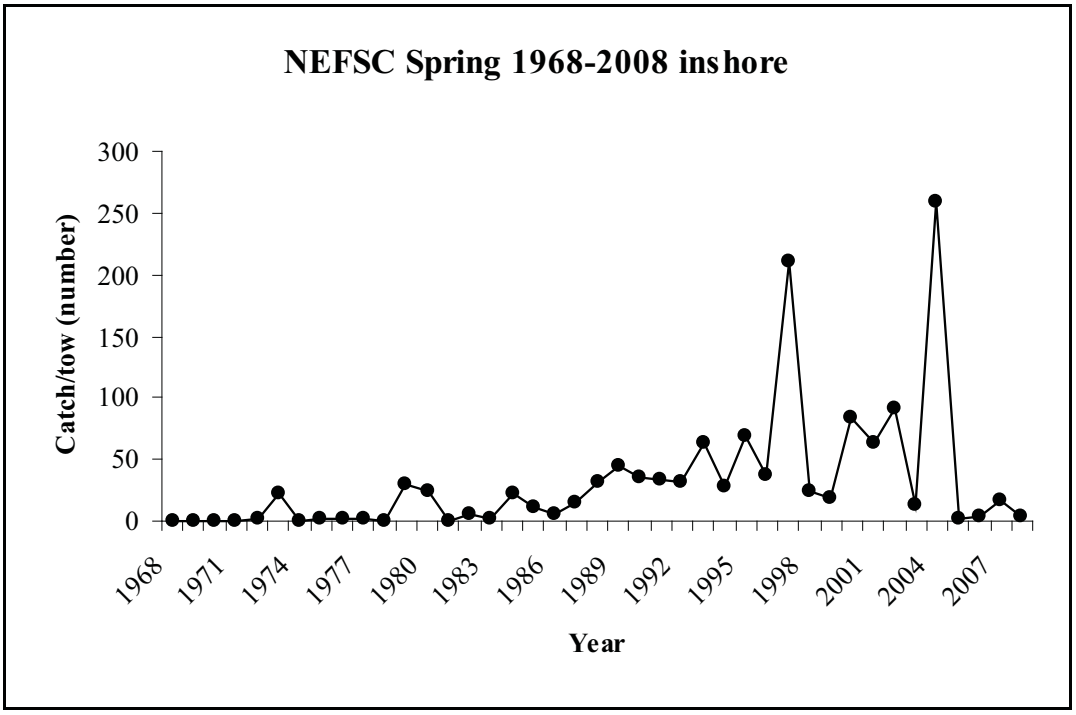
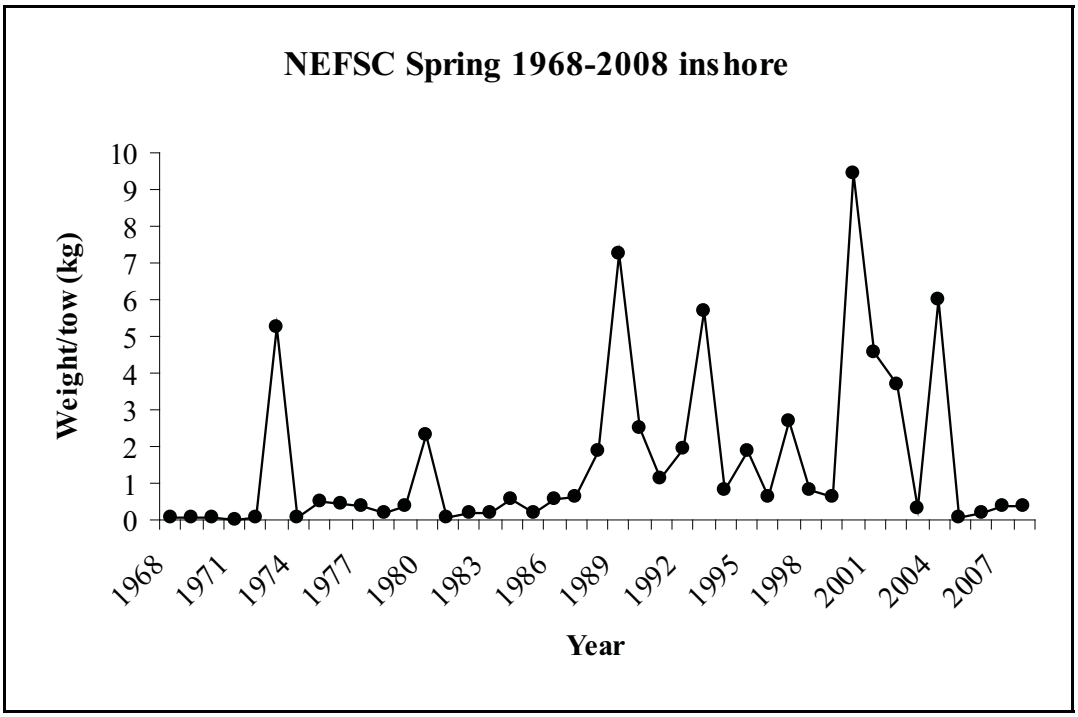


Figure 6 Herring Catch/Tow (Kilograms) Indices from the NMFS Spring Bottom Trawl Survey Strata 26-27,38-40 (Inshore GOM Area), 1968-2008



6.1.1.1.4 MA DMF Inshore Trawl Survey

The MA DMF research bottom trawl surveys (Strata 25-36) for spring and fall through 2008 were examined for trends in the inshore herring component. In general, the MA DMF inshore survey is dominated by young herring and does not track adult herring abundance. These indices, however, may be more useful as a measure of recruitment to the inshore component of the resource.

Both the fall and spring survey time series are highly variable, as may be expected for a pelagic species and both indices are dominated by young herring. Both survey indices have generally declined since 2005. The spring survey fluctuates without trend, although 2007 and 2006 were well below the 25th quantile (Figure 7) and the fall survey may (Figure 7, Figure 8). Note that the large increase in the fall 2003 index was heavily influenced by two very large tows in Region 4 (Cape Cod Bay). The relative abundance index was low in 2007 and 2008, with both years below the 25th quantile of the time series. The index ticked up to approximately the median in 2009.

Figure 7 MADMF Spring Survey Mean Number per tow for Strata 25-36

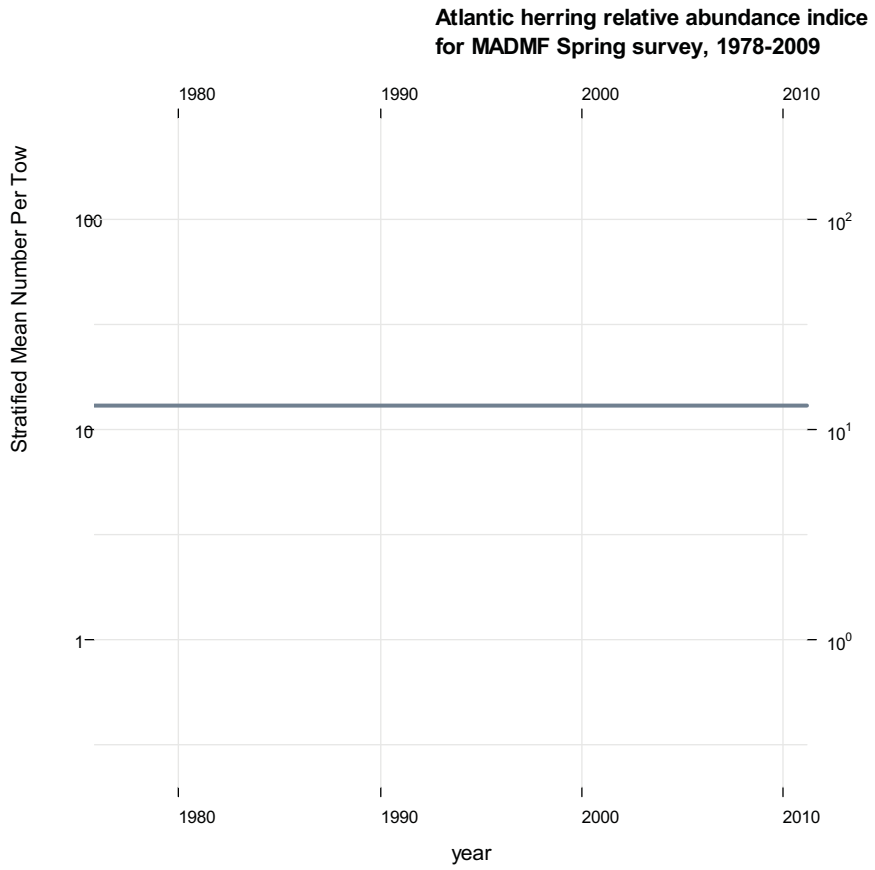


Figure 8 MA DMF Fall Survey Mean Number per tow for Strata 25-36

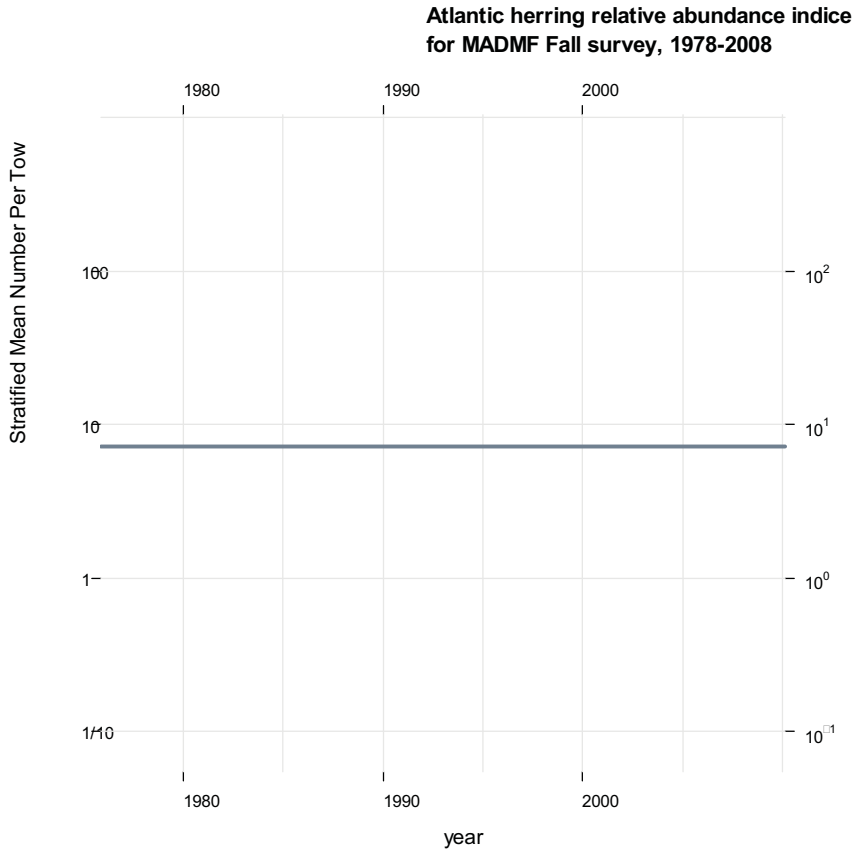


Figure 9 Number of MA DMF Spring (1978-2009) and Fall (1978-2008) Survey Tows that Encountered Herring, as a Proportion of Total Tows for strata 25-36

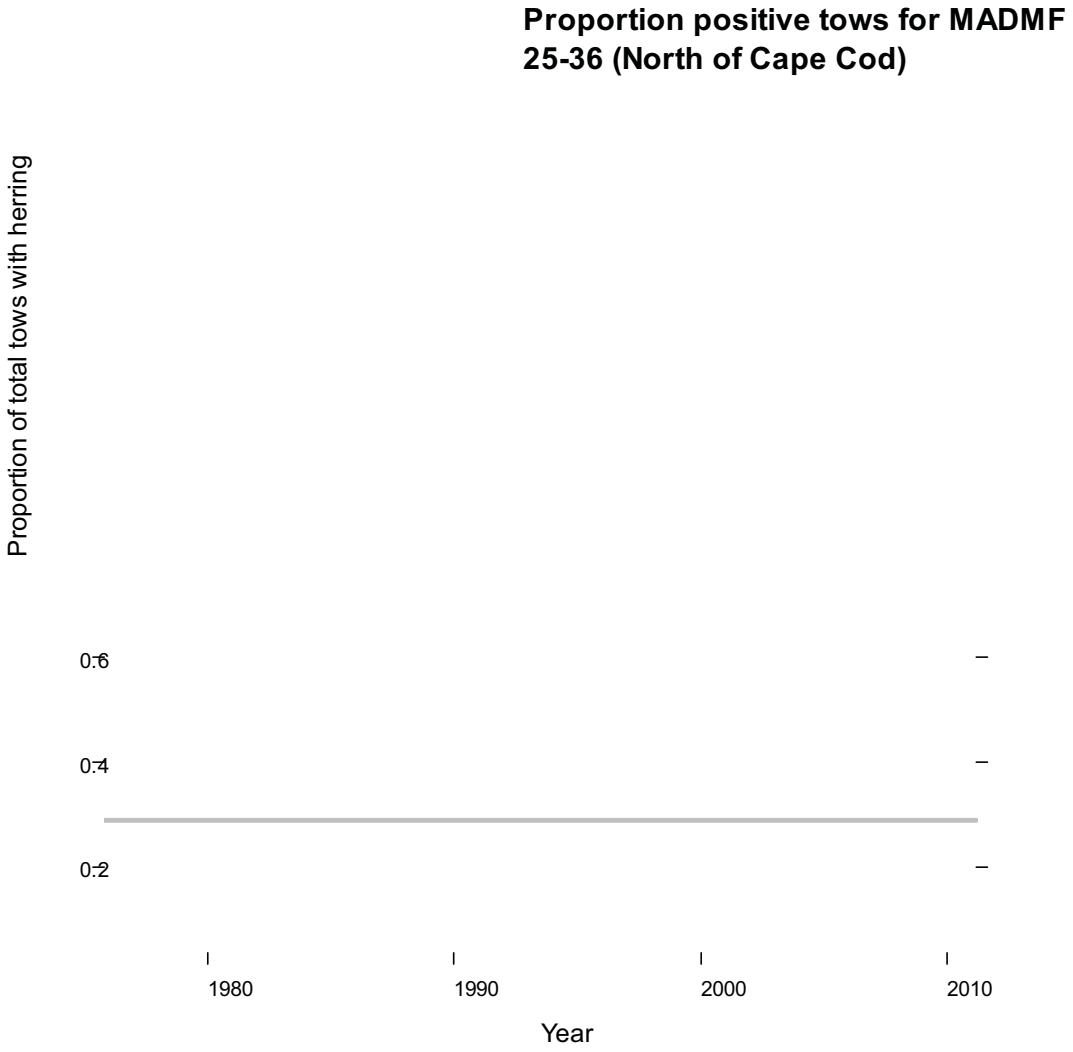


Figure 10 Stratified Mean Number per tow at Length for MA DMF Spring Survey, 1978-2009

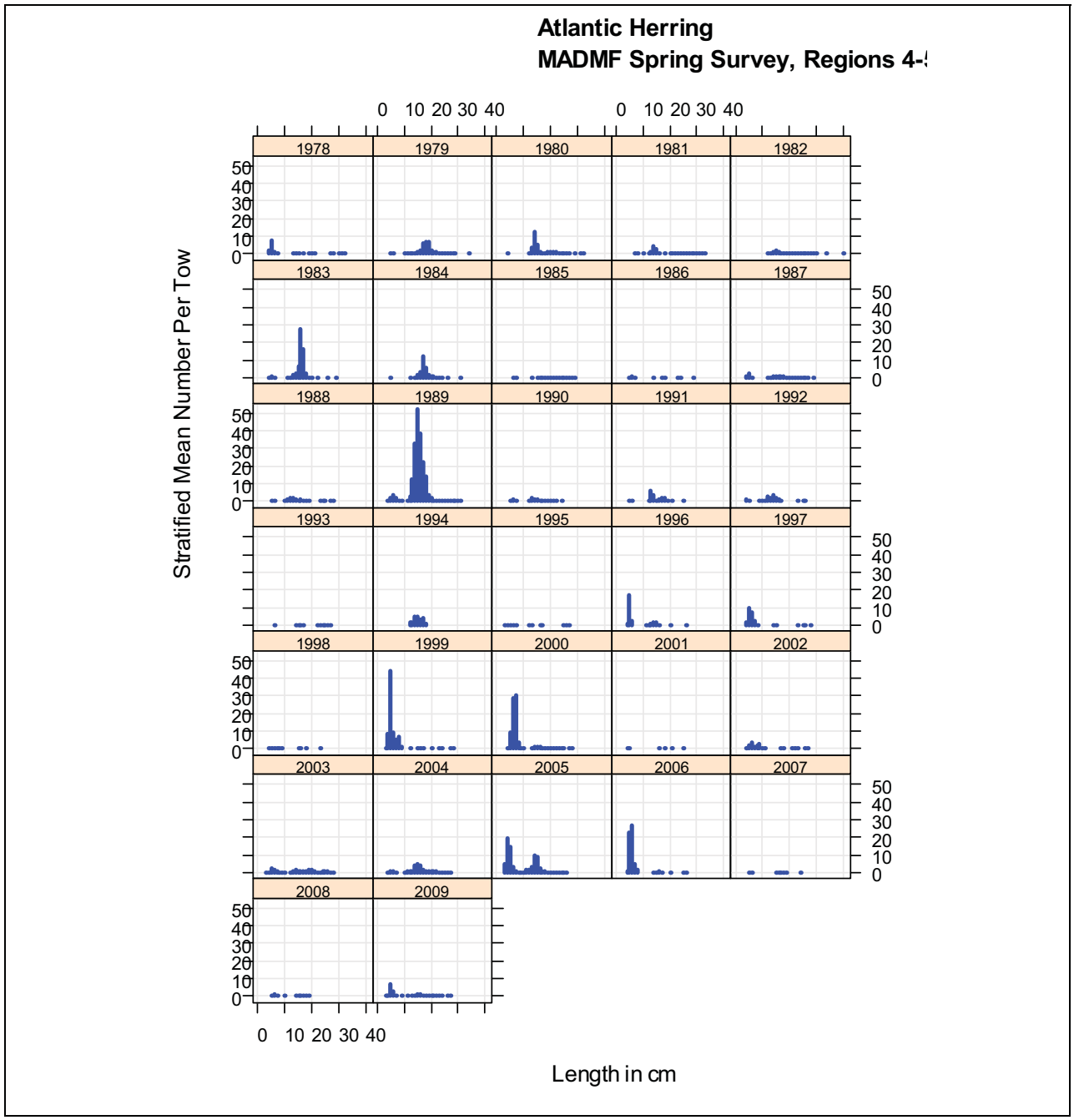


Figure 11 Proportion of Total Mean Number per tow at Length for MA DMF Spring Survey (strata 25-36) for 1978-2008

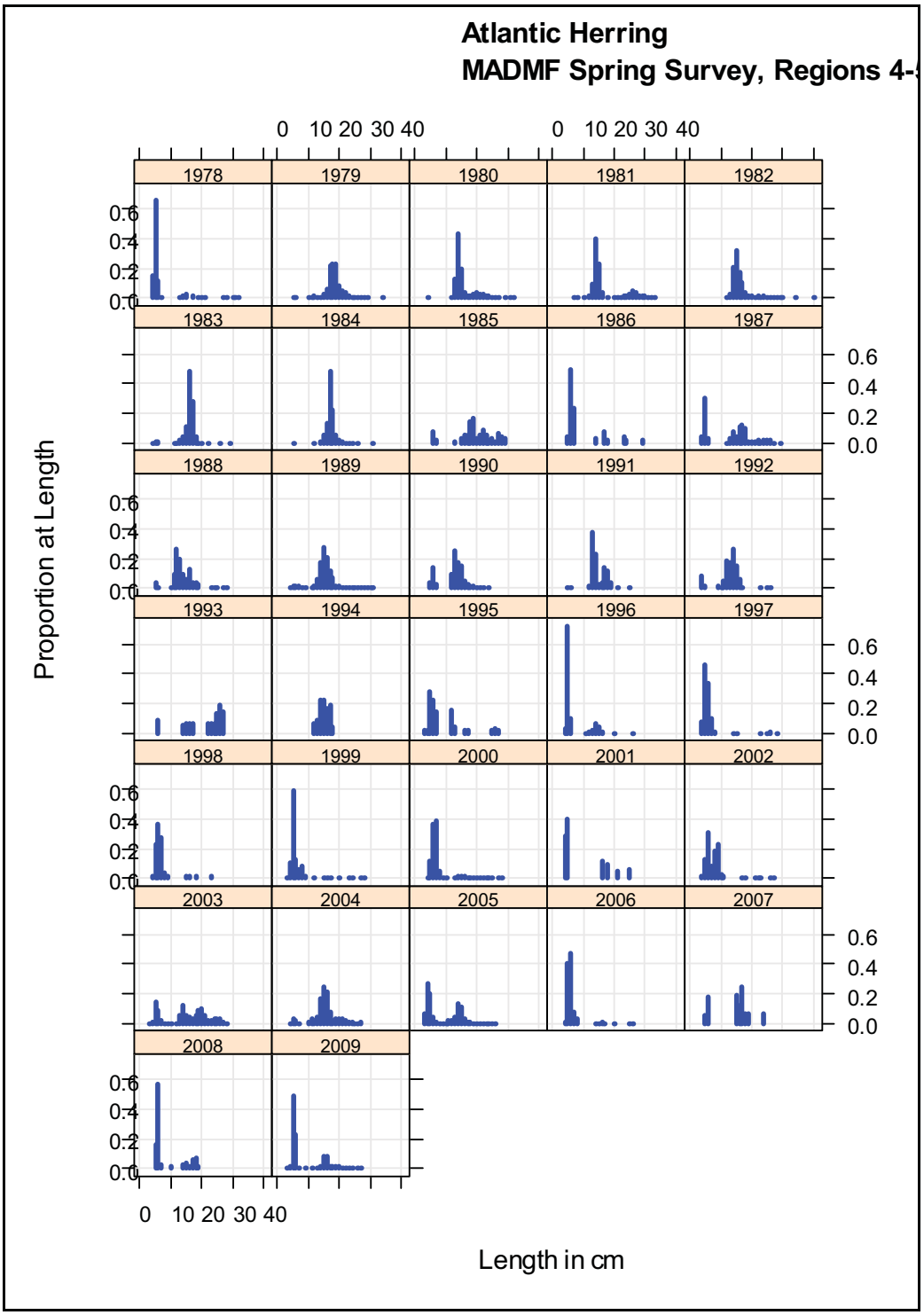


Figure 12 Stratified Mean Number per tow at Length for MA DMF Fall Survey, 1978-2008

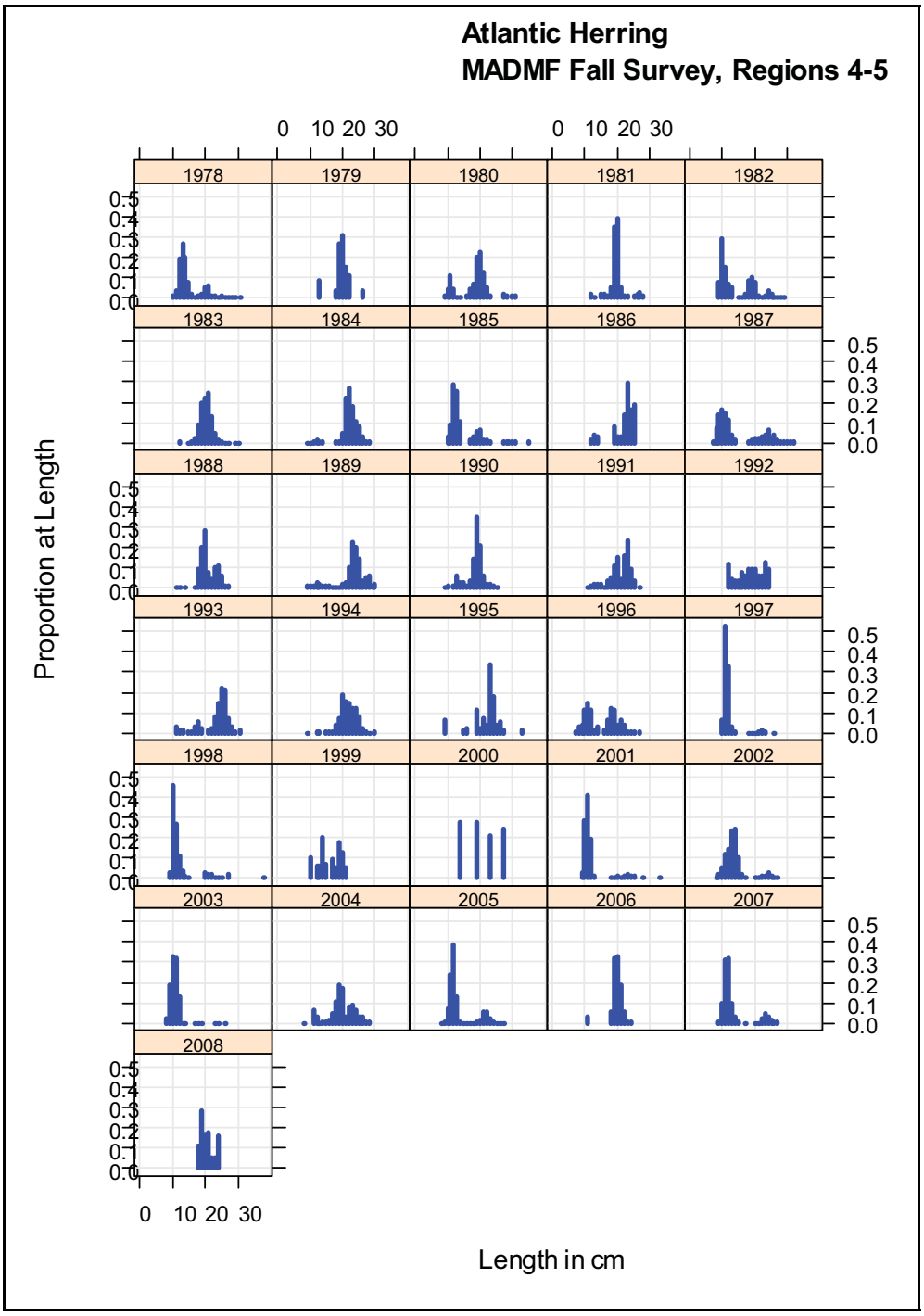
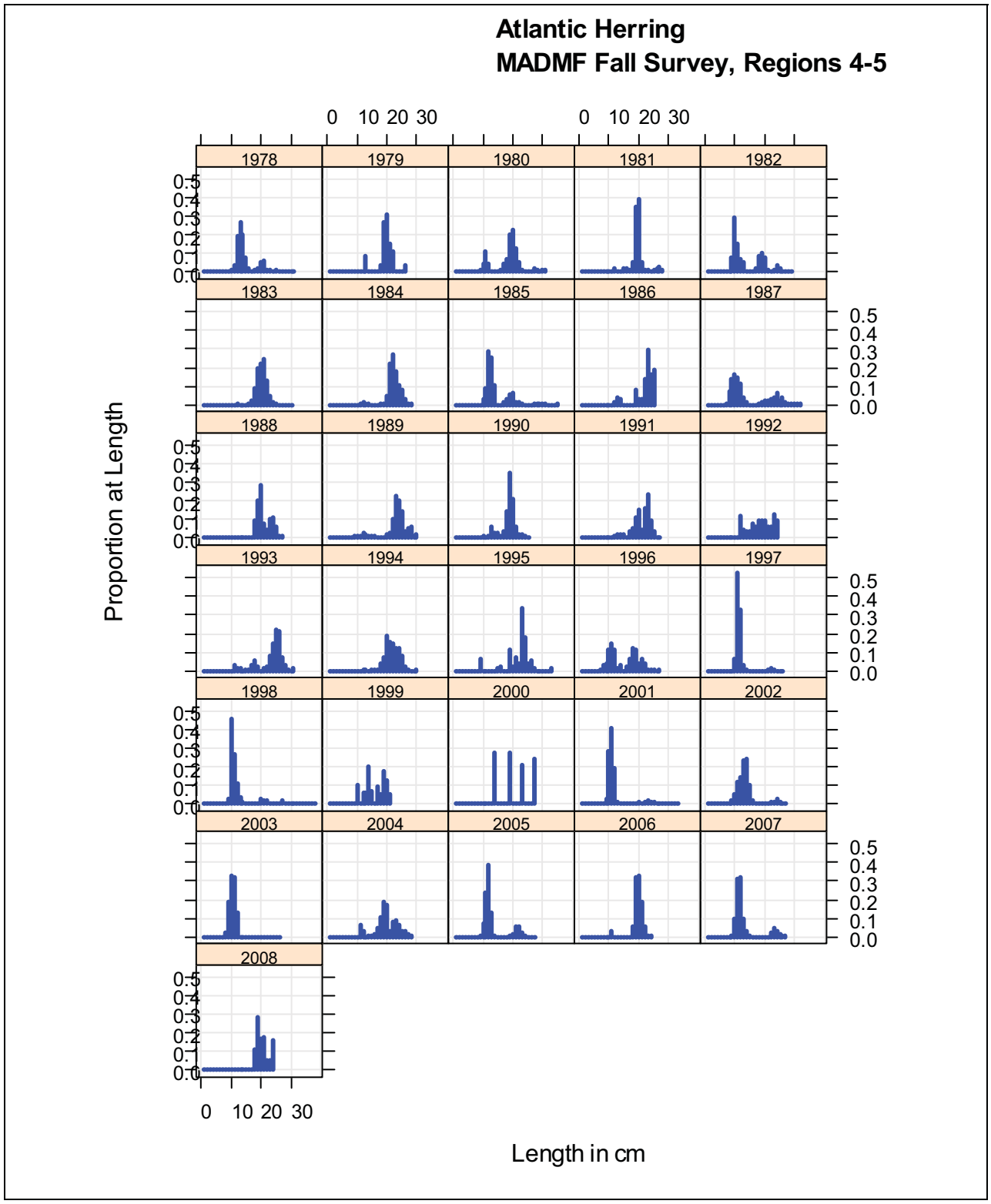


Figure 13 Proportion of Total Mean Number per tow at Length for MA DMF Autumn Survey (strata 25-36), 1978-2008



6.1.1.1.5 ME DMR Inshore Trawl Survey

Since Fall 2000, Maine DMR, in conjunction with the Gulf of Maine Research Institute and the State of New Hampshire, have been conducting an inshore bottom trawl survey. While this survey targets principal groundfish species from the NH/MA boarder to Canada, it regularly samples herring in many of its strata. Results from the fall and spring survey (Figure 14 and Figure 15) have been variable over the time series, and no trend is apparent.

This is a ME/NH coast-wide bottom trawl survey, the results of which should not be viewed as an index of spawning stock biomass (SSB) for the inshore component of the herring resource. In fact, most of the fish sampled by this survey are age 1 fish. Similar to the MA DMF survey, this bottom trawl survey may provide an indication of pre-recruitment year class strength.

Figure 14 ME DMR Fall Inshore Bottom Trawl Survey Catch (# Fish) Per Tow

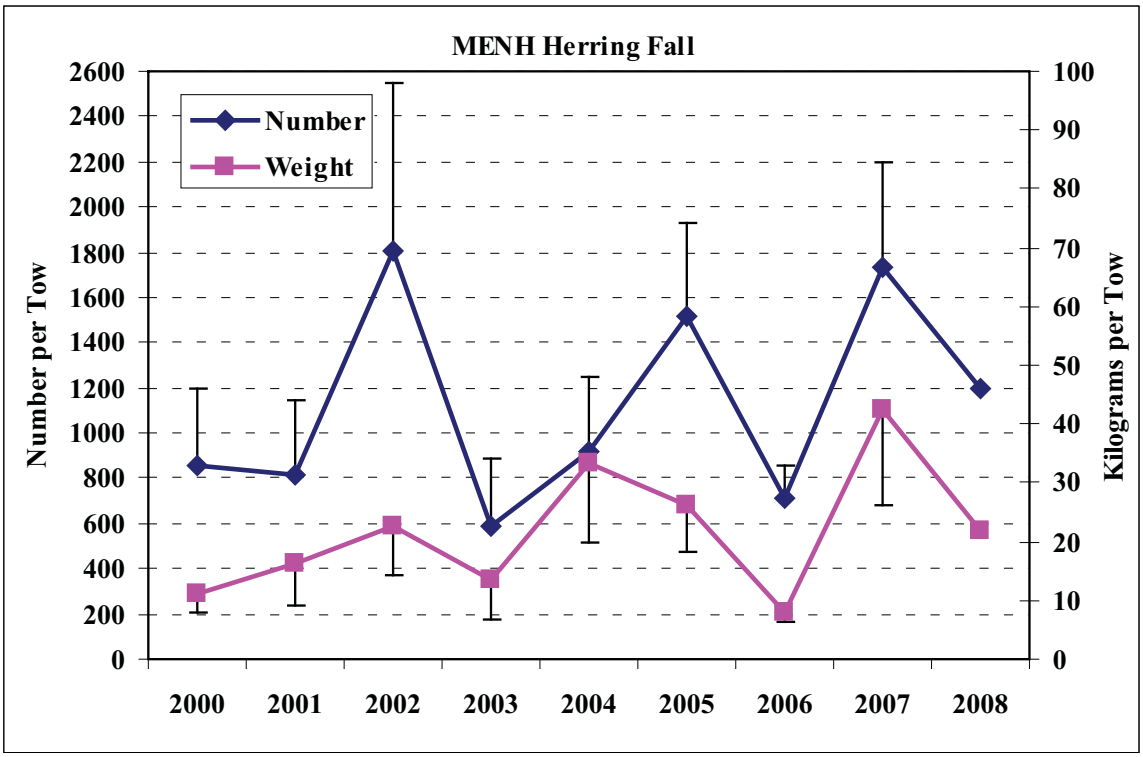
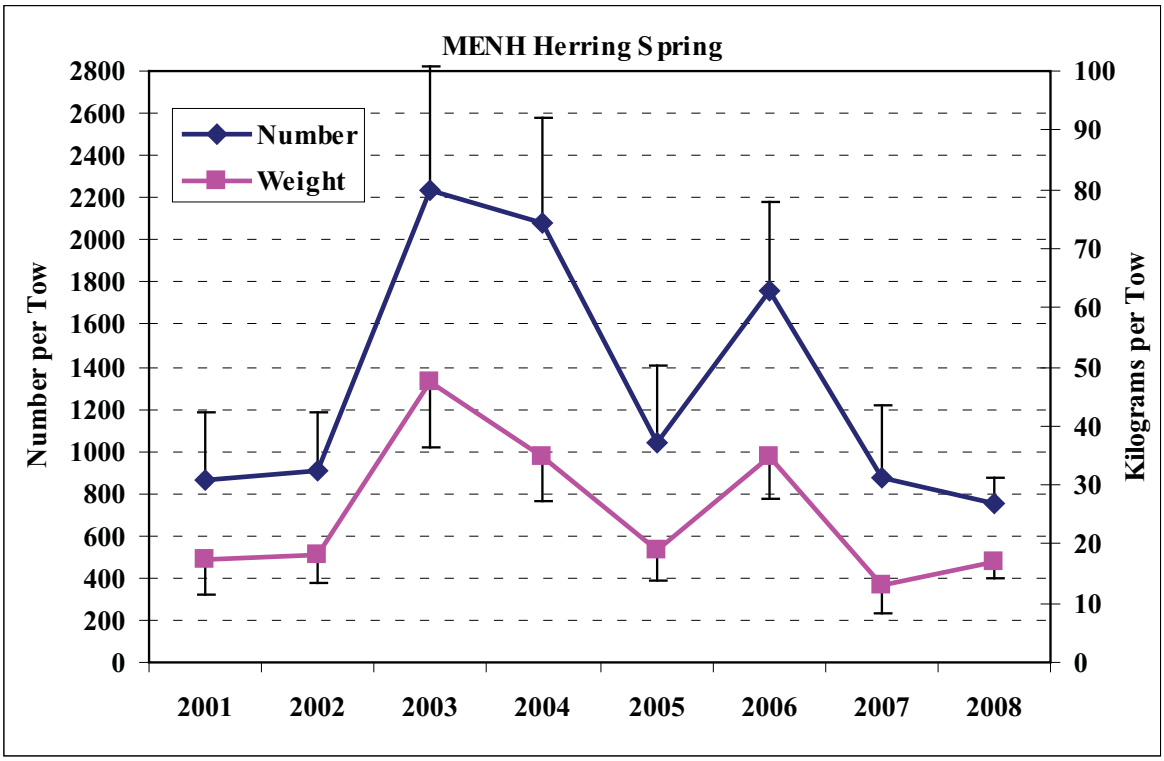


Figure 15 ME DMR Spring Inshore Bottom Trawl Survey Catch (# Fish) Per Tow



6.1.1.2 TRAC Stock Assessment – Summary of Stock Status

Since 1998, the Transboundary Resources Assessment Committee (TRAC) has reviewed stock assessments and projections necessary to support management activities for shared resources across the USA Canada boundary in the Gulf of Maine-Georges Bank region. These assessments are necessary to advise decision makers on the status of these resources and likely consequences of policy choices. The most recent TRAC benchmark assessment of the Atlantic herring complex occurred in June 2009 in St. Andrew's New Brunswick. This assessment served as an update; Atlantic herring for the Gulf of Maine/Georges Bank area were last assessed in a benchmark assessment in May 2006 (O'Boyle and Overholtz 2006). At the 2006 assessment meeting, it was agreed that the Age Structured Assessment Program (ASAP) Base model showed the least retrospective pattern and was the preferred approach amongst all the model formulations. The purpose of the 2009 update assessment meeting was to update both independent and dependent data, and use it in the established benchmark formulation to determine the current status of the Atlantic herring resource. The updated assessment model also prompted revision of the biological reference points to reflect the new results.

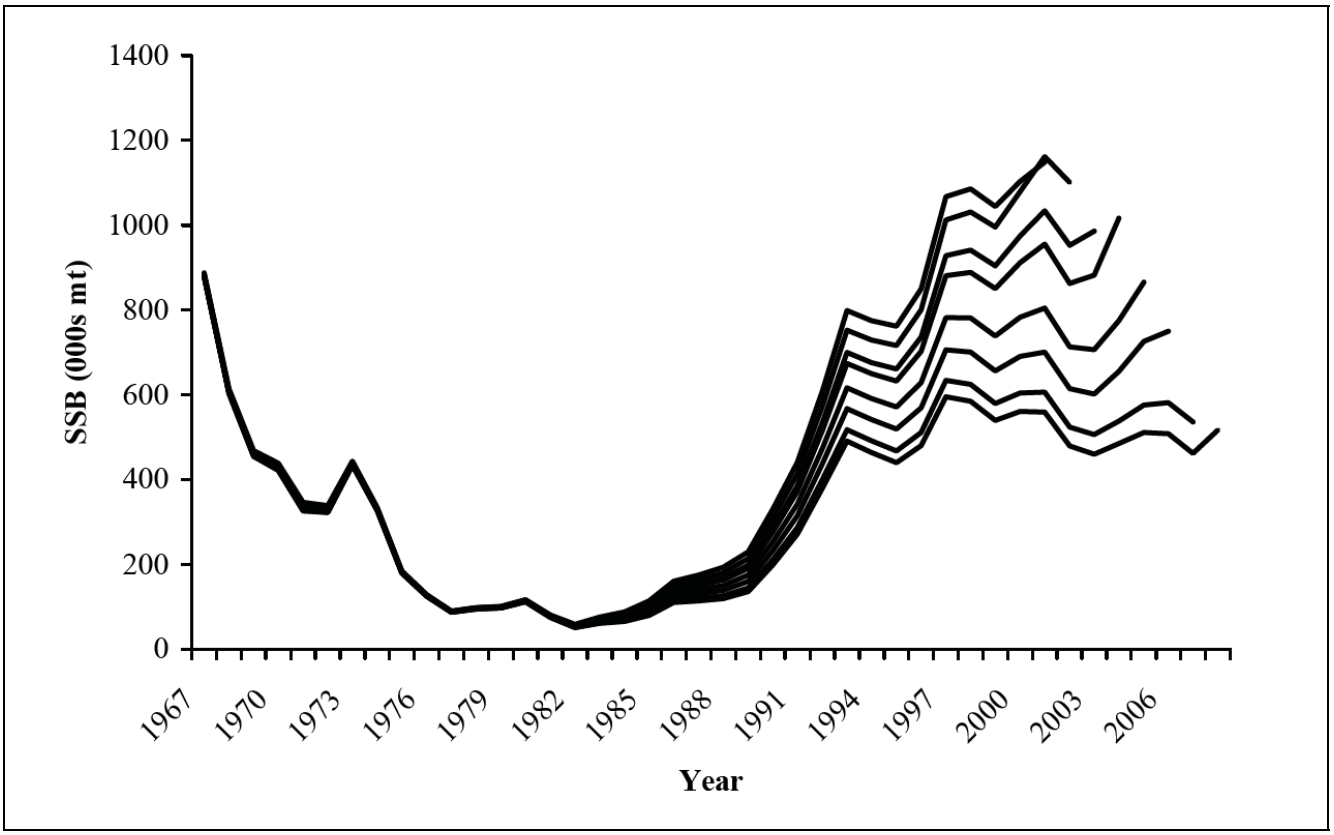
The TRAC update assessment results estimate that Atlantic herring biomass was 651,700 mt at the beginning of 2008, which is slightly below B_{MSY} (670,600 mt). Estimated fishing mortality in 2008 was 0.14, which is below F_{MSY} (0.27). The stock complex is not overfished at this time, and overfishing is not occurring.

The following information summarizes the results of the 2009 TRAC Assessment and the current status of the Atlantic herring complex:

- Combined Canada and USA herring landings increased from 106,000 mt in 2005 to 116,000 mt in 2006, then declined to 90,000 mt in 2008.
- Stock biomass (2+, January 1) increased steadily from about 111,600 mt in 1982 to almost 830,000 mt in 1997, fluctuated without trend since then, and was estimated to be 652,000 mt at the beginning of 2008. This is below B_{MSY} (670,600 mt).
- Recruitment at Age 2 from the 2004 and 2006 year classes appear weaker than the long-term (1967-2005) average of 2.3 billion fish. The 2005 year class abundance estimate is above average abundance at 3.3 billion fish.
- Fishing mortality (Age 2+) declined to 0.14 in 1993 and has remained stable at about 0.16 from 2002 onwards. Estimated fishing mortality in 2008 was 0.14. This is below F_{MSY} (0.27).
- The Atlantic herring 2006 TRAC recommended that a strategy be adopted to maintain a low to neutral risk of exceeding the fishing mortality limit reference point, and that when stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding. A Fox surplus production model estimated F_{MSY} = 0.27, MSY = 178,374 mt, and B_{MSY} = 670,600 mt.

Retrospective analyses were used to detect any patterns to overestimate - or underestimate – fishing mortality, biomass and recruitment relative to the terminal year estimates. A significant retrospective pattern was detected in this assessment in overestimating SSB relative to the current estimate (averaging + 42%/year, and ranging between 14-56%) and this is a concern (Figure 16). The pattern has persisted for several years and is expected to continue in the future.

Figure 16 Retrospective Pattern Associated with SSB in TRAC 2009 Atlantic Herring Update Assessment



TRAC Assessment - Outlook

An outlook is provided from the TRAC Assessment in terms of the consequences on SSB and for yield in 2009, 2010, and 2011 of maintaining the current (2008) fishing mortality rate (F=0.14, see Table 8 below). Although uncertainty in stock size and recruitment generates uncertainty in forecast results, a formal risk analysis was not undertaken due to the significant retrospective pattern in SSB and the difficulty and uncertainty in selecting the final model formulation. Nevertheless, the forecasts are considered useful for general management guidance.

The projections assumed that recruitment of the 2009-2011 year classes was equal to the recent 10-year average (2.0 billion fish at Age 2). A fishing mortality of F=0.14 in 2009 generates a landings of 82,403 mt and an SSB in 2009 of 460,343 mt, a decline of about 11%. Continuing to fish at F=0.14 in both 2010 and 2011 produces annual landings of 81,154 mt and 82,625 mt, respectively, and results in a slight decline in SSB in 2011 to 444,532 mt.

Table 8 2009 TRAC Assessment – General Outlook for 2009-2011 at Current F (0.14)

	2+ Biomass	SSB	Landings	F
2009	694.3	460.3	82.4	0.14
2010	683.8	440.0	81.2	0.14
2011	692.2	444.5	82.6	0.14

The TRAC Assessment results formed the basis of advice from the Council's SSC regarding scientific uncertainty and the specification of ABC.

6.1.1.3 Herring Overfishing Definition – Stock Status

The 2009 TRAC update assessment results estimate that Atlantic herring biomass was 651,700 mt at the beginning of 2008, which is below B_{MSY} (670,600 mt). Estimated fishing mortality in 2008 was 0.14, which is below F_{MSY} (0.27).

The Atlantic herring stock complex is above ½ B_{MSY} and fishing mortality is below F_{MSY}, so the stock is not overfished and overfishing is not occurring. The current overfishing definition (Atlantic Herring FMP, 1999) for Atlantic herring is provided 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 ½ 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 $1/2B_{MSY}$, 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 $F_{Threshold}$.*

6.1.1.4 The Important Role of Atlantic Herring in the Northeast Region Ecosystem

Setting ABC and dividing it into ACLs for the herring fishery management areas should acknowledge the role that Atlantic herring plays in the Northwest Atlantic ecosystem and address the importance of herring as a forage species for many fish stocks, marine mammals, and seabirds throughout the region to the extent possible. One of the objectives of this amendment (Section 2.1) is:

In the context of Objectives 1 – 3, to consider the health of the herring resource and the important role of herring as a forage fish and a predator fish throughout its range.

The ACL and AM provisions established in this amendment, therefore, should account for the importance of herring as a forage species and the role of herring in the Northwest Atlantic ecosystem.

NMFS Guidelines for National Standard 1 suggest that when specifying OY and determining the greatest benefit to the Nation, one of the values that should be weighed and given serious attention is the need to maintain adequate forage for all components of the ecosystem. The ecological factors that may be incorporated into decisions regarding the specification of OY include impacts on ecosystem component species, forage fish stocks, other fisheries, predator-prey or competitive interactions, marine mammals, threatened or endangered species, and birds. Species interactions that have not been explicitly taken into account when estimating MSY (through a stock assessment) should be considered as relevant factors for setting OY below MSY. In addition, consideration should be given to managing forage stocks for higher biomass than B_{MSY} to enhance and protect the marine ecosystem.

All of the above considerations will be considered by the Herring PDT and the Council when specifying OY and determining the appropriate level of catch for the fishery as part of the 2010-2012 specifications process. Stock assessment work should also incorporate new information about the role of herring in the ecosystem and the impact of predation on total herring mortality +incorporated into the last stock assessment and reviewed by the Herring PDT as part of the last specifications process (see below).

Current Assumptions Regarding Natural Mortality

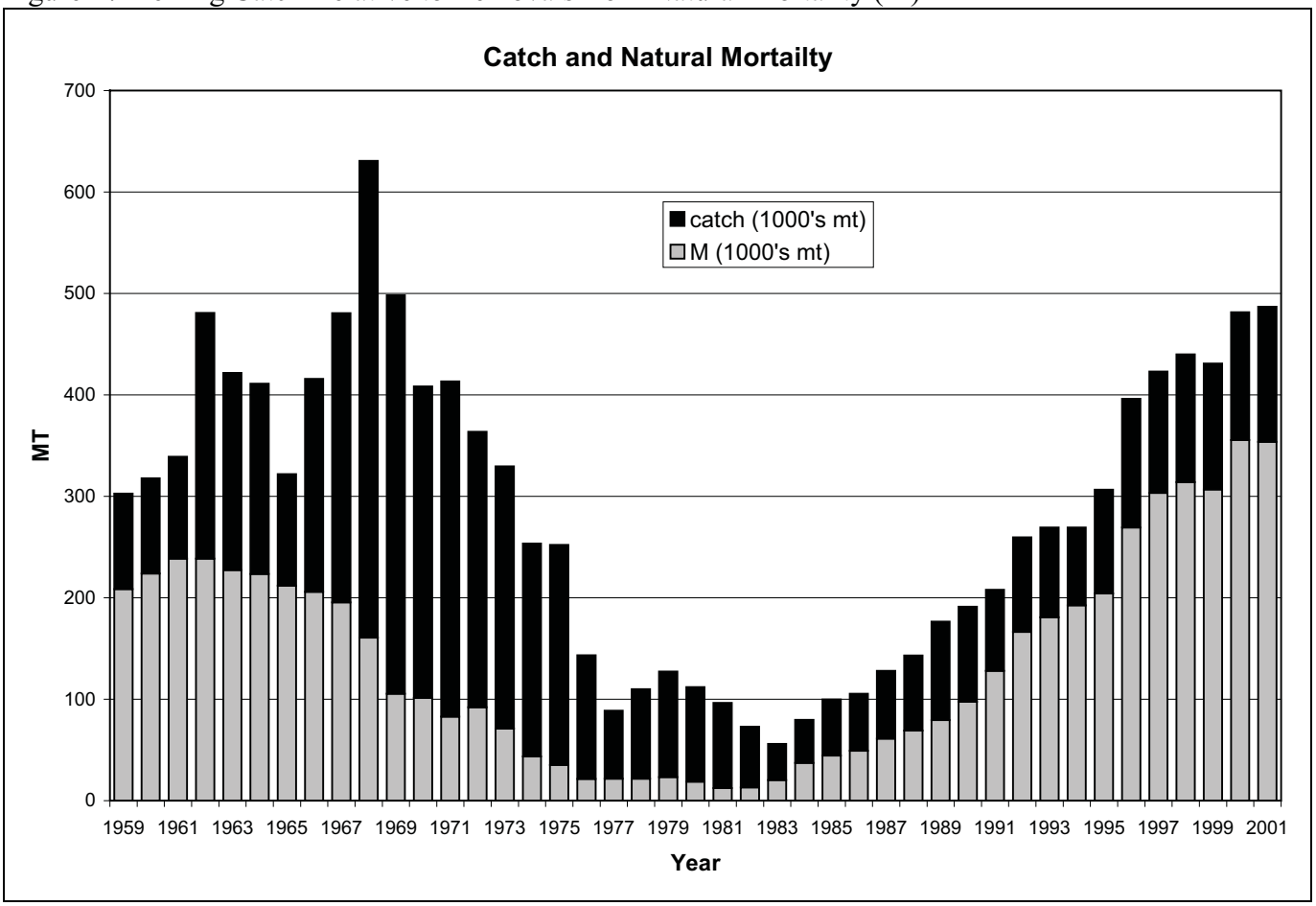
Both stock assessment models (FPM and ADAPT VPA) that were reviewed at the last TRAC meeting (2006) for the Atlantic herring complex assume a natural mortality rate (M) of 0.2. This value is based on life-history characteristics and is fixed at this value across age classes and years. Much of the natural morality incurred by Atlantic herring is attributable to predator consumption of herring. In addition to the stock assessment, the management program has been implicitly addressed the importance of herring as a forage species through establishing a precautionary proxy for MSY and a buffer between MSY and OY. Most of the natural mortality (~350,000 mt year $^{-1}$) experienced by this forage species is probably due to predator removals.

Examination of removals due to M, as calculated by the FPM, can be seen in the graph of M removals and landings. While removals due to fishing and natural mortality have been roughly equal over the time series, current removals due to M are 3-3.5 times higher then removals by fishing.

The Herring PDT has concluded that the importance of herring as a forage species has been implicitly addressed through establishing a precautionary proxy for MSY (proposed in this amendment) and a buffer between MSY and OY, which is determined through the annual specification process. Even before setting these precautionary reference points, the amount of forage associated with natural mortality (M = 0.2, assumes 350,000 mt of forage) is believed to be within the range of what is consumed by predators on an annual basis (Figure 17). Additional

information is needed to evaluate this conclusion in a more quantitative model over the long-term.

Figure 17 Herring Catch Relative to Removals from Natural Mortality (M)



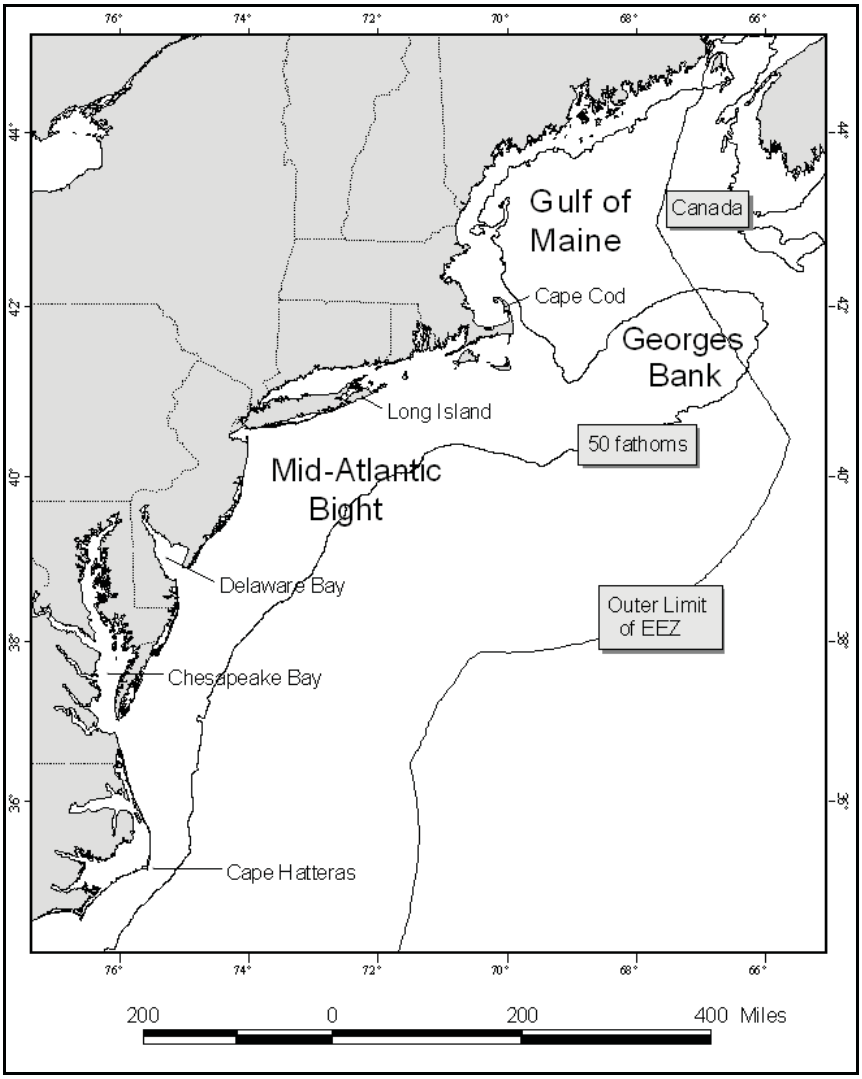
Consistent with the objectives of this amendment, additional consideration should be given to the role that herring plays in the ecosystem as a predator and a competitor, not just as a forage species (prey). Some recent studies have suggested predation by herring on zooplankton and larvae *could* affect recruitment and rebuilding of some important stocks in the Region, Atlantic cod, for example. Competition for prey could also be having an indirect effect on marine mammals like right whales, which depend on plentiful supplies of zooplankton like *calanus* during certain life stages (calves) and times of the year. The survival ratio of calanus appears to be inversely related to pelagic fish biomass, while the calving success of right whales appears to be positively related to adult calanus abundance. However, competition and predation by herring are difficult factors to quantify. Competition is especially difficult to characterize, as there are many other larval predators that are more abundant than herring by orders of magnitude. Nevertheless, these kinds of ecosystem considerations should also be addressed to the extent possible when specifying ABC, addressing scientific uncertainty, and specifying ACLs for the Atlantic herring fishery.

6.1.2 Habitat and EFH

6.1.2.1 Physical and Biological Environment

The Northeast U.S. Shelf Ecosystem includes the area from the Gulf of Maine south to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream to a depth of 2,000 m (Figure 18**,** Sherman et al. 1996). Four distinct sub-regions are identified: the Gulf of Maine, Georges Bank, the Mid-Atlantic Bight, and the continental slope. The physical and biological features of these regions are described below. Much of this information was extracted from Stevenson et al. (2004), and the reader is referred to this document and sources referenced therein for additional information. These sources included, among others: Abernathy 1989; Backus 1987; Beardsley et al. 1996; Brooks 1996; Cook 1988; Mountain 1994; Reid and Steimle 1988; Schmitz et al. 1987; Sherman et al. 1996; Stumpf and Biggs 1988; Townsend 1992; and Wiebe et al. 1987.

Figure 18 Northeast U.S Shelf Ecosystem



6.1.2.1.1 Gulf of Maine

The Gulf of Maine is an enclosed, glacially-derived, coastal sea, bounded on the east by Browns Bank, on the north by the Nova Scotian (Scotian) Shelf, on the west by the New England states, and on the south by Cape Cod and Georges Bank. The Gulf of Maine is characterized by a system of deep basins, moraines and rocky protrusions with limited access to the open ocean. This geomorphology influences complex oceanographic processes that result in a rich biological community.

Geology

The Gulf of Maine is topographically unlike any other part of the continental border along the U.S. Atlantic coast. The Gulf of Maine's geologic features, when coupled with the vertical variation in water properties, result in a great diversity of habitat types. It contains twenty-one distinct basins separated by ridges, banks, and swells. The three largest basins are Wilkinson, Georges, and Jordan. Depths in the basins exceed 250 m, with a maximum depth of 350 m in Georges Basin, just north of Georges Bank. The Northeast Channel between Georges Bank and Browns Bank leads into Georges Basin, and is one of the primary avenues for exchange of water between the Gulf of Maine and the North Atlantic Ocean.

High points within the Gulf include irregular ridges, such as Cashes Ledge, which peaks at 9 m below the surface, as well as lower flat-topped banks and gentle swells. Some of these rises are remnants of the sedimentary shelf that was left after most of it was removed by the glaciers. Others are glacial moraines and a few, like Cashes Ledge, are outcroppings of bedrock. Very fine sediment particles created and eroded by the glaciers have collected in thick deposits over much of the Gulf of Maine, particularly in its deep basins. These mud deposits blanket and obscure the irregularities of the underlying bedrock, forming topographically smooth terrains. Some shallower basins are covered with mud as well, including some in coastal waters. In the rises between the basins, other materials are usually at the surface. Unsorted glacial till covers some morainal areas, as on Sewell Ridge to the north of Georges Basin and on Truxton Swell to the south of Jordan Basin. Sand predominates on some high areas and gravel, sometimes with boulders, predominates on others.

Coastal sediments exhibit a high degree of small-scale variability. Bedrock is the predominant substrate along the western edge of the Gulf of Maine, north of Cape Cod in a narrow band out to a depth of about 60 m. Rocky areas become less common with increasing depth, but some rock outcrops poke through the mud covering the deeper sea floor. Mud is the second most common substrate on the inner continental shelf. Mud predominates in coastal valleys and basins that often abruptly border rocky substrates. Many of these basins extend without interruption into deeper water. Gravel, often mixed with shell, is common adjacent to bedrock outcrops and in fractures in the rock. Large expanses of gravel are not common, but do occur near reworked glacial moraines and in areas where the seabed has been scoured by bottom currents. Gravel is most abundant at depths of 20-40 m, except in eastern Maine where a gravel-covered plain exists to depths of at least 100 m. Bottom currents are stronger in eastern Maine where the mean tidal range exceeds 5 m. Sandy areas are relatively rare along the inner shelf of the western Gulf of Maine, but are more common south of Casco Bay, especially offshore of sandy beaches.

Physical Oceanography

An intense seasonal cycle of winter cooling and turnover, springtime freshwater runoff, and summer warming influences oceanographic and biologic processes in the GOM. The Gulf has a general counterclockwise non-tidal surface current that flows around its coastal margin. It is primarily driven by fresh, cold Scotian Shelf water that enters over the Scotian Shelf and through the Northeast Channel, and freshwater river runoff, which is particularly important in the spring. Dense, relatively warm, and saline slope water entering through the bottom of the Northeast Channel from the continental slope also influences gyre formation. Counterclockwise gyres generally form in Jordan, Wilkinson, and Georges Basins and the Northeast Channel as well. These surface gyres are more pronounced in spring and summer; with winter, they weaken, and are more wind-influenced.

Stratification of surface waters during spring and summer seals off a mid-depth layer of water that preserves winter salinity and temperatures. This cold layer of water is called Maine Intermediate Water, and is located between more saline Maine Bottom Water and the warmer, stratified Maine Surface Water. The stratified surface layer is most pronounced in the deep portions of the western Gulf of Maine. Tidal mixing of shallow areas prevents thermal stratification and results in thermal fronts between the stratified areas and cooler mixed areas. Typically, mixed areas include Georges Bank, the southwest Scotian Shelf, eastern Maine coastal waters, and the narrow coastal band surrounding the remainder of the Gulf.

The Northeast Channel provides an exit for cold Maine Intermediate Water and outgoing surface water while it allows warmer more saline slope water to move in along the bottom and spill into the deeper basins. The influx of water occurs in pulses, and appears to be seasonal, with lower flow in late winter and a maximum in early summer. Gulf of Maine circulation and water properties can vary significantly from year to year. Notable episodic events include shelf-slope interactions such as the entrainment of shelf water by Gulf Stream rings, and strong winds that can create currents as high as 1.1 $m \cdot s^{-1}$ over Georges Bank. Warm core Gulf Stream rings can also influence upwelling and nutrient exchange on the Scotian shelf, and affect the water masses entering the Gulf of Maine. Annual and seasonal inflow variations also affect water circulation.

Internal waves are episodic and can greatly affect the biological properties of certain habitats. Internal waves can shift water layers vertically, so that habitats normally surrounded by cold MIW are temporarily bathed in warm, organic rich surface water. On Cashes Ledge, it is thought that deeper nutrient rich water is driven into the photic zone, providing for increased productivity. Localized areas of upwelling interaction occur in numerous places throughout the Gulf.

Biological Oceanography

Based on 303 benthic grab samples collected in the Gulf of Maine during 1956-1965, Theroux and Wigley (1998) reported that, in terms of numbers, the most common groups of benthic invertebrates in the GOM were annelid worms (35%), bivalve mollusks (33%), and amphipod crustaceans (14%). Biomass was dominated by bivalves (24%), sea cucumbers (22%), sand dollars (18%), annelids (12%), and sea anemones (9%). Watling (1988) considered predominant taxa, substrate types, and seawater properties when separating benthic invertebrate samples into seven bottom assemblages (Table 9).

Table 9 Gulf of Maine Benthic Assemblages as Identified by Watling (1988)

Assemblage	Community Description
1	Comprises all sandy offshore banks, most prominently Jeffreys Ledge, Fippennies Ledge, and Platts Bank; depth on top of banks about 70 m; substrate usually coarse sand with some gravel; fauna characteristically sand dwellers with an abundant interstitial component.
2	Comprises the rocky offshore ledges, such as Cashes Ledge, Sigsbee Ridge and Three Dory Ridge; substrate either rock ridge outcrop or very large boulders, often with a covering of very fine sediment; fauna predominantly sponges, tunicates, bryozoans, hydroids, and other hard bottom dwellers; overlying water usually cold Gulf of Maine Intermediate Water.
3	Probably extends all along the coast of the Gulf of Maine in water depths less than 60 m; bottom waters warm in summer and cold in winter; fauna rich and diverse, primarily polychaetes and crustaceans, probably consists of several (sub-) assemblages due to heterogeneity of substrate and water conditions near shore and at mouths of bays.
4	Extends over the soft bottom at depths of 60 - 140 m, well within the cold Gulf of Maine Intermediate Water; bottom sediments primarily fine muds; fauna dominated by polychaetes, shrimp, and cerianthid anemones.
5	A mixed assemblage comprising elements from the cold water fauna as well as a few deeper water species with broader temperature tolerances; overlying water often a mixture of Intermediate Water and Bottom Water, but generally colder than 7°C most of the year; fauna sparse, diversity low, dominated by a few polychaetes, with brittle stars, sea pens, shrimp, and cerianthids also present.
6	Comprises the fauna of the deep basins; bottom sediments generally very fine muds, but may have a gravel component in the offshore morainal regions; overlying water usually 7 - 8°C, with little variation; fauna shows some bathyal affinities but densities are not high, dominated by brittle stars and sea pens, and sporadically by a tube-making amphipod.
7	The true upper slope fauna that extends into the Northeast Channel; water temperatures are always above 8°C and salinities are at least 35 ppt; sediments may be either fine muds or a mixture of mud and gravel.

Various studies have classified demersal fish assemblages for the Gulf of Maine and Georges Bank, including Gabriel (1992), Mahon et al. (1998), and Overholtz and Tyler (1985). Gabriel (1992) found that the most persistent feature over time in assemblage structure from Nova Scotia to Cape Hatteras was the boundary separating assemblages between the GOM and Georges Bank, which occurred at approximately the 100 m isobath on northern Georges Bank. The Overholtz and Tyler (1985) classification is given below (Table 10).

Table 10 Demersal Fish Assemblages of Georges Bank and the Gulf of Maine

Assemblage	Species
Slope and Canyon	offshore hake, blackbelly rosefish, Gulf stream flounder, fourspot flounder, goosefish, silver hake, white hake, red hake
Intermediate	silver hake, red hake, goosefish, Atlantic cod, haddock, ocean pout, yellowtail flounder, winter skate, little skate, sea raven, longhorn sculpin
Shallow	Atlantic cod, haddock, pollock, silver hake, white hake, red hake, goosefish, ocean pout, yellowtail flounder, windowpane, winter flounder, winter skate, little skate, longhorn sculpin, summer flounder, sea raven, sand lance
Gulf of Maine-Deep	white hake, American plaice, witch flounder, thorny skate, silver hake, Atlantic cod, haddock, cusk, Atlantic wolffish
Northeast Peak	Atlantic cod, haddock, Pollock, ocean pout, winter flounder, white hake, thorny skate, longhorn sculpin

6.1.2.1.2 Georges Bank

Georges Bank is a shallow (3 - 150 m depth), elongate (161 km wide by 322 km long) extension of the continental shelf that was formed by the Wisconsinian glacial episode. It is characterized by a steep slope on its northern edge and a broad, flat, gently sloping southern flank. The Great South Channel lies to the west.

Geology and Physical Oceanography

Glacial retreat during the late Pleistocene deposited the bottom sediments currently observed on the eastern section of Georges Bank, and the sediments have been continuously reworked and redistributed by the action of rising sea level, and by tidal, storm and other currents. It is anticipated that erosion and reworking of sediments will reduce the amount of sand available to the sand sheets, and cause an overall coarsening of the bottom sediments (Valentine et al. 1993).

Bottom topography on eastern Georges Bank is characterized by linear ridges in the western shoal areas; a relatively smooth, gently dipping sea floor on the deeper, easternmost part; a highly energetic peak in the north with sand ridges up to 30 m high and extensive gravel pavement; and steeper and smoother topography incised by submarine canyons on the southeastern margin. The central region of the Bank is shallow, and the bottom is characterized by shoals and troughs, with sand dunes superimposed upon them. The two most prominent elevations on the ridge and trough area are Cultivator and Georges Shoals. This shoal and trough area is a region of strong currents, with average flood and ebb tidal currents greater than 4 km/h, and as high as 7 km/h. The dunes migrate at variable rates, and the ridges may move.

The Great South Channel separates the main part of Georges Bank from Nantucket Shoals. Nantucket Shoals is similar in nature to the central region of the Bank. Currents are strongest where water depth is shallower than 50 m. Tidal and storm currents range from moderate to strong, depending upon location and storm activity. Sediments in this region include gravel pavement and mounds, some scattered boulders, sand with storm-generated ripples, and scattered shell and mussel beds.

Oceanographic frontal systems separate water masses of the GOM and Georges Bank from oceanic waters south of the Bank. These water masses differ in temperature, salinity, nutrient

concentration, and planktonic communities, which influence productivity and may influence fish abundance and distribution. Currents on Georges Bank include a weak, persistent clockwise gyre around the Bank, a strong semidiurnal tidal flow predominantly northwest and southeast, and very strong, intermittent storm induced currents, which all can occur simultaneously. Tidal currents over the shallow top of Georges Bank can be very strong, and keep the waters over the Bank well mixed vertically. This results in a tidal front that separates the cool waters of the well-mixed shallows of the central Bank from the warmer, seasonally stratified shelf waters on the seaward and shoreward sides of the Bank. The clockwise gyre is instrumental in distribution of plankton, including fish eggs and larvae.

Biological Oceanography

The strong, erosive currents affect the character of the biological community. Amphipod crustaceans (49%) and annelid worms (28%) numerically dominated the contents of 211 samples collected on Georges Bank during 1956-1965 (Theroux and Wigley 1998). Biomass was dominated by sand dollars (50%) and bivalves (33%). Theroux and Grosslein (1987) utilized the same database to identify four macrobenthic invertebrate assemblages. They noted that the boundaries between assemblages were not well defined because there is considerable intergrading between adjacent assemblages. These assemblages are associated with sedimentary provinces as defined by Valentine and Lough (1991) and Valentine (1993) (Table 11).

The Western Basin assemblage is found in the upper Great South Channel region at the northwestern corner of the Bank, in comparatively deepwater (150 - 200 m) with relatively slow currents and fine bottom sediments of silt, clay and muddy sand. Fauna are comprised mainly of small burrowing detritivores and deposit feeders, and carnivorous scavengers. Valentine and Lough (1991) did not identify a comparable assemblage; however, this assemblage is geographically located adjacent to Assemblage 5 as described by Watling (1998) (Table 9). The Northeast Peak assemblage is found along the Northern Edge and Northeast Peak, which varies in depth and current strength and includes coarse sediments, consisting mainly of gravel and coarse sand with interspersed boulders, cobbles, and pebbles. Fauna tend to be sessile (coelenterates, brachiopods, barnacles, and tubiferous annelids) or free-living (brittle stars, crustaceans, and polychaetes), with a characteristic absence of burrowing forms. The Central Georges Bank assemblage occupies the greatest area, including the central and northern portions of the Bank in depths less than 100 m. Medium-grained shifting sands predominate in this dynamic area of strong currents. Organisms tend to be small to moderately large with burrowing or motile habits. The Southern Georges Bank assemblage is found on the southern and southwestern flanks at depths from 80 - 200 m, where fine-grained sands and moderate currents predominate. Many southern species exist here at the northern limits of their range.

Along with high levels of primary productivity, Georges Bank has been historically characterized by high levels of fish production. Several studies have attempted to identify demersal fish assemblages over large spatial scales. Overholtz and Tyler (1985) found five depth related groundfish assemblages for Georges Bank and the GOM that were persistent temporally and spatially. Depth and salinity were identified as major physical influences explaining assemblage structure. Gabriel (1992) identified six assemblages, which are compared with the results of Overholtz and Tyler (1985) in Table 11. Mahon et al. (1998) found similar results.

Table 11 Sedimentary Provinces and Associated Benthic Landscapes of Georges Bank

Sedimentary Province	Depth (m)	Description	Benthic Assemblage
Northern Edge / Northeast Peak (1)	40 - 200	Dominated by gravel with portions of sand, common boulder areas, and tightly packed pebbles. Representative epifauna (bryozoa, hydrozoa, anemones, and calcareous worm tubes) are abundant in areas of boulders. Strong tidal and storm currents.	Northeast Peak
Northern Slope and Northeast Channel (2)	200 - 240	Variable sediment type (gravel, gravel-sand, and sand) scattered bedforms. This is a transition zone between the northern edge and southern slope. Strong tidal and storm currents.	Northeast Peak
North /Central Shelf (3)	60 - 120	Highly variable sediment type (ranging from gravel to sand) with rippled sand, large bedforms, and patchy gravel lag deposits. Minimal epifauna on gravel due to sand movement. Representative epifauna in sand areas includes amphipods, sand dollars, and burrowing anemones.	Central Georges
Central and Southwestern Shelf - shoal ridges (4)	10 - 80	Dominated by sand (fine and medium grain) with large sand ridges, dunes, waves, and ripples. Small bedforms in southern part. Minimal epifauna on gravel due to sand movement. Representative epifauna in sand areas includes amphipods, sand dollars, and burrowing anemones.	Central Georges
Central and Southwestern Shelf - shoal troughs (5)	40 - 60	Gravel (including gravel lag) and gravel-sand between large sand ridges. Patchy large bedforms. Strong currents. (Few samples – submersible observation noted presence of gravel lag, rippled gravel-sand, and large bedforms.) Minimal epifauna on gravel due to sand movement. Representative epifauna in sand areas includes amphipods, sand dollars, and burrowing anemones.	Central Georges
Southeastern Shelf (6)	80 - 200	Rippled gravel-sand (medium and fine grained sand) with patchy large bedforms and gravel lag. Weaker currents; ripples are formed by intermittent storm currents. Representative epifauna includes sponges attached to shell fragments and amphipods.	Southern Georges
Southeastern Slope (7)	400 - 2000	Dominated by silt and clay with portions of sand (medium and fine) with rippled sand on shallow slope and smooth silt-sand deeper.	none

Sediment provinces as defined by Valentine et al. (1993) and Valentine and Lough (1991), with additional comments by Valentine (pers. comm.) and benthic assemblages assigned by Theroux and Grosslein (1987).

6.1.2.1.3 Mid-Atlantic Bight

The Mid-Atlantic Bight includes the shelf and slope waters from Georges Bank south to Cape Hatteras, and east to the Gulf Stream (Figure 18). Like the rest of the continental shelf, the topography of the Mid-Atlantic Bight was shaped largely by sea level fluctuations caused by past ice ages. The shelf's basic morphology and sediments derive from the retreat of the last ice sheet, and the subsequent rise in sea level. Since that time, currents and waves have modified this basic structure.

Geology and Physical Oceanography

Shelf and slope waters of the Mid-Atlantic Bight have a slow southwestward flow that is occasionally interrupted by warm core rings or meanders from the Gulf Stream. On average, shelf water moves parallel to bathymetry isobars at speeds of 5 - 10 cm/s at the surface and 2 cm/s or less at the bottom. Storm events can cause much more energetic variations in flow. Tidal currents on the inner shelf have a higher flow rate of 20 cm/s that increases to 100 cm/s near inlets.

Slope water tends to be warmer than shelf water because of its proximity to the Gulf Stream, and tends to be more saline. The abrupt gradient where these two water masses meet is called the shelf-slope front. This front is usually located at the edge of the shelf and touches bottom at about 75 - 100 m depth of water, and then slopes up to the east toward the surface. It reaches surface waters approximately 25 - 55 km further offshore. The position of the front is highly variable, and can be influenced by many physical factors. Vertical structure of temperature and salinity within the front can develop complex patterns because of the interleaving of shelf and slope waters; e.g., cold shelf waters can protrude offshore, or warmer slope water can intrude up onto the shelf.

The seasonal effects of warming and cooling increase in shallower, nearshore waters. Stratification of the water column occurs over the shelf and the top layer of slope water during the spring-summer and is usually established by early June. Fall mixing results in homogenous shelf and upper slope waters by October in most years. A permanent thermocline exists in slope waters from 200 - 600 m deep. Temperatures decrease at the rate of about 0.02ºC per meter and remain relatively constant except for occasional incursions of Gulf stream eddies or meanders. Below 600 m, temperature declines, and usually averages about 2.2ºC at 4000 m. A warm, mixed layer approximately 40 m thick resides above the permanent thermocline.

The "cold pool" is an annual phenomenon particularly important to the Mid-Atlantic Bight. It stretches from the Gulf of Maine along the outer edge of Georges Bank and then southwest to Cape Hatteras. It becomes identifiable with the onset of thermal stratification in the spring and lasts into early fall until normal seasonal mixing occurs. It usually exists along the bottom between the 40 and 100 m isobaths and extends up into the water column for about 35 m, to the bottom of the seasonal thermocline. The cold pool usually represents about 30% of the volume of shelf water. Minimum temperatures for the cold pool occur in early spring and summer, and range from 1.1 - 4.7ºC.

The shelf slopes gently from shore out to between 100 and 200 km offshore where it transforms to the slope (100 - 200 m water depth) at the shelf break. In both the Mid-Atlantic and on Georges Bank, numerous canyons incise the slope, and some cut up onto the shelf itself (see the "Continental Slope" section, below). The primary morphological features of the shelf include shelf valleys and channels, shoal massifs, scarps, and sand ridges and swales. Most of these structures are relic except for some sand ridges and smaller sand-formed features. Shelf valleys and slope canyons were formed by rivers of glacier outwash that deposited sediments on the outer shelf edge as they entered the ocean. Most valleys cut about 10 m into the shelf, with the exception of the Hudson Shelf Valley that is about 35 m deep. The valleys were partially filled as the glacier melted and retreated across the shelf. The glacier also left behind a lengthy scarp near the shelf break from Chesapeake Bay north to the eastern end of Long Island. Shoal retreat

massifs were produced by extensive deposition at a cape or estuary mouth. Massifs were also formed as estuaries retreated across the shelf.

The sediment type covering most of the shelf in the Mid-Atlantic Bight is sand, with some relatively small, localized areas of sand-shell and sand-gravel. On the slope, silty sand, silt, and clay predominate. Some sand ridges are more modern in origin than the shelf's glaciated morphology. Their formation is not well understood; however, they appear to develop from the sediments that erode from the shore face. They maintain their shape, so it is assumed that they are in equilibrium with modern current and storm regimes. They are usually grouped, with heights of about 10 m, lengths of 10 – 50 km and spacing of 2 km. Ridges are usually oriented at a slight angle towards shore, running in length from northeast to southwest. The seaward face usually has the steepest slope. Sand ridges are often covered with smaller similar forms such as sand waves, megaripples, and ripples. Swales occur between sand ridges. Since ridges are higher than the adjacent swales, they are exposed to more energy from water currents, and experience more sediment mobility than swales. Ridges tend to contain less fine sand, silt and clay while relatively sheltered swales contain more of the finer particles. Swales have greater benthic macrofaunal density, species richness and biomass, due in part to the increased abundance of detrital food and the physically less rigorous conditions.

Sand waves are usually found in patches of 5 – 10 with heights of about 2 m, lengths of 50 – 100 m and 1 - 2 km between patches. Sand waves are primarily found on the inner shelf, and often observed on sides of sand ridges. They may remain intact over several seasons. Megaripples occur on sand waves or separately on the inner or central shelf. During the winter storm season, they may cover as much as 15% of the inner shelf. They tend to form in large patches and usually have lengths of 3 - 5 m with heights of 0.5 - 1 m. Megaripples tend to survive for less than a season. They can form during a storm and reshape the upper 50-100 cm of the sediments within a few hours. Ripples are also found everywhere on the shelf, and appear or disappear within hours or days, depending upon storms and currents. Ripples usually have lengths of about 1-150 cm and heights of a few centimeters.

Sediments are uniformly distributed over the shelf in this region. A sheet of sand and gravel varying in thickness from 0-10 m covers most of the shelf. The mean bottom flow from the constant southwesterly current is not fast enough to move sand, so sediment transport must be episodic. Net sediment movement is in the same southwesterly direction as the current. The sands are mostly medium to coarse grains, with finer sand in the Hudson Shelf Valley and on the outer shelf. Mud is rare over most of the shelf, but is common in the Hudson Shelf Valley. Occasionally relic estuarine mud deposits are re-exposed in the swales between sand ridges. Fine sediment content increases rapidly at the shelf break, which is sometimes called the "mud line," and sediments are 70 - 100% fines on the slope.

The mud patch (considered sometimes to be part of the Southern New England region) is located just southwest of Nantucket Shoals and southeast of Long Island and Rhode Island. Tidal currents in this area slow significantly, which allows silts and clays to settle out of the water column. The mud is mixed with sand, and is occasionally re-suspended by large storms. This habitat is an anomaly of the outer continental shelf.

Artificial reefs are another significant Mid-Atlantic habitat, formed much more recently on the geologic time scale than other regional habitat types. These localized areas of hard structure have been formed by shipwrecks, lost cargos, disposed solid materials, shoreline jetties and groins, submerged pipelines, cables, and other materials (Steimle and Zetlin 2000). While some of materials have been deposited specifically for use as fish habitat, most have an alternative primary purpose; however, they have all become an integral part of the coastal and shelf ecosystem. It is expected that the increase in these materials has had an impact on living marine resources and fisheries, but these effects are not well known. In general, reefs are important for attachment sites, shelter, and food for many species, and fish predators such as tunas may be attracted by prey aggregations, or may be behaviorally attracted to the reef structure. Steimle and Zetlin (2000) used NOAA hydrographic surveys to plot rocks, wrecks, obstructions, and artificial reefs, which together were considered by the authors to be a fairly complete list of nonbiogenic reef habitat in the Mid-Atlantic estuarine and coastal areas. They also described representative epibenthic/epibiotic, motile epibenthic, and fish species associated these habitats.

Biological Oceanography

Wigley and Theroux (1981) reported on the faunal composition of 563 bottom grab samples collected in the Mid-Atlantic Bight during 1956-1965. Amphipod crustaceans and bivalve mollusks accounted for most of the individuals (41% and 22%, respectively), whereas mollusks dominated the biomass (70%). Three broad faunal zones related to water depth and sediment type were identified by Pratt (1973). The "sand fauna" zone was defined for sandy sediments (1% or less silt) that are at least occasionally disturbed by waves, from shore out to 50 m. The "silty sand fauna" zone occurred immediately offshore from the sand fauna zone, in stable sands containing a small amount of silt and organic material. Silts and clays become predominant at the shelf break and line the Hudson Shelf Valley, and support the "silt-clay fauna".

Building on Pratt's work, the Mid-Atlantic shelf was further divided by Boesch (1979) into seven bathymetric/morphologic subdivisions based on faunal assemblages (Table 12). Sediments in the region studied (Hudson Shelf Valley south to Chesapeake Bay) were dominated by sand with little finer materials. Ridges and swales are important morphological features in this area. Sediments are coarser on the ridges, and the swales have greater benthic macrofaunal density, species richness, and biomass. Faunal species composition differed between these features, and Boesch (1979) incorporated this variation in his subdivisions. Much overlap of species distributions was found between depth zones, so the faunal assemblages represented more of a continuum than distinct zones.

Demersal fish assemblages were described at a broad geographic scale for the continental shelf and slope from Cape Chidley, Labrador to Cape Hatteras, North Carolina (Mahon et al. 1998) and from Nova Scotia to Cape Hatteras (Gabriel 1992). Factors influencing species distribution included latitude and depth. Results of these studies were similar to an earlier study confined to the Mid-Atlantic Bight continental shelf (Colvocoresses and Musick 1984). In this study, there were clear variations in species abundances, yet they demonstrated consistent patterns of community composition and distribution among demersal fishes of the Mid-Atlantic shelf. This is especially true for five strongly recurring species associations that varied slightly by season (Table 12). The boundaries between fish assemblages generally followed isotherms and

isobaths. The assemblages were largely similar between the spring and fall collections, with the most notable change being a northward and shoreward shift in the temperate group in the spring.

Table 12 Mid-Atlantic Habitat Types as described by Pratt (1973) and Boesch (1979) with Characteristic Macrofauna as identified in Boesch (1979)

Description	Depth (m)	Geology	Characteristic Benthic Macrofauna
Inner shelf	0 - 30	coarse sands with finer sands off MD and VA (sand zone)	Polychaetes:
Central shelf	30 - 50	(sand zone)	Polychaetes: Amphipod:
Central and inner shelf swales	0 - 50	occurs in swales between sand ridges (sand zone)	
Outer shelf	50 - 100	(silty sand zone)	Amphipods: Polychaetes:
Outer shelf swales	50 - 100	occurs in swales between sand ridges (silty sand zone)	Amphipods:
Shelf break	100 - 200	(silt-clay zone)	not given
Continental slope	> 200	(none)	not given

Table 13 Major Recurrent Demersal Finfish Assemblages of the Mid-Atlantic Bight During Spring and Fall as determined by Colvocoresses and Musick (1984)

Season					
Spring	Atlantic cod, little skate, sea raven, goosefish, winter flounder, longhorn sculpin, ocean pout, silver hake, red hake, white hake, spiny dogfish	black sea bass, summer flounder, butterfish, scup, spotted hake, northern searobin	windowpane	fourspot flounder	shortnose greeneye, offshore hake, blackbelly rosefish, white hake
Fall	white hake, silver hake, red hake, goosefish, longhorn sculpin, winter flounder, yellowtail flounder, witch flounder, little skate, spiny dogfish	black sea bass, summer flounder, butterfish, scup, spotted hake, northern searobin, smooth dogfish	windowpane	fourspot flounder , fawn cusk eel, gulf stream flounder	shortnose greeneye offshore hake, blackbelly rosefish, white hake, witch flounder

6.1.2.2 Essential Fish Habitat

Councils are required to designated Essential Fish Habitat (EFH) for all life stages of each managed species. The Atlantic herring EFH description is provided below.

6.1.2.2.1 Atlantic Herring EFH

Essential Fish Habitat (EFH) for Atlantic herring is described in NEFMC (1998a) as those areas of the coastal and offshore waters (out to the offshore U.S. boundary of the exclusive economic zone) that are designated in Figure 19 through Figure 22 and in Table 14 and meet the following conditions:

Eggs: Bottom habitats with a substrate of gravel, sand, cobble and shell fragments, but also on aquatic macrophytes, in the Gulf of Maine and Georges Bank as depicted in Figure 19. Eggs adhere to the bottom, forming extensive egg beds which may be many layers deep. Generally, the following conditions exist where Atlantic herring eggs are found: water temperatures below 15° C, depths from 20 - 80 meters, and a salinity range from 32 - 33‰. Herring eggs are most often found in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots. Atlantic herring eggs are most often observed during the months from July through November.

Larvae: Pelagic waters in the Gulf of Maine, Georges Bank, and southern New England that comprise 90% of the observed range of Atlantic herring larvae as depicted in Figure 20. Generally, the following conditions exist where Atlantic herring larvae are found: sea surface temperatures below 16° C, water depths from 50 - 90 meters, and salinities around 32‰. Atlantic herring larvae are observed between August and April, with peaks from September through November.

Juveniles: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras as depicted in Figure 21. Generally, the following conditions exist where Atlantic herring juveniles are found: water temperatures below 10° C, water depths from 15 - 135 meters, and a salinity range from 26 - 32‰.

Adults: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras as depicted in Figure 22. Generally, the following conditions exist where Atlantic herring adults are found: water temperatures below 10° C, water depths from 20 - 130 meters, and salinities above 28‰.

Spawning Adults: Bottom habitats with a substrate of gravel, sand, cobble and shell fragments, but also on aquatic macrophytes, in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay as depicted in Figure 22. Generally, the following conditions exist where spawning Atlantic herring adults are found: water temperatures below 15° C, depths from 20 - 80 meters, and a salinity range from 32 - 33‰. Herring eggs are spawned in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots. Atlantic herring are most often observed spawning during the months from July through November.

All of the above EFH descriptions include those bays and estuaries listed in Table 14, according to life history stage. The Council acknowledges potential seasonal and spatial variability of the conditions generally associated with this species.

Table 14 EFH Designation of Estuaries and Embayments for Atlantic Herring

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

S ≡ The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).
M ≡ The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).
F ≡ The EFH designation for this species includes the tidal freshwater salinity zone of this bay or estuary (0.0 < salinity < 0.5‰).
These EFH designations of estuaries and embayments are based on the NOAA Estuarine Living Marine Resources (ELMR) program (Jury *et al.* 1994; Stone *et al.* 1994).

Figure 19 EFH Designation for Atlantic Herring Eggs

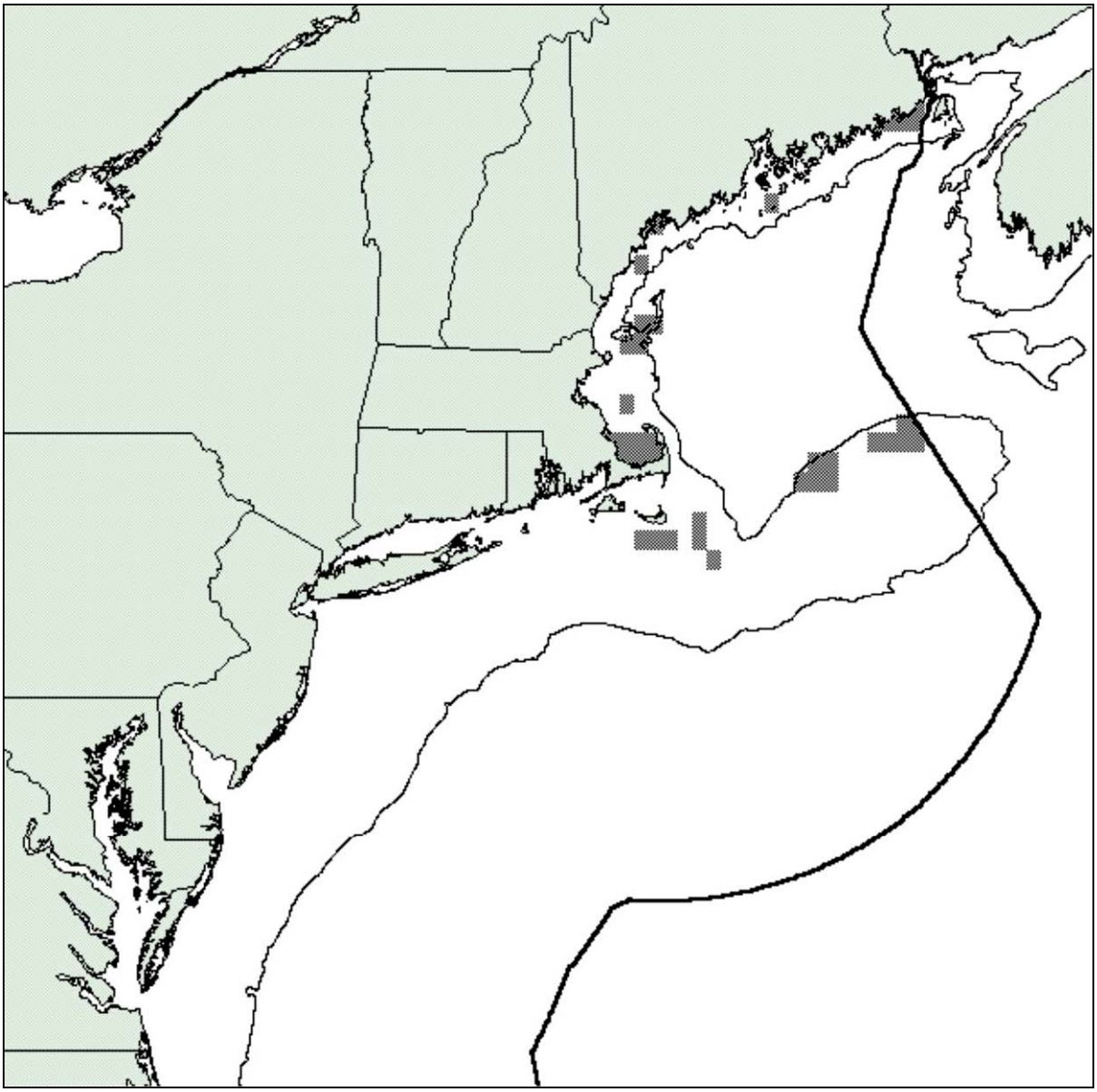


Figure 20 EFH Designation for Atlantic Herring Larvae

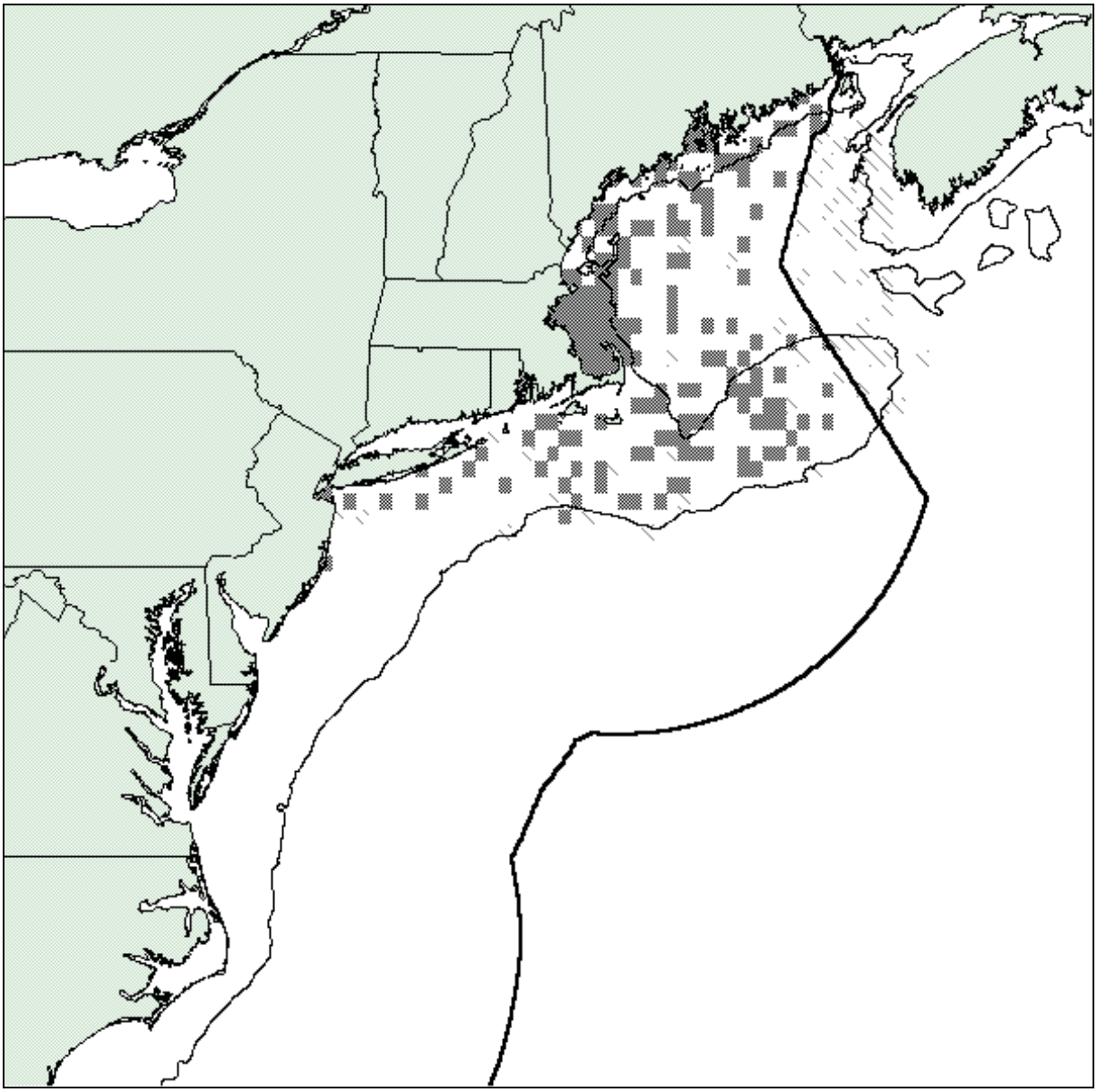


Figure 21 EFH Designation for Juvenile Atlantic Herring

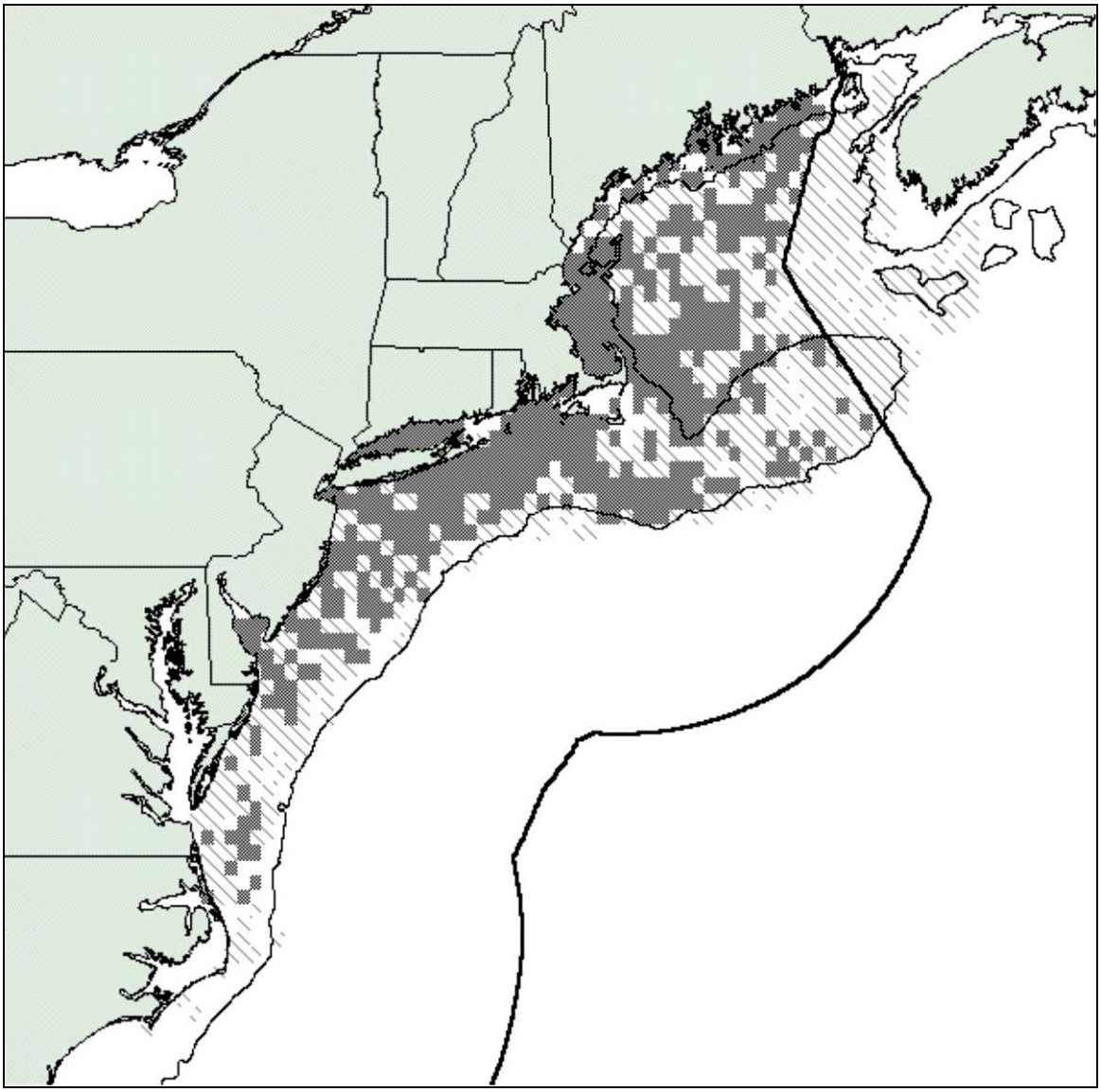
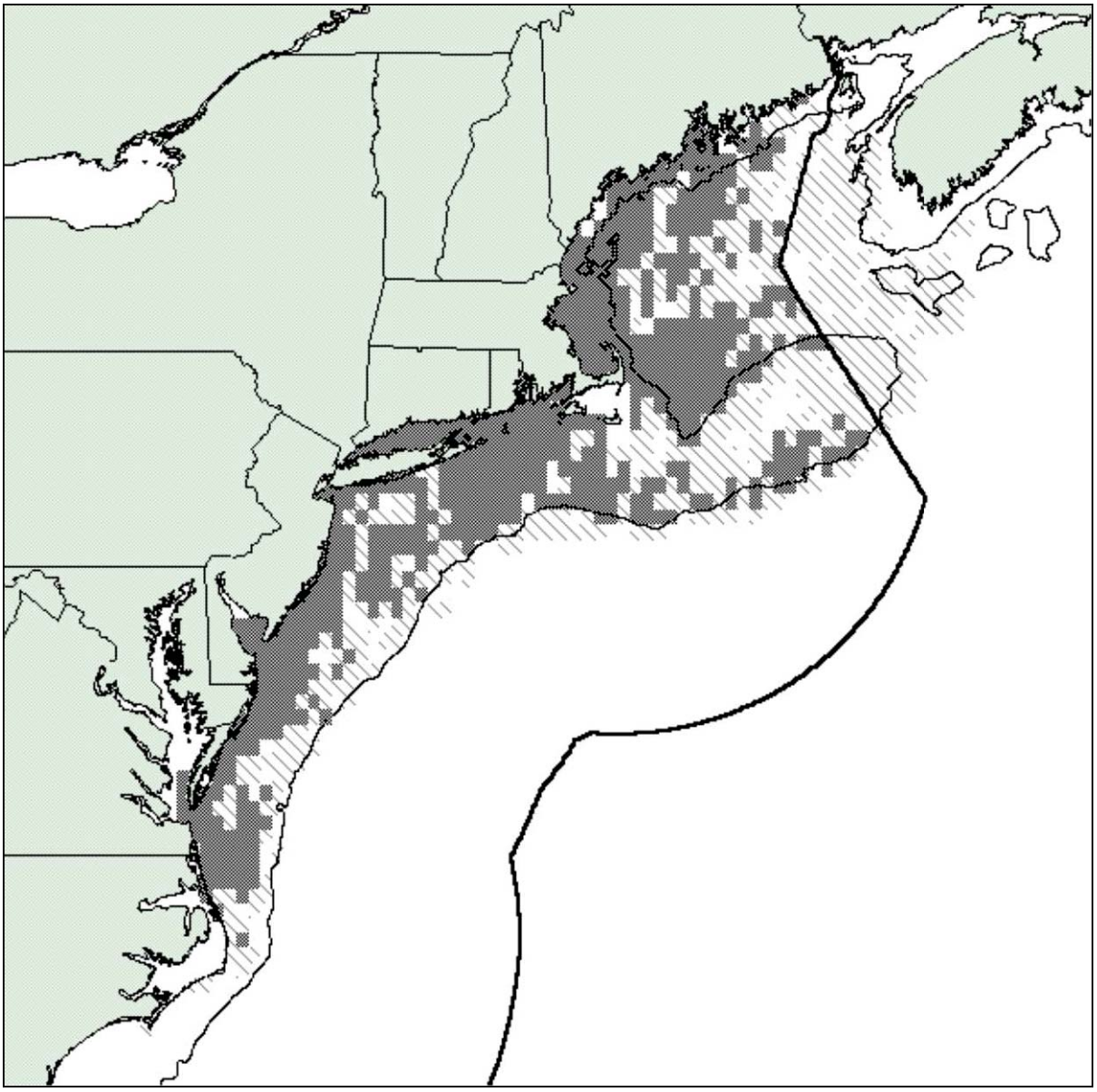


Figure 22 EFH Designation for Adult Atlantic Herring



6.1.2.2.2 EFH for Other Species

The Atlantic herring fishery is prosecuted in four areas defined as 1A, 1B, 2, and 3 (Figure 23). These areas, which could potentially be affected by the Proposed Action, have been identified as EFH various species listed in Table 15. Many of these EFH designations were developed in NEFMC Essential Fish Habitat Omnibus Amendment 1 (1998). For additional information, the reader is referred to the Omnibus Amendment and the other FMP documents listed in Table 16. In addition, EFH descriptions and maps for all Northeast region species can be accessed at http://www.nero.noaa.gov/hcd/webintro.html. Two FMP amendments in development will update current EFH designations. Amendment 16 to the Northeast Multispecies FMP will add Atlantic wolffish to the management unit and includes an EFH designation for the species.

Designations for all other species managed by NEFMC are being reviewed and updated in Omnibus Essential Fish Habitat Amendment.

Figure 23 Geographic Extent of the Atlantic Herring Fishery

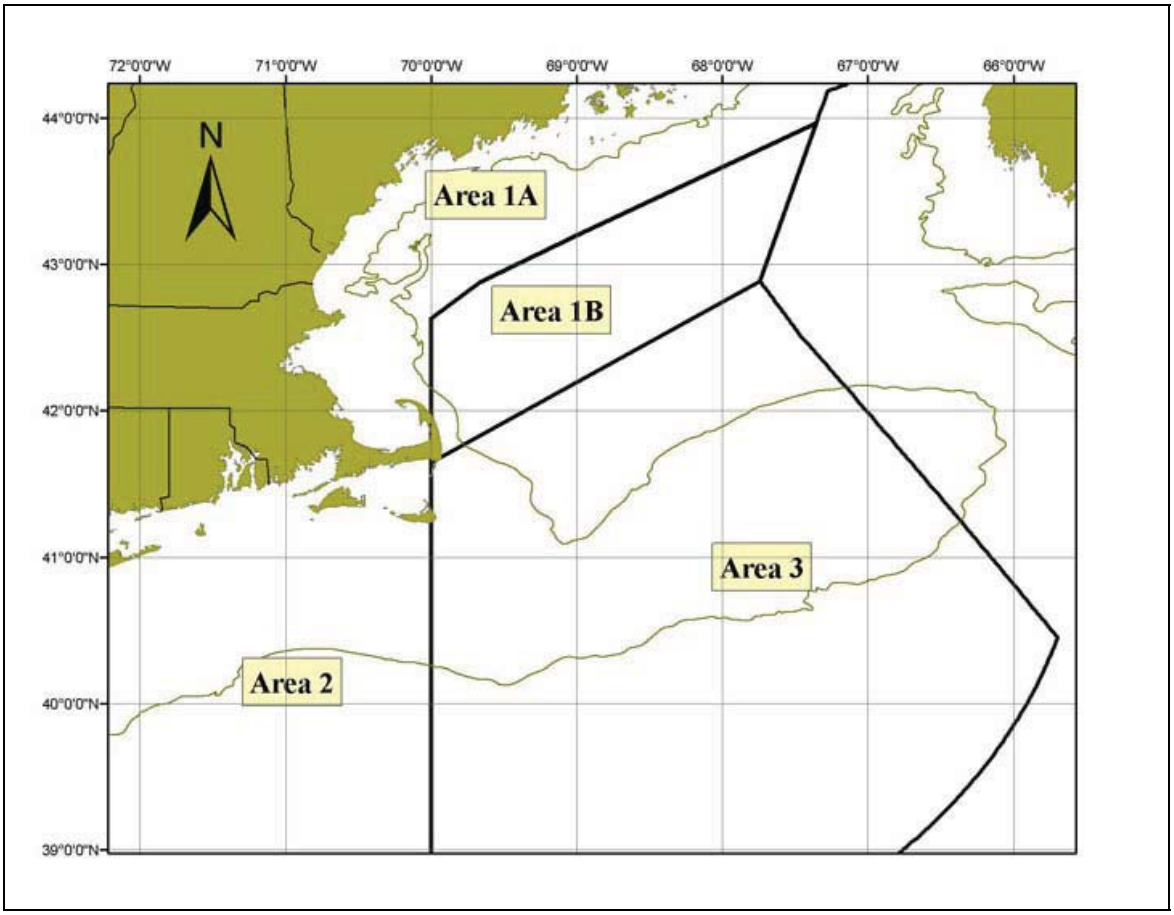


Table 15 – Demersal Species/Lifestages for which Designated EFH Overlaps with the Atlantic Herring Fishery, Listed Alphabetically by Common Name

American plaice	juvenile	GOME and estuaries from Passamaquoddy Bay to Saco Bay, ME and from Mass. Bay to Cape Cod Bay, MA	45 - 150		Bottom habitats with fine grained sediments or a substrate of sand or gravel
American plaice	adult	GOME and estuaries from Passamaquoddy Bay to Saco Bay, ME and from Mass. Bay to Cape Cod Bay, MA	45 - 175		Bottom habitats with fine grained sediments or a substrate of sand or gravel
Atlantic cod	juvenile	GOME, GB, eastern portion of continental shelf off southern NE and following estuaries: Passamaquoddy Bay to Saco Bay; Mass. Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay	25 - 75		Bottom habitats with a substrate of cobble or gravel
Atlantic cod	adult	GOME, GB, eastern portion of continental shelf off southern NE and following estuaries: Passamaquoddy Bay to Saco Bay; Mass. Bay, Boston Harbor, Cape Cod Bay, Buzzards Bay	10 - 150		Bottom habitats with a substrate of rocks, pebbles, or gravel
Atlantic halibut	juvenile	GOME, GB	20 - 60		Bottom habitats with a substrate of sand, gravel, or clay
Atlantic halibut	adult	GOME, GB	100 - 700		Bottom habitats with a substrate of sand, gravel, or clay
Atlantic salmon	juvenile	Rivers from CT to Maine: Connecticut, Pawcatuck, Merrimack, Cocheco, Saco, Androscoggin, Presumpscot, Kennebec, Sheepscot, Ducktrap, Union, Penobscot, Narraguagus, Machias, East Machias, Pleasant, St. Croix, Denny's, Passagassawaukeag, Aroostook, Lamprey, Boyden, Orland Rivers, and the Turk, Hobart and Patten Streams; and the following estuaries for juveniles and adults: Passamaquoddy Bay to Muscongus Bay; Casco Bay to Wells Harbor; Mass. Bay, Long Island Sound, Gardiners Bay to Great South Bay. All aquatic habitats in the watersheds of the above listed rivers, including all tributaries to the extent that they are currently or were historically accessible for salmon migration.	10 – 61		Bottom habitats of shallow gravel/cobble riffles interspersed with deeper riffles and pools in rivers and estuaries, water velocities between 30 - 92 cm/s
Atlantic sea scallop	juvenile	GOME, GB, southern NE and middle Atlantic south to Virginia-North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Great Bay, Mass Bay, and Cape Cod Bay	18 - 110		Bottom habitats with a substrate of cobble, shells, and silt
Atlantic sea scallop	adult	GOME, GB, southern NE and middle Atlantic south to Virginia-North Carolina border and following estuaries: Passamaquoddy Bay to Sheepscot R.; Casco Bay, Great Bay, Mass Bay, and Cape Cod Bay	18 - 110		Bottom habitats with a substrate of cobble, shells, coarse/gravelly sand, and sand
Atlantic surfclam	juvenile	Eastern edge of GB and the GOME throughout Atlantic EEZ	0 - 60, low density beyond 38		Throughout substrate to a depth of 3 ft within federal waters, burrow in medium to coarse sand and gravel substrates, also found in silty to fine sand, but

					not in mud
Atlantic surfclam	adult	Eastern edge of GB and the GOME throughout Atlantic EEZ	0 - 60, low density beyond 38	Spawn summer to fall	Throughout substrate to a depth of 3 ft within federal waters
Barndoor skate	juvenile	Eastern GOME, GB, Southern NE, Mid-Atlantic Bight to Hudson Canyon	l0 - 750, mosty < 150		Bottom habitats with mud, gravel, and sand substrates
Barndoor skate	adult	Eastern GOME, GB, Southern NE, Mid-Atlantic Bight to Hudson Canyon	l0 - 750, mosty < 150		Bottom habitats with mud, gravel, and sand substrates
Black sea bass	juvenile	Demersal waters over continental shelf from GOME to Cape Hatteras, NC, also includes estuaries from Buzzards Bay to Long Island Sound; Gardiners Bay, Barnegat Bay to Chesapeake Bay; Tangier/ Pocomoke Sound, and James River	1 – 38	Found in coastal areas (April to December, peak June to November) between VA and MA, but winter offshore from NJ and south; estuaries in summer and spring	Rough bottom, shellfish and eelgrass beds, manmade structures in sandy-shelly areas, offshore clam beds, and shell patches may be used during wintering
Black sea bass	adult	Demersal waters over continental shelf from GOME to Cape Hatteras, NC, also includes estuaries: Buzzards Bay, Narragansett Bay, Gardiners Bay, Great South Bay, Barnegat Bay to Chesapeake Bay; Tangier/ Pocomoke Sound, and James River	20 - 50	Wintering adults (November to April) offshore, south of NY to NC; inshore, estuaries from May to October	Structured habitats (natural and manmade), sand and shell substrates preferred
Clearnose skate	juvenile	GOME, along shelf to Cape Hatteras, NC; includes the estuaries from Hudson River/Raritan Bay south to the Chesapeake Bay mainstem	0 – 500, mostly < 111		Bottom habitats with substrate of soft bottom along continental shelf and rocky or gravelly bottom
Clearnose skate	adult	GOME, along shelf to Cape Hatteras, NC; includes the estuaries from Hudson River/Raritan Bay south to the Chesapeake Bay mainstem	0 – 500, mostly < 111		Bottom habitats with substrate of soft bottom along continental shelf and rocky or gravelly bottom
Golden crab	juvenile	Chesapeake Bay to the south through the Florida Straight (and into the Gulf of Mexico)	290 - 570		Continental slope in flat areas of foraminifera ooze, on distinct mounds of dead coral, ripple habitat, dunes, black pebble habitat, low outcrop, and soft bioturbated habitat
Golden crab	adult	Chesapeake Bay to the south through the Florida Straight (and into the Gulf of Mexico)	290 - 570		Continental slope in flat areas of foraminifera ooze, on distinct mounds of dead coral, ripple habitat, dunes, black pebble habitat, low outcrop, and soft bioturbated habitat
Haddock	juvenile	GB, GOME, middle Atlantic south to Delaware Bay	35 - 100		Bottom habitats with a substrate of pebble and gravel
Haddock	adult	GB and eastern side of Nantucket Shoals, throughout GOME, *additional area of	40 - 150		Bottom habitats with a substrate of broken

		Nantucket Shoals, and Great South Channel			ground, pebbles, smooth hard sand, and smooth areas between rocky patches
Little skate	juvenile	GB through Mid-Atlantic Bight to Cape Hatteras, NC; includes the estuaries from Buzzards Bay south to the Chesapeake Bay mainstem	0 - 137, mostly 73 - 91		Bottom habitats with sandy or gravelly substrate or mud
Little skate	adult	GB through Mid-Atlantic Bight to Cape Hatteras, NC; includes the estuaries from Buzzards Bay south to the Chesapeake Bay mainstem	0 - 137, mostly 73 - 91		Bottom habitats with sandy or gravelly substrate or mud
Monkfish	juvenile	Outer continental shelf in the middle Atlantic, mid-shelf off southern NE, all areas of GOME	25 - 200		Bottom habitats with substrates of a sandshell mix, algae covered rocks, hard sand, pebbly gravel, or mud
Monkfish	adult	Outer continental shelf in the middle Atlantic, mid-shelf off southern NE, outer perimeter of GB, all areas of GOME	25 - 200		Bottom habitats withsubstrates of a sandshell mix, algae covered rocks, hard sand, pebbly gravel, or mud
Ocean pout	juvenile	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass. Bay, and Cape Cod Bay	< 50	Late fall to spring	Bottom habitats in close proximity to hard bottom nesting areas
Ocean pout	adult	GOME, GB, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Saco Bay; Mass. Bay, Boston Harbor, and Cape Cod Bay	< 80		Bottom habitats, often smooth bottom near rocks or algae
Ocean quahog	juvenile	Eastern edge of GB and GOME throughout the Atlantic EEZ	8 - 245		Throughout substrate to a depth of 3 ft within federal waters, occurs progressively further offshore between Cape Cod and Cape Hatteras
Ocean quahog	adult	Eastern edge of GB and GOME throughout the Atlantic EEZ	8 - 245	Spawn May to December with several peaks	Throughout substrate to a depth of 3 ft within federal waters, occurs progressively further offshore between Cape Cod and Cape Hatteras
Offshore hake	juvenile	Outer continental shelf of GB and southern NE south to Cape Hatteras, NC	170 - 350		Bottom habitats
Offshore hake	adult	Outer continental shelf of GB and southern NE south to Cape Hatteras, NC	150 - 380		Bottom habitats
Pollock	juvenile	GOME, GB, and the following estuaries: Passamaquoddy Bay to Saco Bay; Great Bay to Waquoit Bay; Long Island Sound, Great South Bay	0 – 250		Bottom habitats with aquatic vegetation or a substrate of sand, mud, or rocks
Pollock	adult	GOME, GB, southern NE, and middle Atlantic south to New Jersey and the following estuaries: Passamaquoddy Bay, Damariscotta R., Mass Bay, Cape Cod Bay, Long Island Sound	15 – 365		Hard bottom habitats including artificial reefs
Red crab	juvenile	Southern flank of GB and south the Cape Hatteras, NC	700 - 1800		Bottom habitats of continental slope with a substrate of silts, clays, and all silt-clay-sand composites
Red crab	adult	Southern flank of GB and south the Cape	200 -		Bottom habitats of

		Hatteras, NC	1300		continental slope with a substrate of silts, clays, and all silt-clay-sand composites
Red drum	juvenile	Along the Atlantic coast from Virginia through the Florida Keys	< 50	Found throughout Chesapeake Bay from September to November	Utilize shallow backwaters of estuaries as nursery areas and remain until they move to deeper water portions of the estuary associated with river mouths, oyster bars, and front beaches
Red drum	adult	Along the Atlantic coast from Virginia through the Florida Keys	< 50	Found in Chesapeake in spring and fall and also along eastern shore of VA	Concentrate around inlets, shoals, and capes along the Atlantic coast; shallow bay bottoms or oyster reef substrate preferred, also nearshore artificial reefs
Red hake	juvenile	GOME, GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Saco Bay; Great Bay, Mass. Bay to Cape Cod Bay; Buzzards Bay to Conn. R.; Hudson R./ Raritan Bay, and Chesapeake Bay	< 100		Bottom habitats with substrate of shell fragments, including areas with an abundance of live scallops
Red hake	adult	GOME, GB, continental shelf off southern NE, and middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Saco Bay; Great Bay, Mass. Bay to Cape Cod Bay; Buzzards Bay to Conn. R.; Hudson R./ Raritan Bay, Delaware Bay, and Chesapeake Bay	10 - 130		Bottom habitats in depressions with a substrate of sand and mud
Redfish	juvenile	GOME, southern edge of GB	25 - 400		Bottom habitats with a substrate of silt, mud, or hard bottom
Redfish	adult	GOME, southern edge of GB	50 - 350		Bottom habitats with a substrate of silt, mud, or hard bottom
Rosette skate	juvenile	Nantucket shoals and southern edge of GB to Cape Hatteras, NC	33 - 530, mostly 74 - 274		Bottom habitats with soft substrate, including sand/mud bottoms, mud with echinoid and ophiuroid fragments, and shell and pteropod ooze
Rosette skate	adult	Nantucket shoals and southern edge of GB to Cape Hatteras, NC	33 - 530, mostly 74 - 274		Bottom habitats with soft substrate, including sand/mud bottoms, mud with echinoid and ophiuroid fragments, and shell and pteropod ooze
Scup	juvenile	Continental shelf from GOME to Cape Hatteras, NC includes the following estuaries: Mass. Bay, Cape Cod Bay to Long Island Sound; Gardiners Bay to Delaware Inland Bays; and Chesapeake Bay	(0 - 38)	Spring and summer in estuaries and bays	Demersal waters north of Cape Hatteras and inshore on various sands, mud, mussel, and eelgrass bed type substrates
Scup	adult	Continental shelf from GOME to Cape Hatteras, NC includes the following estuaries: Cape Cod Bay to Long Island Sound; Gardiners Bay to Hudson R./	(2 -185)	Wintering adults (November to April) are usually offshore, south of	Demersal waters north of Cape Hatteras and inshore estuaries (various substrate

		Raritan Bay; Delaware Bay and Inland Bays; and Chesapeake Bay		NY to NC	types)
Silver hake	juvenile	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Casco Bay, Mass. Bay to Cape Cod Bay	20 – 270		Bottom habitats of all substrate types
Silver hake	adult	GOME, GB, continental shelf off southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Casco Bay, Mass. Bay to Cape Cod Bay	30 – 325		Bottom habitats of all substrate types
Smooth skate	juvenile	Offshore banks of GOME	31 – 874, mostly 110 - 457		Bottom habitats with a substrate of soft mud (silt and clay), sand, broken shells, gravel and pebbles
Smooth skate	adult	Offshore banks of GOME	31 – 874, mostly 110 - 457		Bottom habitats with a substrate of soft mud (silt and clay), sand, broken shells, gravel and pebbles
Spanish mackerel, cobia, and king mackerel	juvenile	South Atlantic and Mid-Atlantic Bights			Sandy shoals of capes and offshore bars, high profile rock bottoms and barrier island oceanside waters from surf zone to shelf break, but from the Gulf Stream shoreward
Spanish mackerel, cobia, and king mackerel	adult	South Atlantic and Mid-Atlantic Bights			Sandy shoals of capes and offshore bars, high profile rock bottoms and barrier island oceanside waters from surf zone to shelf break, but from the Gulf Stream shoreward
Spiny dogfish	juvenile	GOME through Cape Hatteras, NC across the continental shelf; continental shelf waters south of Cape Hatteras, NC through Florida; also includes estuaries from Passamaquoddy Bay to Saco Bay; Mass. Bay and Cape Cod Bay	10 - 390		Continental shelf waters and estuaries
Spiny dogfish	adult	GOME through Cape Hatteras, NC across the continental shelf; continental shelf waters south of Cape Hatteras, NC through Florida; also includes estuaries from Passamaquoddy Bay to Saco Bay; Mass. Bay and Cape Cod Bay	10 - 450		Continental shelf waters and estuaries
Summer flounder	juvenile	Over continental shelf from GOME to Cape Hatteras, NC; south of Cape Hatteras to Florida; also includesestuaries from Waquoit Bay to James R.; Albemarle Sound to Indian R.	0.5 – 5 in estuary		Demersal waters, on muddy substrate but prefer mostly sand; found in the lower estuaries in flats, channels, salt marsh creeks, and eelgrass beds
Summer flounder	adult	Over continental shelf from GOME to Cape Hatteras, NC; south of Cape Hatteras to Florida; also includes estuaries from Buzzards Bay, Narragansett Bay, Conn. R. to James R.; Albemarle Sound to Broad R.; St. Johns R., and Indian R.	0 - 25	Shallow coastal and estuarine waters during warmer months, move offshore on outer continental shelf at depths of 150 m in colder months	Demersal waters and estuaries

Thorny skate	adult	GOME and GB	18 - 2000, mostly 111 - 366		Bottom habitats with a substrate of sand, gravel, broken shell, pebbles, and soft mud
Tilefish	juvenile	US/Canadian boundary to VA/NC boundary (shelf break, submarine canyon walls, and flanks: GB to Cape Hatteras)	76 - 365	All year, may leave GB in winter	Rough bottom, small burrows, and sheltered areas; substrate rocky, stiff clay, human debris
Tilefish	adult	US/Canadian boundary to VA/NC boundary (shelf break, submarine canyon walls, and flanks: GB to Cape Hatteras)	76 - 365	All year, may leave GB in winter	Rough bottom, small burrows, and sheltered areas; substrate rocky, stiff clay, human debris
White hake	adult	GOME, southern edge of GB, southern NE to middle Atlantic and the following estuaries: Passamaquoddy Bay to Great Bay; Mass. Bay to Cape Cod Bay	5 - 325		Bottom habitats with substrate of mud or fine grained sand
White hake	juvenile	GOME, southern edge of GB, southern NE to middle Atlantic and the following estuaries: Passamaquoddy Bay to Great Bay; Mass. Bay to Cape Cod Bay	5 - 225	May to September	Pelagic stage - pelagic waters; demersal stage - bottom habitat with seagrass beds or substrate of mud or fine grained sand
Windowpane flounder	juvenile	GOME, GB, southern NE, middle Atlantic south to Cape Hatteras and the following estuaries: Passamaquoddy Bay to Great Bay; Mass. Bay to Chesapeake Bay	1 - 100		Bottom habitats with substrate of mud or fine grained sand
Windowpane flounder	adult	GOME, GB, southern NE, middle Atlantic south to Virginia - NC border and the following estuaries: Passamaquoddy Bay to Great Bay; Mass. Bay to Chesapeake Bay	1 - 75		Bottom habitats with substrate of mud or fine grained sand
Winter flounder	juvenile	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Chincoteague Bay	0.1 – 10 (1 - 50, age 1+)		Bottom habitats with a substrate of mud or fine grained sand
Winter flounder	adult	GB, inshore areas of GOME, southern NE, middle Atlantic south to Delaware Bay and the following estuaries: Passamaquoddy Bay to Chincoteague Bay	1 - 100		Bottom habitats including estuaries with substrates of mud, sand, grave
Winter skate	juvenile	Cape Cod Bay, GB, southern NE shelf through Mid-Atlantic Bight to North Carolina; includes the estuaries from Buzzards Bay south to the Chesapeake Bay mainstem	0 - 37, mostly < 111		Bottom habitats with substrate of sand and gravel or mud
Winter skate	adult	Cape Cod Bay, GB southern NE shelf through Mid-Atlantic Bight to North Carolina; includes the estuaries from Buzzards Bay south to the Chesapeake Bay mainstem	0 - 371, mostly < 111		Bottom habitats with substrate of sand and gravel or mud
Witch flounder	juvenile	GOME, outer continental shelf from GB south to Cape Hatteras	50 - 450 to 1500		Bottom habitats with fine grained substrate
Witch flounder	adult	GOME, outer continental shelf from GB south to Chesapeake Bay	25 - 300		Bottom habitats with fine grained substrate
Yellowtail flounder	juvenile	GB, GOME, southern NE continental shelf south to Delaware Bay and the following estuaries: Sheepscot R., Casco Bay, Mass. Bay to Cape Cod Bay	20 - 50		Bottom habitats with substrate of sand or sand and mud
Yellowtail flounder	adult	GB, GOME, southern NE continental shelf south to Delaware Bay and the following estuaries: Sheepscot R., Casco Bay, Mass. Bay to Cape Cod Bay	20 - 50		Bottom habitats with substrate of sand or sand and mud

Table 16 Listing of Sources for Original EFH Designation Information

American plaice	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11
Atlantic cod	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11
Atlantic halibut	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11
Atlantic herring	NEFMC	Atlantic Herring	EFH Omnibus/Atlantic Herring FMP
Atlantic salmon	NEFMC	Atlantic salmon	EFH Omnibus/Atlantic Salmon FMP
Atlantic sea scallop	NEFMC	Atlantic Sea Scallop	EFH Omnibus/Atlantic Sea Scallop A9
Atlantic surfclam	MAFMC	Atlantic Surfclam Ocean Quahog	Atlantic Surfclam Ocean Quahog A12
Barndoor skate	NEFMC	NE Skate Complex	Original NE Skate Complex FMP
Black sea bass	MAFMC	Summer Flounder, Scup, and Black Sea Bass	Summer Flounder, Scup, and Black Sea Bass A12
Clearnose skate	NEFMC	NE Skate Complex	Original NE Skate Complex FMP
Golden crab	SAFMC	Golden Crab	Golden Crab FMP A1
Haddock	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11
Little skate	NEFMC	NE Skate Complex	Original NE Skate Complex FMP
Monkfish	NEFMC, MAFMC	Monkfish	EFH Omnibus/Monkfish A1
Ocean pout	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11
Ocean quahog	MAFMC	Atlantic Surfclam Ocean Quahog	Atlantic Surfclam Ocean Quahog A12
Offshore hake	NEFMC	NE Multispecies	NE Multispecies A12
Pollock	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11
Red crab	NEFMC	Red Crab	Original Red Crab FMP
Red drum	ASMFC/SAFMC	ASMFC Red Drum FMP	SAFMC Habitat Plan
Red hake	NEFMC	NE Multispecies	NE Multispecies A12
Redfish	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11
Rosette skate	NEFMC	NE Skate Complex	Original NE Skate Complex FMP
Scup	MAFMC	Summer Flounder, Scup, and Black Sea Bass	Summer Flounder, Scup, and Black Sea Bass A12
Silver hake	NEFMC	NE Multispecies	NE Multispecies A12
Smooth skate	NEFMC	NE Skate Complex	Original NE Skate Complex FMP
Spanish mackerel, cobia, and king mackerel	SAFMC/GMFMC	Coastal Migratory Pelagics	Coastal Migratory Pelagics FMP A10
Spiny dogfish	MAFMC/NEFMC	Spiny Dogfish	Original Spiny Dogfish FMP
Summer flounder	MAFMC	Summer Flounder, Scup, and Black Sea Bass	Summer Flounder, Scup, and Black Sea Bass A12
Thorny skate	NEFMC	NE Skate Complex	Original NE Skate Complex FMP
Tilefish	MAFMC	Tilefish	Tilefish FMP
White hake	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11
Windowpane flounder	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11
Winter flounder	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11
Winter skate	NEFMC	NE Skate Complex	Original NE Skate Complex FMP
Witch flounder	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11
Yellowtail flounder	NEFMC	NE Multispecies	EFH Omnibus/NE Multispecies A11

6.1.3 Protected Resources (Marine Mammals and Protected Species)

There are numerous species that inhabit the environment within the Atlantic herring FMP management unit, and that therefore potentially occur in the operations area of the herring industry, that are afforded protection under the Endangered Species Act of 1973 (ESA; i.e., for those designated as threatened or endangered) and/or the Marine Mammal Protection Act of 1972 (MMPA), and are under NMFS' jurisdiction. Fifteen species are classified as endangered or threatened under the ESA, while the remainders are protected by the provisions of the MMPA.

6.1.3.1 Species Present in the Area

The following list of species, protected either by the ESA, the MMPA, or both, may be found in the environment that would be utilized by the herring fishery. The Council has also identified two right whale critical habitat designations in the Northeast.

Cetaceans	
North Atlantic right whale (*Eubalaena glacialis*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Blue whale (*Balaenoptera musculus*)	Endangered
Sperm whale (*Physeter macrocephalus*)	Endangered
Minke whale (*Balaenoptera acutorostrata*)	Protected
Pilot whale (*Globicephala spp.*)	Protected
Risso's dolphin (*Grampus griseus*)	Protected
White-sided dolphin (*Lagenorhynchus acutus*)	Protected
Common dolphin (*Delphinus delphis*)	Protected
Spotted and striped dolphins (*Stenella spp.*)	Protected
Bottlenose dolphin – Offshore Stock (*Tursiops truncatus*)	Protected
White-beaked dolphin (*Lagenorhynchus albirostris*)	Protected
Harbor Porpoise (*Phocoena phocoena*)	Protected
Sea Turtles	
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered
Green sea turtle (*Chelonia mydas*)	Endangered
Loggerhead sea turtle (*Caretta caretta*)	Threatened
Fish	
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered
Atlantic salmon (*Salmo salar*)	Endangered
Pinnipeds	
Harbor seal (*Phoca vitulina*)	Protected

Gray seal (*Halichoerus grypus*)	Protected
Harp seal (*Pagophilus groenlandicus*)	Protected
Hooded seal (*Cystophora cristata*)	Protected
Northern Right Whale Critical Habitat Designations	
Cape Cod Bay	
Great South Channel	

Two additional species of pinnipeds: Ringed seal (*Phoca hispida*) and the Bearded seal (*Erignathus barbatus*) are listed as candidate species under the ESA. The Northeastern U.S. is at the southern tip of the habitat range for both of these species. These species are rarely sighted off the northeastern U.S. Although a few stranding records have been recorded in the Northeast Region, sightings are rare in the Northeast Atlantic.

6.1.3.2 Species Potentially Affected

It is expected that the sea turtle, cetacean, and pinniped species discussed below have the potential to be affected by the operation of the herring fishery. Background information on the range-wide status of sea turtle and marine mammal species that occur in the area and are known or suspected of interacting with fishing gear (demersal gear including trawls, gillnets, and longline types) can be found in a number of published documents. These include sea turtle status reviews and biological reports (NMFS and USFWS 1995; Marine Turtle Expert Working Group (TEWG) 1998, 2000; NMFS and USFWS 2007a, 2007b; Leatherback TEWG 2007), recovery plans for ESA-listed cetaceans and sea turtles (NMFS 1991, 2005; NMFS and USFWS 1991a, 1991b; NMFS and USFWS 1992), the marine mammal stock assessment reports (e.g., Waring et al. 2006; 2007; 2009), and other publications (e.g., Clapham et al. 1999, Perry et al. 1999, Best et al. 2001, Perrin et al. 2002).

Additional ESA background information on the range-wide status of these species and a description of critical habitat can be found in a number of published documents including recent sea turtle (NMFS and USFWS 1995, USFWS 1997, TEWG 2000, NMFS SEFSC 2001, NMFS and USFWS 2007a), loggerhead recovery team report (NMFS and USFWS 2008), status reviews and stock assessments, Recovery Plans for the humpback whale (NMFS 1991a), right whale (NMFS 1991b, 2005), right whale EIS (August 2007), fin and sei whale (NMFS 1998b), and the marine mammal stock assessment report (Waring et al. 2008) and other publications (*e.g.*, Perry *et al.* 1999; Clapham *et al.* 1999; IWC 2001 *a*). A recovery plan for fin and sei whales is also available and may be found at the following web site http://www.NOAAFisheries.noaa.gov/prot_res/PR3/recovery.html (NOAA Fisheries unpublished).

6.1.3.2.1 Sea Turtles

Loggerhead, leatherback, Kemp's ridley, and green sea turtles occur seasonally in southern New England and Mid-Atlantic continental shelf waters north of Cape Hatteras, North Carolina. In general, turtles move up the coast from southern wintering areas as water temperatures warm in the spring (James et al. 2005, Morreale and Standora 2005, Braun-McNeill and Epperly 2004, Morreale and Standora 1998, Musick and Limpus 1997, Shoop and Kenney 1992, Keinath et al.

1987). The trend is reversed in the fall as water temperatures cool. By December, turtles have passed Cape Hatteras, returning to more southern waters for the winter (James et al. 2005, Morreale and Standora 2005, Braun-McNeill and Epperly 2004, Morreale and Standora 1998, Musick and Limpus 1997, Shoop and Kenney 1992, Keinath et al. 1987). Hard-shelled species are typically observed as far north as Cape Cod whereas the more cold-tolerant leatherbacks are observed in more northern Gulf of Maine waters in the summer and fall (Shoop and Kenney 1992, STSSN database http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp).

In general, sea turtles are a long-lived species and reach sexual maturity relatively late (NMFS SEFSC 2001; NMFS and USFWS 2007a, 2007b, 2007c, 2007d). Sea turtles are injured and killed by numerous human activities (NRC 1990; NMFS and USFWS 2007a, 2007b, 2007c, 2007d). Nest count data are a valuable source of information for each turtle species since the number of nests laid reflects the reproductive output of the nesting group each year. A decline in the annual nest counts has been measured or suggested for four of five western Atlantic loggerhead nesting groups through 2004 (NMFS and USFWS 2007a), however, data collected since 2004 suggests nest counts have stabilized or increased (TEWG 2009). Nest counts for Kemp's ridley sea turtles as well as leatherback and green sea turtles in the Atlantic demonstrate increased nesting by these species (NMFS and USFWS 2007b, 2007c, 2007d).

6.1.3.2.2 Large Cetaceans

The most recent Marine Mammal Stock Assessment Report (SAR) (Waring et al. 2009) reviewed the current population trend for each of these cetacean species within U.S. EEZ waters, as well as providing information on the estimated annual human-caused mortality and serious injury, and a description of the commercial fisheries that interact with each stock in the U.S. Atlantic. Information from the SAR is summarized below.

The western North Atlantic baleen whale species (North Atlantic right, humpback, fin, sei, and minke) follow a general annual pattern of migration from high latitude summer foraging grounds, including the Gulf and Maine and Georges Bank, to low latitude winter calving grounds (Perry et al. 1999, Kenney 2002). However, this is an oversimplification of species movements, and the complete winter distribution of most species is unclear (Perry et al. 1999, Waring et al. 2009). Studies of some of the large baleen whales (right, humpback, and fin) have demonstrated the presence of each species in higher latitude waters even in the winter (Swingle et al. 1993, Wiley et al. 1995, Perry et al. 1999, Brown et al. 2002, Patrician et al. 2009). Blue whales are most often sighted on the east coast of Canada, particularly in the Gulf of St. Lawrence, and occurs only infrequently within the U.S. EEZ (Waring et al. 2002).

In comparison to the baleen whales, sperm whale distribution occurs more on the continental shelf edge, over the continental slope, and into mid-ocean regions (Waring et al. 2006). However, sperm whales distribution in U.S. EEZ waters also occurs in a distinct seasonal cycle (Waring et al. 2006). Typically, sperm whale distribution is concentrated east-northeast of Cape Hatteras in winter and shifts northward in spring when whales are found throughout the Mid-Atlantic Bight (Waring et al. 2006). Distribution extends further northward to areas north of Georges Bank and the Northeast Channel region in summer and then south of New England in fall, back to the Mid-Atlantic Bight (Waring et al. 1999).

For North Atlantic right whales, the available information suggests that the population is increasing at a rate of 1.8 percent per year during 1990-2003, and the total number of North Atlantic right whales is estimated to be at least 323 animals in 2003 (Waring et al. 2009). The minimum rate of annual human-caused mortality and serious injury to right whales averaged 3.8 per year during 2002 to 2006 (Waring et al. 2009). Of these, 1.4 per year resulted from fishery interactions. Recent mortalities included six female right whales, including three that were pregnant at the time of death (Waring et al. 2009).

The North Atlantic population of humpback whales is estimated to be 11,570, although the estimate is considered to be negatively biased (Waring et al. 2009). The best estimate for the Gulf of Maine stock of humpback whales is 847 whales (Waring et al. 2009). The population trend was considered positive for the Gulf of Maine population, but there are insufficient data to estimate the trend for the larger North Atlantic population. Based on data available for selected areas and time periods, the minimum population estimates for other western north Atlantic whale stocks are 2,269 fin whales, 207 sei whales, 4,804 sperm whales, and 3,312 minke whales (Waring et al. 2009). No recent estimates are available for blue whale abundance. Insufficient data exist to determine trends for any other large whale species.

The ALWTRP was recently revised with publication of a new final rule (72 FR 57104, October 5, 2007) that is intended to continue to address entanglement of large whales (right, humpback, fin, and minke) in fixed commercial fishing gear (i.e., pot, trap, and gillnet fisheries) and to reduce the risk of death and serious injury from entanglements that do occur.

6.1.3.2.3 Small Cetaceans

Numerous small cetacean species (dolphins; pygmy and dwarf sperm whales; pilot and beaked, whales; and the harbor porpoise) occur within the area from Cape Hatteras through the Gulf of Maine. Seasonal abundance and distribution of each species in the Mid-Atlantic, Georges Bank, and/or Gulf of Maine waters varies with respect to life history characteristics. Some species primarily occupy continental shelf waters (e.g., white sided dolphins, harbor porpoise), while others are found primarily in continental shelf edge and slope waters (e.g., Risso's dolphin), and still others occupy all three habitats (e.g., common dolphin, spotted dolphins, striped dolphins). Information on the western North Atlantic stocks of each species is summarized in Waring et al. (2009).

6.1.3.2.4 Pinnipeds

Of the four species of seals expected to occur in the area, harbor seals have the most extensive distribution with sightings occurring as far south as 30° N (Katona et al. 1993, Waring et al. 2009). Gray seals are the second most common seal species in U.S. EEZ waters, occurring primarily in New England (Katona et al. 1993; Waring et al. 2009). Pupping for both species occurs in both U.S. and Canadian waters of the western north Atlantic with the majority of harbor seal pupping likely occurring in U.S. waters and the majority of gray seal pupping in Canadian waters, although there are at least three gray seal pupping colonies in U.S. waters as well. Harp and hooded seals are less commonly observed in U.S. EEZ waters. Both species

form aggregations for pupping and breeding off eastern Canada in the late winter/early spring, and then travel to more northern latitudes for molting and summer feeding (Waring et al. 2006). Both species have a seasonal presence in U.S. waters from Maine to New Jersey, based on sightings, stranding, and fishery bycatch (Waring et al. 2009).

6.1.3.3 Species Not Likely to be Affected

The Gulf of Maine (GOM) Distinct Population Segment (DPS) of anadromous Atlantic salmon was initially listed by the USFWS and NMFS (collectively, the Services) as an endangered species on November 17, 2000 (65 FR 69459). A subsequent listing as an endangered species by the Services on June 19, 2009 (74 FR 29344) included an expanded range for the GOM DPS of Atlantic salmon.

Presently, the GOM DPS includes all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River. Included are all associated conservation hatchery populations used to supplement these natural populations; currently, such conservation hatchery populations are maintained at Green Lake National Fish Hatchery (GLNFH) and Craig Brook National Fish Hatchery (CBNFH). Coincident with the June 19, 2009 endangered listing, NMFS designated critical habitat for the GOM DPS of Atlantic salmon (74 FR 29300; June 19, 2009). The critical habitat designation for the GOM DPS includes 45 specific areas occupied by Atlantic salmon at the time of listing that include approximately 19,571 km of perennial river, stream, and estuary habitat and 799 square km of lake habitat within the range of the GOM DPS and in which are found those physical and biological features essential to the conservation of the species. The entire occupied range of the GOM DPS in which critical habitat is designated is within the State of Maine.

The action being considered in the EA is not likely to adversely affect shortnose sturgeon, the Gulf of Maine distinct population segment (DPS) of Atlantic salmon, hawksbill sea turtles, blue whales, or sperm whales, all of which are listed as endangered species under the ESA. Shortnose sturgeon and salmon belonging to the Gulf of Maine Distinct Population Segment (DPS) occur within the general geographical areas fished by the herring fishery, but they are unlikely to occur in the area where the fleet operates given their numbers and distribution. Therefore, none of these species are likely to be affected by the new measures. The following discussion provides the rationale for these determinations. Although there are additional species that may occur in the operations area that are not known to interact with the specific gear types that would be used by the herring fishery, impacts to these species are still considered due to their range and similarity of behaviors to species that have been adversely affected.

Shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. Shortnose sturgeon can be found in rivers along the western Atlantic coast from St. Johns River, Florida (although the species is possibly extirpated from this system), to the Saint John River in New Brunswick, Canada. The species is anadromous in the southern portion of its range (i.e., south of Chesapeake Bay), while some northern populations are amphidromous (NMFS 1998). Since the herring fishery would not operate in or near the rivers where concentrations of

shortnose sturgeon are most likely found, it is highly unlikely that the herring fishery would affect shortnose sturgeon.

The wild populations of Atlantic salmon found in rivers and streams from the lower Kennebec River north to the U.S. - Canada border are listed as endangered under the ESA. These populations include those in the Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot Rivers and Cove Brook. Juvenile salmon in New England rivers typically migrate to sea in May after a 2- to 3-year period of development in freshwater streams, and remain at sea for two winters before returning to their U.S. natal rivers to spawn. Results from a 2001 post-smolt trawl survey in Penobscot Bay and the nearshore waters of the Gulf of Maine indicate that Atlantic salmon post-smolts are prevalent in the upper water column throughout this area in mid- to late May. Therefore, commercial fisheries deploying small-mesh active gear (pelagic trawls and purse seines within 10 m of the surface) in nearshore waters of the Gulf of Maine may have the potential to incidentally take smolts. Little information has been generated regarding salmon take by the herring fishery since Amendment 1 passed, thus, this species is not considered further in this EA.

The hawksbill turtle is uncommon in the waters of the continental U.S. Hawksbills prefer coral reefs, such as those found in the Caribbean and Central America. Hawksbills feed primarily on a wide variety of sponges but also consume bryozoans, coelenterates, and mollusks. The Culebra Archipelago of Puerto Rico contains especially important foraging habitat for hawksbills. Nesting areas in the western North Atlantic include Puerto Rico and the Virgin Islands. There are accounts of hawksbills in south Florida and individuals have been sighted along the east coast as far north as Massachusetts; however, east coast sightings north of Florida are rare (NMFS 2009a). Since operation of the herring fleet would not occur in waters that are typically used by hawksbill sea turtles, it is highly unlikely that its operations would affect this turtle species.

Blue whales do not regularly occur in waters of the U.S. EEZ (Waring et al. 2009). In the North Atlantic, blue whales are most frequently sighted in the St. Lawrence from April to January (Sears 2002). No blue whales were observed during the Cetacean and Turtle Assessment Program (CeTAP) surveys of the mid- and north Atlantic areas of the outer continental shelf (CeTAP 1982). Calving for the species occurs in low latitude waters outside of the area where the herring fleet operates. Blue whales feed on euphausiids (krill) that are too small to be captured in fishing gear. Given that the species is unlikely to occur in areas where the herring fishery operates, and given that the operation of the fleet would not affect the availability of blue whale prey or areas where calving and nursing of young occurs, the Proposed Action would not be likely to adversely affect blue whales.

Unlike blue whales, sperm whales do regularly occur in waters of the EEZ. However, the distribution of the sperm whales in the EEZ occurs on the continental shelf edge, over the continental slope, and into mid-ocean regions (Waring et al. 2006). In contrast, the herring fishery operates in continental shelf waters. The average depth of sperm whale sightings observed during the CeTAP surveys was 1792 m (CeTAP 1982). Female sperm whales and young males almost always inhabit open ocean, deep water habitat with bottom depths greater than 1000 m and at latitudes less than 40° N (Whitehead 2002). Sperm whales feed on large

squid and fish that inhabit the deeper ocean regions (Perrin et al. 2002). Given that sperm whales are unlikely to occur in areas (based on water depth) where the herring fishery operates, and given that the operation of the fleet would not affect the availability of sperm whale prey or areas where calving and nursing of young occurs, the Proposed Action would not be likely to adversely affect sperm whales.

Although large whales and marine turtles may be potentially affected through interactions with fishing gear, it is likely that the herring fishery would not have any adverse effects on the availability of prey for most of these species. Right whales and sei whales feed on copepods (Horwood 2002, Kenney 2002). The herring fishery would not affect the availability of copepods for foraging right and sei whales because copepods are very small organisms that would pass through herring fishing gear rather than being captured in it. Humpback whales and fin whales, however, feed on krill as well as small schooling fish (e.g., sand lance, herring, mackerel) (Aguilar 2002, Clapham 2002). The TRAC Status Report of 2006 suggests that although predator consumption estimates have increased since the mid-1980's, the productive potential of the herring stock complex has improved in recent years. The proposed management measures may provide a benefit to the protected resources by providing a greater quantity of food available. Moreover, none of the turtle species are known to feed upon groundfish.

6.1.3.4 Interactions Between Gear and Protected Resources

Commercial fisheries are categorized by NMFS based on a two-tiered, stock-specific fishery classification system that addresses both the total impact of all fisheries on each marine mammal stock as well as the impact of individual fisheries on each stock. The system is based on the numbers of animals per year that incur incidental mortality or serious injury due to commercial fishing operations relative to a stock's Potential Biological Removal (PBR) level (the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population). Tier 1 takes into account the cumulative mortality and serious injury to marine mammals caused by commercial fisheries while Tier 2 considers marine mammal mortality caused by the individual fisheries; Tier 2 classifications are used in this EA to indicate how each type of gear proposed for use in the Proposed Action may affect marine mammals (NMFS 2009b). Table 17 identifies the classifications used in the List of Fisheries (LOF) proposed for FY 2010 (50 CFR 229), which are broken down into Tier 2 Categories I, II, and III).

Table 17 Description of the Tier 2 Fishery Classification Categories

Category	Category Description
Tier 2, Category I	A commercial fishery that has frequent incidental mortality and serious injury of marine mammals. This classification indicates that a commercial fishery is, by itself, responsible for the annual removal of 50 percent or more of any stock's potential biological removal (PBR) level.
Tier 2, Category II	A commercial fishery that has occasional incidental mortality and serious injury of marine mammals. This classification indicates that a commercial fishery is one that, collectively with other fisheries, is responsible for the annual removal of more than 10 percent of any marine mammal stock's PBR level and that is by itself responsible for the annual removal of between 1 percent and 50 percent, exclusive of any stock's PBR.
Tier 2, Category III	A commercial fishery that has a remote likelihood of, or no known incidental mortality and serious injury of marine mammals. This classification indicates that a commercial fishery is one that collectively with other fisheries is responsible for the annual removal of: Less than 50 percent of any marine mammal stock's PBR level, or More than 1 percent of any marine mammal stock's PBR level, yet that fishery by itself is responsible for the annual removal of 1 percent or less of that stock's PBR level. In the absence of reliable information indicating the frequency of incidental mortality and serous injury of marine mammals by a commercial fishery, the Assistant Administrator would determine whether the incidental serious injury or mortality is "remote" by evaluating other factors such as fishing techniques, gear used, methods used to deter marine mammals, target species, seasons and areas fished, qualitative data from logbooks or fisher reports, stranding data, and the species and distribution of marine mammals in the area or at the discretion of the Assistant Administrator.

Interactions between gear and a given species occur when fishing gear overlaps both spatially and trophically with the species' niche. Spatial interactions are more "passive" and involve unintentional interactions with fishing gear. Trophic interactions are more "active" and occur when protected species attempt to consume prey caught in fishing gear and become entangled in the process. Spatial and trophic interactions can occur with various types of fishing gear used by the herring fishery through the year.

Although interactions between deployed gear and protected species would vary, all the species identified in the following table have the potential to be affected by the operation of the herring fishery. The herring fishery is prosecuted by midwater trawl gear (single), paired midwater trawls, purse seines, stop seines and weirs. A full description of the gear used in the fishery is provided in the Amendment 1 FSEIS. Only the first three are considered to be primary gears in the Atlantic herring fishery. Weirs and stop seines are responsible for a only a small fraction of herring landings (see Amendment 1 FSEIS), operate exclusively within State waters and are not regulated by the Federal FMP, and therefore will not be discussed further in this document relative to protected species. It should be noted, however, that both gear types have accounted for interactions with protected species, notably right, humpback and minke whales, and harbor porpoise, as well as harbor and gray seals. Animals, particularly pinnipeds, may be released alive.

Table 18 Marine Mammal Impacts Based on Herring Gear and Herring Fishing Areas (Based on 2010 List of Fisheries)

Fishery		Estimated Number of Vessels/Persons	Marine Mammal Species and Stocks Incidentally Killed or Injured
Category	**Type**		
Tier 2, Category II	Northeast midwater trawl (including pair trawl)	17	Harbor Seal, Western North Atlantic Long-finned pilot whale, Western North Atlantic Short-finned pilot whale, Western North Atlantic White-sided dolphin, Western North Atlantic
Tier 2, Category II	Mid-Atlantic midwater trawl (including pair trawl)	620	Bottlenosed dolphin WNA offshore Common dolphin, WNA Long-finned pilot whale, WNA Risso's dolphin, WNA Short-finned pilot whale, WNA White-sided dolphin, WNA
Tier 2, Category III	Gulf of Maine Atlantic herring purse seine	30	Harbor seal, Western North Atlantic Gray seal, Western North Atlantic
Tier 2, Category III	Gulf of Maine herring and Atlantic mackerel stop seine/weir	50	Gray seal, Northwest North Atlantic Harbor porpoise, Gulf of Maine/Bay of Fundy Harbor seal, Western North Atlantic Minke whale, Canadian East Coast White-sided dolphin, Western North Atlantic

Due to the remote likelihood of interactions denoted by the *List of Fisheries* designations for the purse seine fishery and stop seines and weirs, discussion of these fisheries will only be where necessary. This discussion, as well as that in Amendment 1, will instead focus on the proposed measures and associated mid-water trawl activities.

Given the target species of this fishery and because herring is a primary prey species for seals, porpoises and some whales, levels of protected species interactions with the fishery are likely for the mid-water and pair trawl. The NOAA Fisheries Northeast Fisheries Science Center incidental take reports are published on the Northeast Fisheries Science Center website - http://www.nefsc.noaa.gov/femad/fishsamp/fsb/ A number of takes have occurred in the past four years by the mid-water trawl fishery, as indicated in Table 19.

Table 19 Number of Incidental Takes Recorded by Fisheries Observers

Protected Species Encountered	2009 (Through July)	2008	2007	2006	Total
Grey Seal	1	2			3
Harbor Seal	1	1			2
Fin/Sei Whale		1			1
Humpback Whale		1			1
Pilot Whale		6			6
White-sided Dolphin		3	2	3	8
Seal Unk.			1		1

Although the incidents are isolated to observed herring trips, the table indicates that pilot whales and white-sided dolphin are the most likely to be taken in the herring mid-water trawl fishery. According to Waring *et al.* (2005), pilot whales are distributed along the continental shelf in winter and off the northeast coast in early spring. White-sided dolphins are also distributed offshore on the continental shelf, but seasonally move into the Bay of Fundy and Gulf of Maine. Interactions between each of these species and the herring fishery are most likely to occur in Areas 1B, 2 and 3, given their offshore distribution. Short-finned pilot whales may also interact with the fishery, but the possibility is more remote since the fishery occurs from Cape Hatteras north to the Gulf of Maine and the boundary between the two pilot whale species is the New Jersey/Cape Hatteras area. The humpback whale is a species that has not been recorded as interacting with the herring fishery significantly before.

Harbor porpoise and both gray and harbor seals are distributed inshore during the period of highest activity in the herring fishery, from May through October. Interactions are most likely to occur in Area 1A, although porpoise are also found in the Bay of Fundy and less frequently on the northern edge of Georges Bank. Although all three of these species have had documented interactions with the herring purse seine/fixed gear fishery, the animals, if observed, are often released alive.

6.1.3.5 Actions to Minimize Interactions with Protected Species

Many of the factors that serve to mitigate the impacts of the herring fishery on protected species are currently being implemented in the Northeast Region under the Atlantic Trawl Gear Take Reduction Strategy (ATGTRS). While neither the Atlantic Large Whale Take Reduction Plan (ALWTRP) nor the Harbor Porpoise Take Reduction Plan (HPTRP) contain any components that would serve to mitigate the impact of the herring fishery on protected species, they do benefit the protected species with which the herring fishery interacts. In addition, the Herring FMP has undergone repeated consultations pursuant to Section 7 of the Endangered Species Act (ESA), with the most recent Biological Opinion prepared by NOAA Fisheries in 1999. The conclusion in that Opinion states that the herring fishery is not likely to jeopardize the continued existence of threatened or endangered species or critical habitat. The Biological Opinion includes

an Incidental Take Statement that provides the fishery with an exemption to the take prohibitions established in Section 9 of the ESA.

6.1.3.5.1 Atlantic Trawl Gear Take Reduction Team/Atlantic Trawl Gear Take Reduction Strategy

The first meeting of the Atlantic Trawl Gear Take Reduction Team (ATGTRT) was held in September 2006. The ATGTRT was convened by NMFS as part of a settlement agreement between the Center for Biological Diversity and NOAA Fisheries Service to address the incidental mortality and serious injury of long-finned pilot whales, short-finned pilot whales, common dolphins, and white-sided dolphins in several trawl gear fisheries operating in the Atlantic Ocean. Incidental takes of pilot whales, common dolphins and white-sided dolphins have occurred in fisheries operating under the Atlantic Mackerel, Squid, and Butterfish FMP, as well as in midwater and bottom trawl fisheries in the Northeast and Mid-Atlantic regions.

In December of 2008 a Atlantic Trawl Gear Take Reduction Strategy (ATGTRS) was finalized. The ultimate goal of a Take Reduction Plan (TRP) was to reduce the incidental serious injury and mortality of marine mammals from commercial fishing operations to insignificant levels approaching a zero serious injury and mortality rate. At the time of the ATGTRS, however, none of these marine mammal stocks under consideration by the ATGTRT were classified as a strategic stock nor did they interact with a Category I fishery. The ATGTRT therefore felt that efforts should be made to identify and conduct research necessary to identify measures to reduce serious injury and mortality of marine mammals in Atlantic trawl fisheries and, ultimately, to achieve the MMPA's Zero Mortality Rate Goal.

To that end the ATGTRT developed two plans; an Education and Outreach Plan and a Research Plan, as a part of the ATGTRS. The Education and Outreach Plan identifies activities that promote the exchange of information necessary to reduce the bycatch of marine mammals in Atlantic trawl fisheries. The Research Plan identifies information and research needs necessary to improve our understanding of the factors resulting in the bycatch in Atlantic trawl fisheries.

6.1.3.5.2 Harbor Porpoise Take Reduction Plan

NMFS published the rule implementing the Harbor Porpoise Take Reduction Plan on December 1, 1998. The HPTRP includes measures for gillnet gear modifications and area closures, based on area, time of year, and mesh size. In general, the Gulf of Maine component of the HPTRP includes time and area closures, some of which are complete closures to gillnet gear only; others are closures to gillnet fishing unless pingers (acoustic deterrent devices) are used in the prescribed manner. An action proposed on July 21st, 2009 (74 *Federal Register* 36058**)** would also incorporate the concept of ''consequence'' closure areas in Southern New England. The Mid-Atlantic component includes time and area closures in which gillnet fishing is prohibited regardless of the gear specifications.

6.1.3.5.3 Atlantic Large Whale Take Reduction Plan

The ALWTRP contains a series of regulatory measures designed to reduce the likelihood of fixed fishing gear (gillnets, pots, and traps) entanglements of right, humpback, fin, and minke whales in the North Atlantic. The main tools of the plan include a combination of broad gear modifications and time/area closures (which are being supplemented by progressive gear research), expanded disentanglement efforts (which include an Atlantic Large Whale Disentanglement Network which includes governmental and non-governmental agencies in addition to fishermen), extensive outreach efforts in key areas, whale research, and an expanded right whale surveillance program to supplement the Mandatory Ship Reporting System.

6.1.4 Non-target and Bycatch Species

"Non-target species" refers to the other species which permitted herring vessels land while fishing for herring. These other fish species may be caught by the same gear while fishing for herring, and sold assuming the vessel has proper authorization or permit(s). As defined in the MSA, "bycatch" refers to "fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards." For the purposes of this EA, the discussion of non-target species and bycatch refers primarily to mackerel, dogfish, and herring based the catch and discard data by weight on observed herring trips from 2007-2009 (Table 35-Table 46). These species predominate bycatch (i.e., herring and dogfish) or are the primary alternate species that are landed by herring vessels (i.e., mackerel). Mackerel is commonly landed when caught. Spiny dogfish, which tend to be relatively abundant in catches, may be landed but are often the predominant component of the discarded bycatch. Herring, though the target species, may be discarded for various reasons discussed below.

6.1.4.1 Spiny Dogfish

Dogfish are sometimes kept and landed as a non-target species, however, the majority of dogfish are discarded as bycatch. On 133 observed herring trips taken between 2007-2009, 15-20% of the pounds discarded were dogfish.

6.1.4.1.1 Life History

The spiny dogfish, *Squalus acanthias*, is distributed in the western North Atlantic from Labrador to Florida and are considered to be a unit stock off the coast of New England. In summer, dogfish migrate northward to the Gulf of Maine-Georges Bank region and into Canadian waters and return southward in autumn and winter. Spiny dogfish tend to school by size and, when mature, by sex. The species bears live young, with a gestation period of about 18 to 22 months, and produce between 2 to 15 pups with an average of 6. Size at maturity for females is around 80 cm, but can vary from 78 cm to 85 cm depending on the abundance of females.

6.1.4.1.2 Population Management and Status

The fishery is managed under an FMP developed jointly by the NEFMC and Mid-Atlantic Fishery Management Council (MAFMC) for Federal waters and a plan developed concurrently by the Atlantic States Marine Fisheries Commission (ASMFC) for state waters. Spawning stock biomass of spiny dogfish declined rapidly in response to a directed fishery during the 1990's. Management measures, initially implemented in 2001, have been effective in reducing landings and reducing fishing mortality. Overfishing is not presently considered to be occurring. Conclusions regarding the overfished and overfishing status of spiny dogfish are strongly dependent on the NEFSC spring survey results in 2006. Future surveys will be closely monitored to determine if the 2006 results signal a true increase in abundance (Sosebee and Rago, 2006).

6.1.4.2 Mackerel

As a non-target species in the herring fishery, mackerel were noted to be caught along with herring and landed. On 133 observed herring trips taken between 2007 and 2009, mackerel represented 15-20% of the lbs kept (versus discarded). Most of the catch is herring; mackerel represents the second most retained species.

6.1.4.2.1 Life History

Atlantic mackerel is a pelagic, schooling species distributed between Labrador (Parsons 1970) and North Carolina (Anderson 1976a). A southern group begins its spring migration from waters off North Carolina and Virginia in March- April, and moves northward, reaching New Jersey and Long Island usually by April-May, where spawning occurs. Both groups make extensive northerly (spring) and southerly (autumn) migrations to and from spawning and summer feeding grounds. Both groups overwinter between Nova Scotia and Cape Hatteras (USDC 1984a).

The southern group spawns from mid-April to June in the Mid-Atlantic Bight and the Gulf of Maine and the northern group spawns in the southern Gulf of St. Lawrence from the end of May to mid-August (Morse 1978). Most spawn in the shoreward half of continental shelf waters, although some spawning extends to the shelf edge and beyond. Average size at maturity is about 10.5-11" FL (Grosslein and Azarovitz 1982) and maximum age observed is 17 years (Pentilla and Anderson 1976).

6.1.4.2.2 Population Management and Status

The MAFMC manages the Atlantic mackerel along with squid and butterfish (MSB) fisheries with the MSB FMP. The mackerel stock is not overfished and overfishing is not occurring. A December 2009 TRAC will re-assess the status.

6.1.4.3 Haddock

As a non-target species Haddock is caught occasionally as bycatch in the Herring fishery when they are encountered unusually high in the water column. On 133 observed herring trips taken between 2007-2009, less than 15% of the pounds discarded were haddock, however the joint

measure with the Northeast Multispecies FMP being considered in the amendment makes this species relevant.

6.1.4.3.1 Life History

The demersal species *Melanogrammus aeglefinus* is distributed from Cape May, New Jersey to the Strait of Belle Isle, Newfoundland in the northwest Atlantic. Six different haddock stocks have been identified, two of which are in the U.S: the Georges Bank stock and the Gulf of Maine stock. Georges Bank is the primary spawning areas from January to June however peak spawning season runs from February to April. Large adults, commonly found in deeper water than the juveniles, undertake seasonal movements from the deeper waters to the shoals in the spring to spawn. An average-sized female, approximately 55 cm, can produce around 850,000 eggs, however larger females are capable of producing up to 3 million eggs annually. (Brodziak and Traver, 2006)

6.1.4.3.2 Population Management and Status

A complex of 15 groundfish are managed under the Northeast Multispecies FMP by the NEFMC in the U.S. Management measures have been in place since 1994 and in 2004 a transboundary eastern Georges Bank haddock management unit was established, which allows both the US and Canada to have separate TACs. The Northeast Multispecies FMP has been updated through a series of amendments and framework adjustments, the most recent of which was Amendment 16. The amendment implemented a broad range of measures that were designed to achieve mortality targets, provide opportunities to target healthy stocks, mitigate (to the extent possible) the economic impacts of the measures, and improve administration of the fishery (NEFMC 2009). The GARM III (2008) determined that the status of both stocks (Georges Bank and Gulf of Maine) had been elevated from the status of overfished but not overfishing (in the 2004 GARM II) to a status of not overfished and not overfishing.

6.1.4.3.3 Haddock Incidental Catch

6.1.4.3.4 The management measures in Framework 43 to the Northeast Multispecies FMP established a catch cap for haddock in the Atlantic herring fishery, based on the following provisions:

- Vessels issued an All Areas or Areas 2 and 3 Limited Access herring permit may possess and land haddock and other regulated species smaller than the minimum sizes established by the NE multispecies regulations. Such vessels may not use a multispecies Day at Sea (DAS) or sell any NE multispecies for human consumption.
- Vessels issued an All Areas or Areas 2 and 3 Limited Access herring permit are prohibited from discarding haddock that has been brought on the deck or pumped into the hold.
- Vessels issued an All Areas or Areas 2 and 3 Limited Access herring permit may possess and land up to 100 lb, combined, of other regulated NE multispecies on all trips that do not use a multispecies DAS. Such fish may not be sold for human consumption.

- Vessels issued an All Areas or Areas 2 and 3 Limited Access herring permit must notify NMFS of their intent to land at least 6 hours prior to landing.
- An incidental haddock catch allowance is specified for the herring fishery. When the catch allowance has been attained, all vessels issued a herring permit or fishing in the Federal portion of the GOM/GB Herring Exemption Area are prohibited from fishing for, possessing, or landing herring in excess of 2,000 lb per trip in or from the GOM/GB Herring Exemption Area, unless all herring possessed and landed by the vessel were caught outside the GOM/GB Herring Exemption Area and the vessel complies with the gear stowage provisions while transiting the Exemption Area.
- When the incidental haddock catch allowance has been attained, the haddock possession limit is reduced to 0 lb for all vessels issued a herring permit, including those issued an All Areas or Areas 2 and 3 Limited Access herring permit.
- Herring dealers and processors that sort herring as part of their operations are required to separate out, report, retain and make available for inspection all haddock offloaded from vessels that have an All Areas or Areas 2 and 3 Limited Access herring permit. This requirement applies to vessels issued an at-sea processing permit. Such haddock may not be sold and must be retained for 12 hours. At-sea processing vessels must retain such haddock for 12 hours following landing.

The haddock catch cap is established in conjunction with the other NE multispecies TACs, which are specified for a fishing year that covers the period May 1 – April 30. The cap for the period May 1, 2008 – April 30, 2009 was 541,925 lb. Reported haddock catch through May 22, 2009 was 37,126 lb.

The cap for the period May 1, 2009 - April 30, 2010 is 316,218 lb. At this time, 12,215 lb has been documented towards the 2009-2010 catch cap.

6.1.4.4 Atlantic Herring

The life history and status of Atlantic herring was described in (Section 6.1.1) and more thoroughly in the EIS for Amendment 1 to the FMP. As a bycatch species, the industry indicates herring is discarded due to mechanical issues associated with gear, poor species composition of a tow, test tows, or poor herring quality (feedy). Species composition is an issue when too many dogfish are in the net which are impossible to pump out. On 133 observed herring trips taken between 2007 and 2009, 45-50% of the pounds discarded were herring. Further discussion of herring discards appears at 5.3.3 and discusses herring discards as a portion of overall catch for the entire herring fishery.

6.2 HUMAN ENVIRONMENT

6.2.1 Atlantic Herring Fishery

A complete description of the Atlantic herring fishery – vessels, processors, and communities – is provided in Amendment 1 to the Herring FMP. The following subsections update general fishery information through the 2008 fishing year and is consistent with information provided in previous SAFE Reports. The Amendment 1 FSEIS should be referenced for additional information.

6.2.1.1 Herring IVR Landings

The main reason for utilizing the interactive voice response (IVR) system in the Atlantic herring fishery is to monitor the Total Allowable Catch (TAC) limits set for the four Federal management areas. As part of the herring FMP, each management area is annually assigned a TAC (in metric tons). Although harvesters are required to also report catches with vessel trip report (VTR) forms, near real-time data is obtained through the IVR system allowing the TACs to be monitored. As of the 2008 fishing year, the 3% research set-aside established in Amendment 1 requires that when the catch in a management area is projected to reach 92% of its specified TAC, the Regional Administrator closes the area to all directed herring fishing. The 2008 fishing year was the eighth year of mandatory IVR reporting for the Atlantic herring fleet.

Table 20 Total Allowable Catches (TACs) for 2008 Fishing Year

Management Area	TAC (mt)	92% of TAC (mt)
Area 1A (Jan 1st – May 31st)	5,000	N/A
Area 1A (June 1st – Dec 31st)	40,000	N/A
Area 1A TOTAL	45,000	41,400
Area 1B	10,000	9,200
Area 2	30,000	27,600
Area 3	60,000	55,200

Note: Research set-asides were only utilized in Area 1A and 1B during 2008, so the 3% set-aside was made available to the fishery. The same has occurred in 2009.

Table 21 Total IVR Landings of Atlantic Herring, 2000-2008

Year	Total IVR Landings (MT)
2000	107,387
2001	121,569
2002	91,831
2003	100,544
2004	93,722
2005	96,895
2006	99,185
2007	78,172
2008	80,800

Table 22 provides IVR catches for the 2008 fishing year. Overall, the IVR reports totaled 80,800 mt of herring across all management areas, which represents about 56% of the OY for the U.S. fishery (145,000 mt) . Consistent with previous years, the majority of the landings were taken from Area 1 (1A and 1B). Part of the reduction in total landings since 2006 is attributable to a 15,000 mt decrease in the TAC for Area 1A. Overall, the timing of the fishery appears to have been consistent with previous years (Figure 24). However, fishing effort in Area 1A was distributed over the year in a more step-wise fashion due to adjustments to the days out provisions that are intended to slow the pace of the fishery (Figure 25). In 2008, the Area 1A fishery closed on November 14, 2008.

Table 22 IVR Herring Catch for 2008 Fishing Year

Management Area	IVR Catch (mt)	% of TAC
Area 1A (Jan 1st – May 31st)	0	N/A
Area 1A (June 1st – Dec 31st)	41,640	N/A
Area 1A TOTAL	41,640	92.5%
Area 1B	8,104	81%
Area 2	19,256	64.2%
Area 3	11,800	19.7%
Total	**80,800**	**55.7%**

Figure 24 Cumulative Total Catch of Atlantic Herring in All Management Areas by Week, 2004-2008 (IVRs)

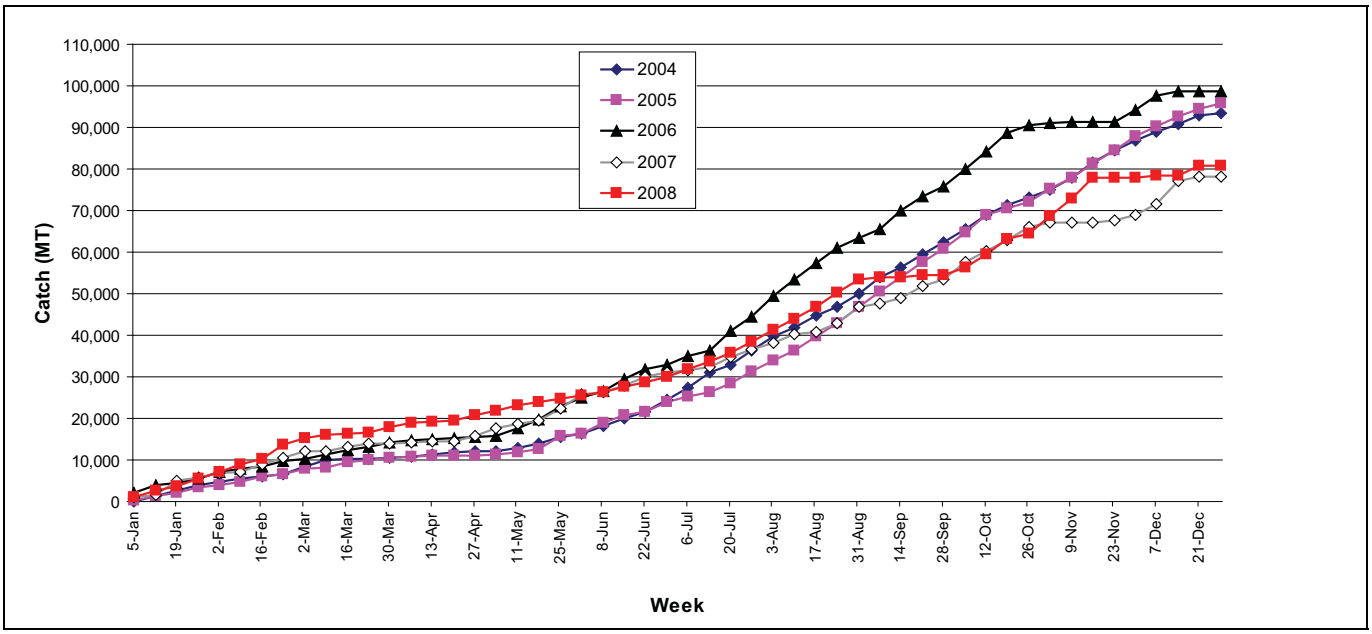


Figure 25 Cumulative Total Catch of Atlantic Herring in Area 1A by Week, 2004-2008 (IVRs)

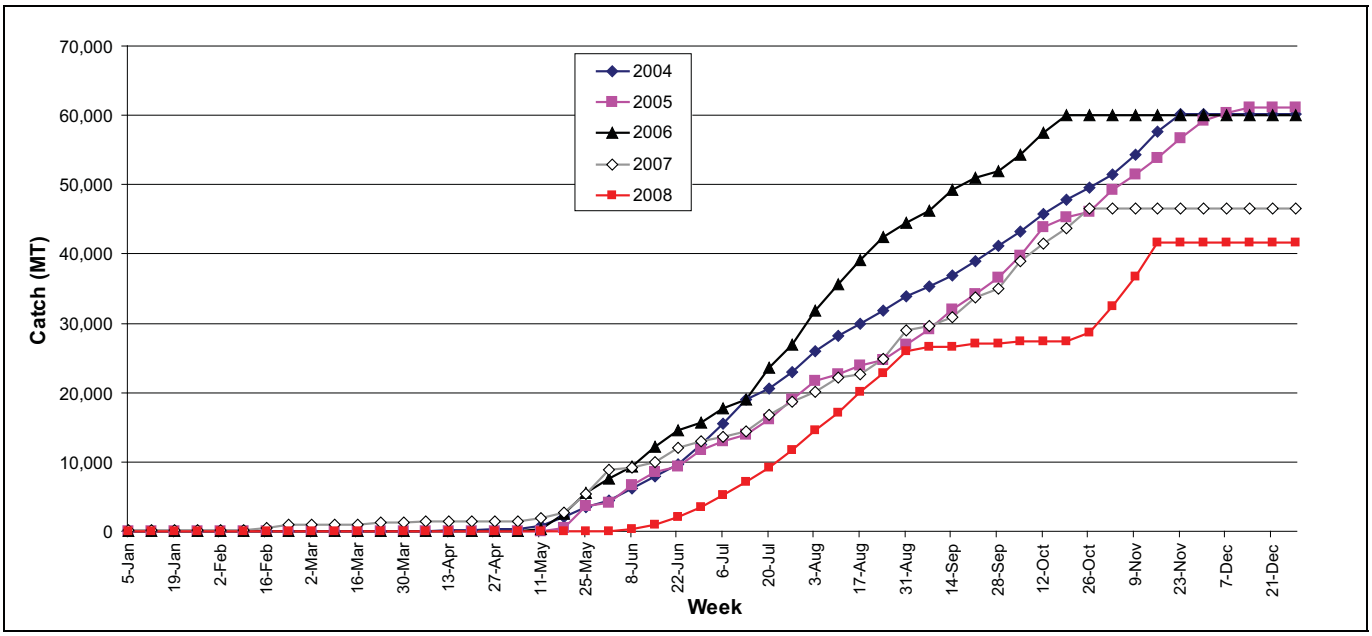


Table 23 shows the differences in IVR-reported herring catch by management area from 2007 to 2008. The decrease in Area 1A catch corresponds with the additional 5,000 mt decrease in the 1A TAC from 50,000 mt in 2007 to 45,000 mt in 2008. Catch from Area 1B increased to compensate, in part, for the catch reduction in Area 1A. The Area 2 fishery increased substantially. Landings from Area 3 increased as well but remain far lower than the 60,000 mt TAC for that area. Overall, landings increased from 2007 to 2008 by 2,628 metric tons (+3.4%) but remain considerably lower than years prior to 2007 and well below the total available OY for the U.S. Atlantic herring fishery.

Table 23 Differences in IVR Herring Catch by Management Area, 2007-2008

Management Area	2007 Catch (mt)	2008 Catch (mt)	Difference (mt)
1A	46,870	41,640	**-5,230**
1B	6,859	8,104	**+1,245**
2	14,687	19,256	**+4,569**
3	9,756	11,800	**+2,044**
Total	**78,172**	**80,800**	**+2,628**

Table 24provides 2009 IVR-reported Atlantic herring catch through September 24, 2009. The Atlantic herring fishery is monitored using data provided by federally-permitted fishing vessels weekly through the IVR system and supplemented by NMFS using other data sources where IVR data are not available. For quota monitoring purposes, IVR data are compared to federal and state dealer data each week and, dealer reports are used to supplement the IVR when necessary. These supplements include data from non-federally permitted inshore fisheries when provided by state agencies or from other sources.

Table 24 2009 IVR Herring Catch Through September 24, 2009

Management Area	IVR Reports Without Supplements			Supplemented with Dealer Data	
	Cumulative Catch (mt)	Quota (mt)	Percent of Quota (%)	Cumulative Catch (mt)	Percent of Quota (%)
1A	22,160	43,150	51%	22,224[1]	52%[1]
1B	1,602	9,700	17%	1,604	17%
2	25,620	30,000	85%	26,643	89%
3	11,622	60,000	19%	11,815	20%
Total	61,004	142,850	43%	62,286	44%

[1] *Includes current ME state-only vessel herring landings.*

6.2.1.2 Landings from State Waters

Atlantic Herring are regulated by the Atlantic States Marine Fisheries Commission's (Commission) Atlantic Herring Section (Section) in state waters from Maine through New Jersey. The Section developed and adopted Amendment 2 to the Interstate FMP for Atlantic Herring as a complimentary document to the Council's Amendment 1. The Section's adoption of Amendment 2 and the Council's adoption of Amendment 1 were vital steps towards the creation of a complementary and comprehensive herring management program between state and federal waters. 2007 was the first full year under both amendments. The Commission adopted Addendum I to Amendment 2 in March 2009.

Management in state and federal waters is largely identical. State and federal plans delineate four management areas, each of which are assigned a maximum total allowable catch (TAC). The Commission and Council have worked cooperatively to establish identical TACs for each area since these areas were created. TACs are set based on maximum sustainable yield (MSY) derived from OY, allowing fishermen to harvest a sustainable amount of herring while accounting for herring's role as a forage species. Three percent of the TAC for each area may be set aside for research.

There are a few differences between state and federal management. The Council implemented a mid-water trawl ban from June 1 – September 30 beginning in 2007 while no such regulation exists in state waters. The Commission has implemented month long spawning closures in the Gulf of Maine and 'days out' effort controls. Vessels may not land herring on any day designated as a 'day out' of the fishery and may only land once per 24 hour period. At the beginning of each fishing year, Section members from states adjacent to a management area will meet to review the TAC and catch projections, and set days out accordingly. Addendum I to the Commission's Amendment 2 gives the Section the option to divide the Area 1A TAC into quota periods.

The Commission is currently developing two draft addenda. Draft Addendum II will propose changes to the Commissions specification setting process including options that are consistent with reauthorized Magnuson Stevens Act and Draft Addendum III will propose days out exemption for small mesh bottom trawl vessels.

Landings by non-federally permitted vessels comprise a small amount of overall landings and made up only 243 metric tons (Table 25) in 2008 accounting for 2.9% percent of total U.S. landings (83,600 mt) in 2008.

Table 25 2008 Atlantic Herring Landings by Non-Federally-Permitted Vessels

State	Live Pounds	Metric Tons
CT*		
DE*		
MD*		
ME	392,999	178.26
NJ*		
NY	107,295	48.67
VA	5,258	2.38
Total	**536,036**	**243.14**

Provided by ACCSP for non-federally-permitted vessels.
**Indicates data are confidential.*

6.2.1.3 Herring Fishery – Economic Factors

One of the major features of Amendment 1 was the establishment of a limited access program in the herring fishery. There are four permit categories: 1) limited access permit for all management areas (Category A); 2) limited access permit for access to Areas 2 and 3 only (Category B); 3) limited access incidental catch permit for 25 mt per trip (Category C); and 4) an open access incidental catch permit for 3 mt per trip (Category D).

With the implementation of the limited access permit program in Amendment 1, the following numbers of vessels applied for and received permits in 2008:

- Category A – 41 vessels;
- Category B – 4 vessels;
- Category C – 50 vessels; and
- Category D – 2,275 vessels.

As of April, 2009, the following information is available about vessel permitting:

Table 26 Amendment 1 Limited Access Permits Issued as of April 2009

2009 Permits Issued (LA = limited access)			
Category A (LA All Areas)	Category B (LA Areas 2/3)	Category C (LA Incidental)	Category D (Open Access)
41	4	54	2,272

Not all of the vessels that received Amendment 1 herring permits were active during the 2008 fishing year. Table 27 classifies all ***active*** vessels – those that reported landing herring by principal gear (based on the gear which earned the most revenue for the vessel in a given year) and permit category (in 2005 and 2006, there were two open access permit categories based on intended level of herring catch). The majority of the vessels that had Category 1 permits in 2005

and 2006 qualified for either the all-areas limited access permit or the limited access Areas 2 and 3 only permit. The majority of Category 2 permits in 2005 and 2006 obtained either the limited access incidental catch permit or open access permit. However, there were a few vessels in which these patterns were reversed. The vessels in the "no permit" category did not obtain any kind of permit for herring after the implementation of Amendment 1 and do not have significant landings.

Table 28 shows the 2008 landings by gear used, management area, and permit category. Nearly 98% of the total 2008 landings are landed by vessels with an all-areas limited access permit. Approximately 28% of the total landings in 2008 were from limited access purse seine vessels landing herring from Area 1A. Approximately 18% were from limited access pair trawl vessels landing herring from Area 1A. As far as catch by gear type, nearly 60% of the landings were by pair trawl vessels; a third of which is from Area 1A. Purse seine vessel landed 32% of the total with nearly 90% of the purse seine catch coming form Area 1A.

Table 29 summarizes the number of trips and days absent by management area and permit category for the 2008 fishing year.

Table 30 and Table 31 summarize the number of trips and the amount of Atlantic herring landings, respectively, by fishing port and permit category, for the 2008 fishing year. The majority of the limited access directed fishery for Atlantic herring (Category A permits) operates from ports in Maine and Massachusetts, with another smaller component operating out of Cape May, New Jersey and RI/CT.

6.2.1.4 2008 Atlantic Herring Revenues

Based on dealer weighout reports, herring revenues by permit category during the 2008 fishing year were:

- Category A - $19.9 million;
- Category B – cannot report, less than three vessels;
- Category C - $19,500;
- Category D - $86,700.

Note: all vessels are considered small businesses according to the Small Business Administration's definition of having less than $4 million in gross revenues.

As compared to 2007, the total value of landings were significantly lower in 2008 for Category C and D vessels. Category C value of landings were $485,000 in 2007 and $207,000 for Category D vessels. Conversely, Category A landings rose to $19.9 million from $15.7 million.

Table 27 Number of Vessels by Principal Gear and Permit Category (VTR Data, 2005-2008)

		2005 Permit Category			
		Category 1	Category 2	No Permit	Total
2005	PURSE SEINE	4			**4**
	MIDWATER TRAWL	5	6		**11**
	PAIR TRAWL	12			**12**
	BOTTOM TRAWL	7	45	6	**58**
	SEINE/WEIR			1	**1**
	OTHER		42	16	**58**
	TOTAL	28	93	23	**144**
		2006 Permit Category			
		Category 1	Category 2	No Permit	Total
2006	PURSE SEINE	4	2		**6**
	MIDWATER TRAWL	6	5		**11**
	PAIR TRAWL	14	1		**15**
	BOTTOM TRAWL	9	50	9	**68**
	SEINE/WEIR			1	**1**
	OTHER		37	20	**57**
	TOTAL	33	95	30	**158**

		2007 Permit Category					
		All Areas	Areas 2/3	LA Inc. Catch	Open Access	No Permit	Total
2007	PURSE SEINE	6			5		**11**
	MIDWATER TRAWL	4			3		**7**
	PAIR TRAWL	13			1		**14**
	BOTTOM TRAWL	5	2	11	56	14	**88**
	SEINE/WEIR				36	14	**50**
	TOTAL	28	2	11	101	28	**170**
		2008 Permit Category					
		All Areas	Areas 2/3	LA Inc. Catch	Open Access	No Permit	Total
2008	PURSE SEINE	4			1	4	**9**
	MIDWATER TRAWL	3			3		**3**
	PAIR TRAWL	16			1		**17**
	BOTTOM TRAWL	3	1	12	46	6	**68**
	SEINE/WEIR				4		**4**
	OTHER				25	13	**38**
	TOTAL	26	1	12	72	28	**139**

Table 28 2008 Herring Landings (mt) by Gear and Amendment 1 Permit Category (VTR Data)

	Management Area	Amendment 1 Permit Category					
		All Areas	Areas 2/3	LA Inc. Catch	Open Access	No Permit	Total
PURSE SEINE	**1A**	23,389			347	302	**24,038**
	1B	2,637			14		**2,651**
	3X	90					**90**
	Unknown	93				55	**147**
MIDWATER TRAWL	**1A**	1,137					**1,137**
	1B	797					**797**
	2X	558					**558**
	3X	1,531					**1,531**
PAIR TRAWL	**1A**	14,987					**14,987**
	1B	4,104					**4,104**
	2X	19,471				63	**19,534**
	3X	11,520					**11,520**
	Unknown	50					**50**
BOTTOM TRAWL	**1A**	93		58	72	1	**223**
	2X	1,309	c	20	23	22	**c**
	3X			1	2		**3**
OTHER	**1A**				3	1	**4**
	1B						
	2X				3		**3**

Table 29 Number of Trips and Days Absent by 2008 Permit Category

GEAR TYPE	AREA		2008 PERMIT CATEGORY					2008 TOTAL
			A	B	C	D	#N/A	
PURSE SEINE	**1A**	Number of trips	193			7	15	215
		Total days absent	460			14	24	498
		Average trip length	2.4			2.0	1.6	2.3
	1B	Number of trips	20			1		21
		Total days absent	49			1		50
		Average trip length	2.5			1.0		2.4
	3X	Number of trips	1					1
		Total days absent	3					3
		Average trip length	3.0					3.0
	(blank)	Number of trips	1				8	9
		Total days absent	3				9	12
		Average trip length	3.0				1.1	1.3
	Total	**Number of trips**	215			8	23	246
		Total days absent	515			15	33	563
		Average trip length	2.4			1.9	1.4	2.3
MIDWATER TRAWL	**1A**	Number of trips	4					4
		Total days absent	17					17
		Average trip length	4.3					4.3
	1B	Number of trips	7					7
		Total days absent	21					21
		Average trip length	3.0					3.0
	2X	Number of trips	12					12
		Total days absent	56					56
		Average trip length	4.7					4.7
	3X	Number of trips	9					9
		Total days absent	40					40
		Average trip length	4.4					4.4
	Total	**Number of trips**	32					32
		Total days absent	134					134
		Average trip length	4.2					4.2

Table 30 Number of Trips and Days Absent by 2008 Permit Category

GEAR TYPE	AREA		2008 PERMIT CATEGORY					2008 TOTAL
			A	B	C	D	#N/A	
PAIR TRAWL	**1A**	Number of trips	67					67
		Total days absent	226					226
		Average trip length	3.4					3.4
	1B	Number of trips	22					22
		Total days absent	59					59
		Average trip length	2.7					2.7
	2X	Number of trips	131				1	132
		Total days absent	560				8	568
		Average trip length	4.3				8.0	4.3
	3X	Number of trips	54					54
		Total days absent	241					241
		Average trip length	4.5					4.5
	Total	**Number of trips**	274				1	275
		Total days absent	1086				8	1094
		Average trip length	4.0				8.0	4.0
BOTTOM TRAWL	**1A**	Number of trips	1		117	228	14	360
		Total days absent	2		119	232	14	367
		Average trip length	2.0		1.0	1.0	1.0	1.0
	2X	Number of trips	37	31	51	149	22	290
		Total days absent	146	33	91	215	23	508
		Average trip length	3.9	1.1	1.8	1.4	1.0	1.8
	3X	Number of trips			3	2		5
		Total days absent			11	12		23
		Average trip length			3.7	6.0		4.6
	Total	**Number of trips**	38	31	171	379	36	655
		Total days absent	148	33	221	459	37	898
		Average trip length	3.9	1.1	1.3	1.2	1.0	1.4

Table 31 Number of Trips and Days Absent by 2008 Permit Category

GEAR TYPE	AREA		2008 PERMIT CATEGORY					2008 TOTAL
			A	B	C	D	#N/A	
OTHER	**1A**	Number of trips				33	52	85
		Total days absent				33	52	85
		Average trip length				1.0	1.0	1.0
	2X	Number of trips				107	4	111
		Total days absent				111	4	115
		Average trip length				1.0	1.0	1.0
	(blank)	Number of trips					5	5
		Total days absent					6	6
		Average trip length					1.2	1.2
	Total	**Number of trips**				140	61	201
		Total days absent				144	62	206
		Average trip length				1.0	1.0	1.0

Table 32 2008 Trips by Port and Permit Category

NUMBER OF TRIPS		2008 PERMIT CATEGORY			
STATE	**PORT**	**A**	**B**	**C**	**D**
	Fall River	5			
	Gloucester	120		3	39
	New Bedford	107			
	Other MA			2	41
MA Total		232		5	80
	Port Clyde	25			10
	Portland	80			1
	Stonington	56			
	Rockland	103			
	Vinalhaven	18			
	Other ME	2			101
ME Total		284			112
	Portsmouth			6	18
	Seabrook			102	60
	Other NH	2		7	
NH Total		2		115	78
	Belford				30
	Cape May	30		1	
	Long Beach				17
	Point Pleasant				76
	Other NJ				34
NJ Total		30		1	157
NY Total				30	95
RI/CT Total		43	31	20	6

Table 33 2008 Atlantic Herring Landings by Port and Permit Category

MT HERRING LANDED		2008 PERMIT CATEGORY			
STATE	PORT	A	B	C	D
	Fall River	344			
	Gloucester	26,756		1	8
	New Bedford	18,426			
	Other MA			1	19
MA Total		45,527		1	26
	Port Clyde	1,837			361
	Portland	9,109			0
	Stonington	6,297			
	Rockland	13,142			
	Vinalhaven	1,275			
	Other ME	0	0	0	18
ME Total		31,660			379
NH Total		353		57	31
NJ Total		2,835			6
NY Total				4	8
RI/CT Total		1,336	1,027	16	14

6.2.1.5 Updated Observer Data

The following data summary tables have been provided by the NEFSC Observer Program based on observer data from 2007-2009 (2009 through April).

Key for All Tables in this Section

- Years represent calendar years January 1 – December 31
- Data are reported for all observed trips with 2,000 pounds or more of Atlantic Herring and/or Unk Herring
- 2009 data are reported through April 2009
- Permit Categories reflect Amendment 1 – A/B Limited Access All Areas, C Limited Access Incidental Catch, D Open Access Incidental Catch
- OTF = Otter Trawl Finfish (Bottom Trawl)
- OTM = Otter Trawl Midwater
- PTM = Pair Trawl Midwater
- PUR = Purse Seine
- Observed pair trawl operations have been counted as one trip
- Quarter 1 = January-March
- Quarter 2 = April – June
- Quarter 3 = July – September
- Quarter 4 = October – December

Table 34 summarizes coverage rates from the NEFSC Observer Program for the 2007-2009 calendar years (also the herring fishing years), with 2009 levels summarized through April 30, 2009. 2008 and 2009 to date have seen relatively high levels of coverage across all sectors of the fishery (Area 1A is closed until June, so the data for 2009 do not yet reflect purse seine activity). Summary coverage rates based on the number of trips observed as a percentage of the number of trips taken are 4.3% in 2007, 14.6% in 2008, and 13.3% in 2009 YTD. Of all Atlantic herring landed during the 2008 fishing year (regardless of trip type), the Observer Program covered 20% (16,561 mt observed of 83,275 mt landed). In 2007, 7% of the total herring landings in the fishery were observed (5,156 mt observed of 78,701 mt landed). Through April 2009, the Observer Program has covered 24% of the herring landings (6,215 mt of 26,373 mt landed).

Table 34 Observer Program Coverage Rates for Trips Landing Greater than 2,000 pounds of Herring, 2007-2009 YTD

Year	Gear Type	Total Trips	Total Days	Total Herring Landed	Obs Trips	Obs Days	Obs Herring Kept	% trips obs	% days obs	% herring obs
2007	OTF	357	633	10,354,058	12	15	411,751	3%	2%	4%
2007	OTM	137	457	17,489,210	10	40	1,918,285	7%	9%	11%
2007	PTM	240	860	74,401,385	14	58	6,910,185	6%	7%	9%
2007	PUR	345	733	70,082,994	10	23	2,122,267	3%	3%	3%
2008	OTF	90	241	4,603,190	4	4	70,409	4%	2%	2%
2008	OTM	28	103	8,816,600	15	58	3,081,669	54%	56%	35%
2008	PTM	269	1042	110,452,566	44	170	27,293,511	16%	16%	25%
2008	PUR	230	542	58,942,542	27	64	6,941,134	12%	12%	12%
2009*	OTF	100	245	6,949,390	7	11	451,112	7%	4%	6%
2009*	OTM	22	123	3,048,675	7	32	650,071	32%	26%	21%
2009*	PTM	164	660	47,986,029	24	91	12,822,033	15%	14%	27%

**through April 2009*
Pair trawl operations counted as 1 trip and weight is total for the operation
Herring is Atl Herring or Unk Herring
Day defined as (date land - date sail) + 1
Landings data from Vessel Trip Reports

Table 35 summarizes the catch and discard of all species observed on 18 trips by Category A and B herring permit holders using bottom trawls and catching 2,000 pounds or more of Atlantic herring from January 2007-April 2009. Spiny dogfish represented the majority of bycatch on these trips, followed by Atlantic herring, fishing debris, and alewife. Some of the bycatch species observed on these trips suggest that these vessels were fishing close to the ocean bottom (flounder, skates, sculpin, for example). A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 35 Catch and Discards of All Species on 18 Observed Bottom Trawl Trips, 2007-2009, Permit Categories A & B

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
ALEWIFE	416.1	9,916.5	10,332.6	24.85	1.00
COD, ATLANTIC	202.5		202.5	0.49	0.49
CRAB, SPIDER, NK	4.2		4.2	0.01	0.01
DEBRIS, FISHING GEAR	440.0		440.0	1.06	1.06
DOGFISH, SPINY	42,184.0	87.0	42,271.0	101.65	101.44
FISH, NK		70.0	70.0	0.17	
FLOUNDER, WINDOWPANE	4.1		4.1	0.01	0.01
FLOUNDER, WINTER	62.9		62.9	0.15	0.15
HAKE, RED (LING)	2.1		2.1	0.01	0.01
HAKE, SILVER (WHITING)		7,546.5	7,546.5	18.15	
HERRING, ATLANTIC	2,584.4	415,842.0	418,426.4	1006.21	6.21
HERRING, BLUEBACK	1.3	3,659.0	3,660.3	8.80	0.00
HERRING, NK		84,612.0	84,612.0	203.47	
LAMPREY, NK	0.1		0.1	0.00	0.00
LOBSTER, AMERICAN	2.0		2.0	0.00	0.00
MACKEREL, ATLANTIC	282.3	38,935.0	39,217.3	94.31	0.68
MENHADEN, ATLANTIC	2.4	119.0	121.4	0.29	0.01
OCEAN POUT	14.5		14.5	0.03	0.03
POLLOCK	5.0		5.0	0.01	0.01
RAVEN, SEA	6.4		6.4	0.02	0.02
SCULPIN, LONGHORN	200.4		200.4	0.48	0.48
SCUP	1.0		1.0	0.00	0.00
SHAD, AMERICAN	0.1	1,522.0	1,522.1	3.66	0.00
SHAD, HICKORY	0.2	2.0	2.2	0.01	0.00
SKATE, LITTLE	308.0		308.0	0.74	0.74
SKATE, NK	5.1		5.1	0.01	0.01
SKATE, WINTER (BIG)	527.0		527.0	1.27	1.27
SPOT	0.1		0.1	0.00	0.00
SQUID, ATL LONG-FIN	1.7	51.0	52.7	0.13	0.00
SQUID, SHORT-FIN	43.0	851.0	894.0	2.15	0.10
TAUTOG (BLACKFISH)	1.2		1.2	0.00	0.00
GRAND TOTAL	**47,302.1**	**563,213.0**	**610,515.1**	**1468.14**	**113.75**

Table 36 summarizes the catch and discard of all species observed on 6 trips by Category C and D Herring permit holders using bottom trawls and catching 2,000 pounds or more of Atlantic herring from January 2007-April 2009. Bycatch by these vessels appears to be more diverse than the Category A and B bottom trawl vessels, and the catch of small mesh multispecies like red hake and whiting suggest that these vessels were likely fishing in the exempted small mesh fisheries for a mix of small mesh multispecies and herring. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 36 Catch and Discards of All Species on 6 Observed Bottom Trawl Trips, 2007-2009, Permit Categories C & D

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
ALEWIFE	53.0	4,158.0	4,211.0	58.27	0.73
COD, ATLANTIC	84.9		84.9	1.17	1.17
DEBRIS, FISHING GEAR	60.0		60.0	0.83	0.83
DOGFISH, SPINY	2,763.5	3,017.0	5,780.5	79.98	38.24
FLOUNDER, AMERICAN PLAICE	227.8		227.8	3.15	3.15
FLOUNDER, FOURSPOT	2.0		2.0	0.03	0.03
FLOUNDER, WITCH (GREY SOLE)	19.0		19.0	0.26	0.26
FLOUNDER, YELLOWTAIL	49.0		49.0	0.68	0.68
HADDOCK	37.0		37.0	0.51	0.51
HAKE, RED (LING)	1,033.0	3,898.5	4,931.5	68.24	14.29
HAKE, SILVER (WHITING)	422.0	9,393.5	9,815.5	135.82	5.84
HAKE, WHITE	17.0		17.0	0.24	0.24
HERRING, ATLANTIC		72,271.0	72,271.0	1000.00	
HERRING, BLUEBACK		2,048.0	2,048.0	28.34	
HERRING, NK	28,000.0		28,000.0	387.43	387.43
LOBSTER, AMERICAN	66.5	6.0	72.5	1.00	0.92
LUMPFISH	57.0		57.0	0.79	0.79
OCEAN POUT	3.0		3.0	0.04	0.04
POLLOCK	2.0		2.0	0.03	0.03
RAVEN, SEA	77.0		77.0	1.07	1.07
REDFISH, NK (OCEAN PERCH)	6.0		6.0	0.08	0.08
SCULPIN, LONGHORN	24.8		24.8	0.34	0.34
SKATE, THORNY	2.0		2.0	0.03	0.03
SPONGE, NK	8.0		8.0	0.11	0.11
SQUID, ATL LONG-FIN		94.0	94.0	1.30	
SQUID, SHORT-FIN		17.0	17.0	0.24	
WRYMOUTH	6.0		6.0	0.08	0.08
GRAND TOTAL	**33,020.5**	**94,903.0**	**127,923.5**	**1770.05**	**456.90**

summarizes the catch and discard of all species observed on 13 midwater trawl trips catching 2,000 pounds or more of Atlantic herring during Quarter 1 (January – March) from 2007-2009. These vessels were likely fishing for herring in Area 2. Some of the trips may have been targeting mackerel in this area during this time. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 37 summarizes the catch and discard of all species observed on 13 midwater trawl trips catching 2,000 pounds or more of Atlantic herring during Quarter 1 (January – March) from 2007-2009. These vessels were likely fishing for herring in Area 2. Some of the trips may have been targeting mackerel in this area during this time. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 37 Catch and Discards of All Species on 13 Observed Midwater Trawl Trips, 2007-2009, Quarter 1, Permit Category A

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
ALEWIFE	170.4	69,787.0	69,957.4	48.13	0.12
BASS, STRIPED	280.0		280.0	0.19	0.19
BUTTERFISH		1,231.0	1,231.0	0.85	
DEBRIS, FISHING GEAR	180.0		180.0	0.12	0.12
DEBRIS, METAL	50.0		50.0	0.03	0.03
DOGFISH, NK	2,500.0		2,500.0	1.72	1.72
DOGFISH, SPINY	38,253.0		38,253.0	26.32	26.32
FISH, NK	225,000.0		225,000.0	154.79	154.79
FLOUNDER, NK	29.0		29.0	0.02	0.02
HAKE, SILVER (WHITING)		92.0	92.0	0.06	
HERRING, ATLANTIC	33,881.0	1,453,622.0	1,487,503.0	1023.31	23.31
HERRING, BLUEBACK	615.0	57,231.0	57,846.0	39.79	0.42
HERRING, NK		103,452.0	103,452.0	71.17	
LAMPREY, NK	4.6		4.6	0.00	0.00
LUMPFISH	10.0		10.0	0.01	0.01
MACKEREL, ATLANTIC	2,224.0	3,247,030.0	3,249,254.0	2235.28	1.53
MENHADEN, ATLANTIC		556.0	556.0	0.38	
SCULPIN, LONGHORN	3.0		3.0	0.00	0.00
SHAD, AMERICAN	49.1	1,543.0	1,592.1	1.10	0.03
SHRIMP, NK		5.0	5.0	0.00	
SQUID, ATL LONG-FIN	22.0		22.0	0.02	0.02
SQUID, SHORT-FIN		234.0	234.0	0.16	
GRAND TOTAL	**303,271.1**	**4,934,783.0**	**5,238,054.1**	**3603.45**	**208.63**

Table 38 summarizes the catch and discard of all species observed on 7 midwater trawl trips catching 2,000 pounds or more of Atlantic herring during Quarter 2 (April – June) from 2007-April 2009. Atlantic herring and spiny dogfish represented the majority of bycatch for midwater trawl vessels in Quarter 2 during this time. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 38 Catch and Discards of All Species on 7 Observed Midwater Trawl Trips, 2007-2009, Quarter 2, Permit Category A

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
ALEWIFE	21.0	134.0	155.0	0.09	0.01
BUTTERFISH	1.0	740.0	741.0	0.45	0.00
DOGFISH, SPINY	1,209.0		1,209.0	0.73	0.73
EEL, SAND LANCE, NK		6.0	6.0	0.00	
FLOUNDER, FOURSPOT		98.0	98.0	0.06	
FLOUNDER, NK		18.0	18.0	0.01	
HADDOCK	5.0	5,693.0	5,698.0	3.46	0.00
HAKE, NK	7.0	432.0	439.0	0.27	0.00
HAKE, SILVER (WHITING)	45.0	2,921.0	2,966.0	1.80	0.03
HERRING, ATLANTIC	31,005.5	1,648,087.0	1,679,092.5	1018.81	18.81
HERRING, BLUEBACK	7.0		7.0	0.00	0.00
LUMPFISH	26.0		26.0	0.02	0.02
MACKEREL, ATLANTIC		1,097,003.0	1,097,003.0	665.62	
POLLOCK	21.0		21.0	0.01	0.01
REDFISH, NK (OCEAN PERCH)	36.0		36.0	0.02	0.02
SCULPIN, LONGHORN		9.0	9.0	0.01	
SEA ROBIN, NORTHERN	2.0	18.0	20.0	0.01	0.00
SEAWEED, NK	150.0		150.0	0.09	0.09
SHAD, AMERICAN		33.0	33.0	0.02	
SKATE, LITTLE	2.0		2.0	0.00	0.00
SKATE, WINTER (BIG)	13.0		13.0	0.01	0.01
SQUID, ATL LONG-FIN		298.0	298.0	0.18	
GRAND TOTAL	**32,550.5**	**2,755,490.0**	**2,788,040.5**	**1691.68**	**19.75**

Table 39 summarizes the catch and discard of all species observed on 10 midwater trawl trips catching 2,000 pounds or more of Atlantic herring during Quarter 4 (October – December) in 2007 and 2008. Spiny dogfish, Atlantic herring, and small mesh multispecies represented the majority of bycatch during this time. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 39 Catch and Discards of All Species on 10 Observed Midwater Trawl Trips, 2007-2009, Quarter 4, Permit Category A

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
ALEWIFE	0.5	50,935.0	50,935.5	22.20	0.00
BUTTERFISH	0.1	324.0	324.1	0.14	0.00
COD, ATLANTIC	16.0		16.0	0.01	0.01
DOGFISH, SPINY	10,099.5		10,099.5	4.40	4.40
FLOUNDER, YELLOWTAIL		35.0	35.0	0.02	
HADDOCK		1,871.0	1,871.0	0.82	
HAKE, RED (LING)	318.5	203.0	521.5	0.23	0.14
HAKE, SILVER (WHITING)	117.0	1,491.0	1,608.0	0.70	0.05
HAKE, WHITE	0.1	71.0	71.1	0.03	0.00
HERRING, ATLANTIC	250.6	2,294,510.0	2,294,760.6	1000.11	0.11
HERRING, BLUEBACK		11,419.0	11,419.0	4.98	
HERRING, NK	0.1	952.0	952.1	0.41	0.00
JELLYFISH, NK	0.5		0.5	0.00	0.00
LUMPFISH	5.0		5.0	0.00	0.00
MACKEREL, ATLANTIC		8,312.0	8,312.0	3.62	
MONKFISH (ANGLER, GOOSEFISH)	7.2		7.2	0.00	0.00
POLLOCK	10.0		10.0	0.00	0.00
SCULPIN, LONGHORN	1.5	97.0	98.5	0.04	0.00
SHAD, AMERICAN		2,494.0	2,494.0	1.09	
SHAD, HICKORY		280.0	280.0	0.12	
SKATE, LITTLE	0.1		0.1	0.00	0.00
SQUID, SHORT-FIN	175.0	378.0	553.0	0.24	0.08
GRAND TOTAL	**11,001.7**	**2,373,372.0**	**2,384,373.7**	**1039.16**	**4.79**

Table 40 summarizes the catch and discard of all species observed on 41 pair trawl trips catching 2,000 pounds or more of Atlantic herring during Quarter 1 (January – March) from 2007-2009. Pair trawl vessels fished almost exclusively in Area 2 (southern New England) during Quarter 1 and caught a significant amount of herring and Atlantic mackerel. Spiny dogfish, Atlantic herring, and Atlantic mackerel accounted for the majority of bycatch observed on these trips. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 40 Catch and Discards of All Species on 41 Observed Pair Trawl Trips, 2007-2009, Quarter 1, Permit Category A

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
ALEWIFE	213.1	52,548.0	52,761.1	3.45	0.01
BASS, STRIPED	541.0		541.0	0.04	0.04
BUTTERFISH	14.0	275.0	289.0	0.02	0.00
COD, ATLANTIC	43.0		43.0	0.00	0.00
DEBRIS, FISHING GEAR	1,230.0		1,230.0	0.08	0.08
DEBRIS, METAL	200.0		200.0	0.01	0.01
DEBRIS, NK	500.0		500.0	0.03	0.03
DEBRIS, WOOD	5.0		5.0	0.00	0.00
DOGFISH, SPINY	43,148.3	2,566.0	45,714.3	2.99	2.82
FISH, NK	8,985.0	768,647.0	777,632.0	50.90	0.59
HADDOCK	346.0	12.0	358.0	0.02	0.02
HAKE, SILVER (WHITING)	160.4	1,131.0	1,291.4	0.08	0.01
HERRING, ATLANTIC	76,252.4	15,277,771.0	15,354,023.4	1004.99	4.99
HERRING, BLUEBACK	102.9	115,438.0	115,540.9	7.56	0.01
HERRING, NK	3.0	145,455.0	145,458.0	9.52	0.00
MACKEREL, ATLANTIC	74,859.5	6,828,307.0	6,903,166.5	451.84	4.90
MENHADEN, ATLANTIC	307.0	699.0	1,006.0	0.07	0.02
MONKFISH (ANGLER, GOOSEFISH)		11.0	11.0	0.00	
SCUP	691.0		691.0	0.05	0.05
SEA BASS, BLACK	129.0	1,404.0	1,533.0	0.10	0.01
SHAD, AMERICAN	18.3	8,519.0	8,537.3	0.56	0.00
SHRIMP, NK	64.0		64.0	0.00	0.00
SKATE, WINTER (BIG)	6.0		6.0	0.00	0.00
SQUID, ATL LONG-FIN	15.0	744.0	759.0	0.05	0.00
SQUID, SHORT-FIN	14.1	213.0	227.1	0.01	0.00
WHITING, BLACK (HAKE, OFFSHORE)	1.0		1.0	0.00	0.00
GRAND TOTAL	**207,849.0**	**23,203,740.0**	**23,411,589.0**	**1532.40**	**13.60**

Table 41 summarizes the catch and discard of all species observed on 16 pair trawl trips catching 2,000 pounds or more of Atlantic herring during Quarter 2 (April – June) from 2007-April 2009. Atlantic herring and spiny dogfish accounted for the majority of bycatch observed on these trips. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 41 Catch and Discards of All Species on 16 Observed Pair Trawl Trips, 2007-2009, Quarter 2, Permit Category A

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
ALEWIFE	1.1	3,076.0	3,077.1	0.31	0.00
BUTTERFISH	0.1	474.0	474.1	0.05	0.00
COD, ATLANTIC		8.0	8.0	0.00	
CUNNER (YELLOW PERCH)		4,864.0	4,864.0	0.50	
DOGFISH, SPINY	11,714.0	7,852.0	19,566.0	2.00	1.20
EEL, SAND LANCE, NK	350.0		350.0	0.04	0.04
FISH, NK	300.0		300.0	0.03	0.03
HADDOCK	100.0	10,721.5	10,821.5	1.11	0.01
HAKE, SILVER (WHITING)		1,218.0	1,218.0	0.12	
HERRING, ATLANTIC	20,401.2	9,780,083.0	9,800,484.2	1002.09	2.09
HERRING, NK		260,000.0	260,000.0	26.58	
MACKEREL, ATLANTIC	2.5	1,827,011.0	1,827,013.5	186.81	0.00
SEA BASS, BLACK		7.0	7.0	0.00	
SEA ROBIN, NORTHERN	10.0		10.0	0.00	0.00
SKATE, WINTER (BIG)	3.0		3.0	0.00	0.00
GRAND TOTAL	**32,881.9**	**11,895,314.5**	**11,928,196.4**	**1219.64**	**3.36**

Table 42 summarizes the catch and discard of all species observed on 4 pair trawl trips catching 2,000 pounds or more of Atlantic herring during Quarter 3 (July – September) in 2007 and 2008 (2009 data for Quarter 3 are not yet available). Whiting, redfish, and Atlantic herring accounted for the majority of bycatch observed on these four trips. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 42 Catch and Discards of All Species on 4 Observed Pair Trawl Trips, 2007-2009, Quarter 3, Permit Category A

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
COD, ATLANTIC	3.4		3.4	0.00	0.00
HADDOCK	677.0	380.0	1,057.0	0.59	0.38
HAKE, RED/WHITE MIX		1,204.0	1,204.0	0.68	
HAKE, SILVER (WHITING)	61,380.0	5,208.0	66,588.0	37.36	34.44
HERRING, ATLANTIC	28,460.0	1,782,320.0	1,810,780.0	1015.97	15.97
HERRING, NK	200.0		200.0	0.11	0.11
REDFISH, NK (OCEAN PERCH)	9,328.2	528.0	9,856.2	5.53	5.23
SQUID, NK		144.0	144.0	0.08	
SQUID, SHORT-FIN	410.0	593.0	1,003.0	0.56	0.23
GRAND TOTAL	**100,458.6**	**1,790,377.0**	**1,890,835.6**	**1060.88**	**56.36**

Table 43 summarizes the catch and discard of all species observed on 21 pair trawl trips catching 2,000 pounds or more of Atlantic herring during Quarter 4 (October – December) in 2007 and 2008. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 43 Catch and Discards of All Species on 21 Observed Pair Trawl Trips, 2007-2009, Quarter 4, Permit Category A

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
ALEWIFE		26,810.0	26,810.0	1.36	
BUTTERFISH		180.0	180.0	0.01	
COD, ATLANTIC		50.0	50.0	0.00	
DOGFISH, SPINY	17,812.3		17,812.3	0.90	0.90
EEL, NK	3.0		3.0	0.00	0.00
FISH, NK	24,000.0		24,000.0	1.21	1.21
HADDOCK	25,356.0	3,471.5	28,827.5	1.46	1.28
HAKE, SILVER (WHITING)	2.0	378.8	380.8	0.02	0.00
HERRING, ATLANTIC	1,530.7	19,780,100.0	19,781,630.7	1000.08	0.08
HERRING, BLUEBACK		17,381.0	17,381.0	0.88	
LOBSTER, AMERICAN		10.0	10.0	0.00	
LUMPFISH	11.0		11.0	0.00	0.00
MACKEREL, ATLANTIC	0.8	677,594.9	677,595.7	34.26	0.00
POLLOCK		7.0	7.0	0.00	
REDFISH, NK (OCEAN PERCH)		212.5	212.5	0.01	
SHAD, AMERICAN	221.0	1,552.0	1,773.0	0.09	0.01
SHAD, HICKORY	1,128.0	132.0	1,260.0	0.06	0.06
SQUID, SHORT-FIN	1,141.2	1,723.0	2,864.2	0.14	0.06
GRAND TOTAL	**71,206.0**	**20,509,602.7**	**20,580,808.7**	**1040.48**	**3.60**

Table 44 summarizes the catch and discard of all species observed on 9 purse seine trips catching 2,000 pounds or more of Atlantic herring during Quarter 2 (April – June) from 2007-April 2009. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 44 Catch and Discards of All Species on 9 Observed Purse Seine Trips, 2007-2009, Quarter 2, Permit Category A

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
DOGFISH, SPINY	99.4	1,598.0	1,697.4	1.30	0.08
HERRING, ATLANTIC	586.0	1,308,041.0	1,308,627.0	1000.45	0.45
LUMPFISH	3.8		3.8	0.00	0.00
MACKEREL, ATLANTIC	34.0	365.0	399.0	0.31	0.03
GRAND TOTAL	**723.2**	**1,310,004.0**	**1,310,727.2**	**1002.05**	**0.55**

Table 45 summarizes the catch and discard of all species observed on 22 purse seine trips catching 2,000 pounds or more of Atlantic herring during Quarter 3 (July – September) for 2007 and 2008. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 45 Catch and Discards of All Species on 22 Observed Purse Seine Trips, 2007-2009, Quarter 3, Permit Category A

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
DOGFISH, SPINY	8,783.0	11,249.0	20,032.0	3.00	1.31
HAKE, SILVER (WHITING)	20.0	4,241.0	4,261.0	0.64	0.00
HERRING, ATLANTIC	287,028.0	6,680,430.0	6,967,458.0	1042.97	42.97
HERRING, BLUEBACK		358.0	358.0	0.05	
MACKEREL, ATLANTIC		88.0	88.0	0.01	
SEAWEED, NK		101.0	101.0	0.02	
SQUID, ATL LONG-FIN		272.0	272.0	0.04	
SQUID, NK		15.0	15.0	0.00	
SQUID, SHORT-FIN	50.0	758.0	808.0	0.12	0.01
GRAND TOTAL	**295,881.0**	**6,697,512.0**	**6,993,393.0**	**1046.85**	**44.29**

Table 46 summarizes the catch and discard of all species observed on 3 purse seine trips catching 2,000 pounds or more of Atlantic herring during Quarter 4 (October – December) for 2007 and 2008. A more detailed analysis of observer and other bycatch data will be provided in the EIS for Amendment 5 to the Atlantic Herring FMP.

Table 46 Catch and Discards of All Species on 3 Observed Purse Seine Trips, 2007-2009, Quarter 4, Permit Category A

Species	Lbs Disc	Lbs Kept	Total Lbs	Total Catch Rate (per 1000 lbs Atl Herring Kept)	Discard Rate (per 1000 lbs Atl Herring Kept)
HERRING, ATLANTIC	700.0	479,930.0	480,630.0	1001.46	1.46
SQUID, SHORT-FIN		70.0	70.0	0.15	
GRAND TOTAL	**700.0**	**480,000.0**	**480,700.0**	**1001.60**	**1.46**

6.2.1.6 Canadian Herring Fisheries

Catch of the Gulf of Maine/Georges Bank ***Atlantic herring*** stock complex in Canadian waters consists primarily of fish caught in the New Brunswick (NB) weir fishery. Currently, the Herring FMP assumes that 20,000 mt of fish from the inshore component of the Atlantic herring resource will be taken annually in the NB weir fishery. This assumed catch is subtracted from the available yield from the inshore component of the resource before TACs are determined for management areas in the U.S. EEZ. While the NB weir catch has been quite variable over time, the 20,000 mt assumption has been determined in previous years to be appropriate. The language in Amendment 1 provides flexibility to reconsider this assumption and adjust according to trends in the fishery in future years as part of the fishery specification process.

Table 47 summarizes landings of herring from all Canadian fisheries from 1963-2008. The column labeled "Non-Stock 4Xs N.B. Weir & Shutoff" generally represents catch from the NB weir fishery. For the most part, shutoffs are not located in the same area as weirs, and landings from shutoffs are thought to be from the 4WX stock component. Combined weir and shutoff landings were almost 31,000 mt in 2007, a significant increase from 12,863 mt in 2006. The catch from this fishery in 2007 was the highest observed since the late 1980s and early 1990s. However, catch is clearly quite variable and dropped again to just under 6,500 mt in 2008. The NB weir fishery landings are presented separately in Table 48 and totaled about 30,145 mt in 2007 and 6,041 mt in 2008.

Table 48 lists herring landings by month for weirs located in New Brunswick from 1978 to 2008. 2007 NB weir landings of 30,145 mt were the highest on record since 1992 and 1993. 2008 NB weir landings were the lowest of the time series. The most recent five-year average of NB weir landings (2004 – 2008) is 16,217 mt, and the most recent ten-year average (1999-2008) is 15,739 mt. Extremely low landings during the 2008 fishing year decreased these moving averages, especially the ten-year average. The average landings for the entire time series is 21,829 mt.

Landings from the NB weir fishery have always been somewhat variable; the fishery is dependent on many factors including weather, fish migration patterns, and environmental conditions. NB weir landings should be monitored closely over the next several years to see if a trend emerges.

Table 49 provides information on the number of active weirs and the average catch per weir from the Canadian fisheries from 1978 to 2008. The columns labeled "NB" represent the New Brunswick weir fishery that catches fish from the Atlantic herring stock complex (the Nova Scotian weir fishery primarily catches herring from a different stock). Over time, the number of active weirs in the fishery has decreased considerably, although 2007 saw the highest number since 2001. The number of active weirs declined in 2008, as did catch per unit effort (CPUE). With such low landings, CPUE in 2008 was the second-lowest of the entire time series.

Table 47 Historical Series of Nominal and Adjusted Annual Landings (t) by Major Gear Components and Seasons of the 4WX Herring Fishery, 1963-2008

Year^	4W Winter Purse Seine	4Xs Fall&Winter Purse Seine	4Xqr Summer Purse Seine	4X Summer Gillnet	4Xr Nova Scotia Weir	4WX Stock Nominal Landings	4WX Stock Adjusted Landings*	4WX Stock TAC	Non-Stock 4Xs N.B. Weir & Shutoff	4VWX Coastal Nova Scotia	Offshore Scotian Shelf Banks	Total 4VWX Adjusted Landings
1963		6,871	15,093	2,955	5,345	30,264	30,264		29,366		3,000	62,630
1964		15991	24,894	4,053	12,458	57,396	57,396		29,432		2,000	88,828
1965		15,755	54,527	4,091	12,021	86,394	86,394		33,346		6,000	125,740
1966		25,645	112,457	4,413	7,711	150,226	150,226		35,805		2,000	188,031
1967		20,888	117,382	5,398	12,475	156,143	156,741		30,032		1,000	187,773
1968		42,223	133,267	5,884	12,571	193,945	196,362		33,145		18,000	247,507
1969	25,112	13,202	84,525	3,474	10,744	137,057	150,462		26,539		121,000	298,001
1970	27,107	14,749	74,849	5,019	11,706	133,430	190,382		15,840		87,000	293,222
1971	52,535	4,868	35,071	4,607	8,081	105,162	129,101		12,660		28,000	169,761
1972	25,656	32,174	61,158	3,789	6,766	129,543	153,449		32,699		21,000	207,148
1973	8,348	27,322	36,618	5,205	12,492	89,985	122,687		19,935		14,000	156,622
1974	27,044	10,563	76,859	4,285	6,436	125,187	149,670		20,602			170,272
1975	27,030	1,152	79,605	4,995	7,404	120,186	143,897		30,819			174,716
1976	37,196	746	58,395	8,322	5,959	110,618	115,178		29,206			144,384
1977	23,251	1,236	68,538	18,523	5,213	116,761	117,171	109,000	23,487			140,658
1978	17,274	6,519	57,973	6,059	8,057	95,882	114,000	110,000	38,842			152,842
1979	14,073	3,839	25,265	4,363	9,307	56,847	77,500	99,000	37,828			115,328
1980	8,958	1,443	44,986	19,804	2,383	77,574	107,000	65,000	13,525			120,525
1981	18,588	1,368	53,799	11,985	1,966	87,706	137,000	100,000	19,080			156,080
1982	12,275	103	64,344	6,799	1,212	84,733	105,800	80,200	25,963			131,763
1983	8,226	2,157	63,379	8,762	918	83,442	117,400	82,000	11,383			128,783
1984	6,336	5,683	58,354	4,490	2,684	77,547	135,900	80,000	8,698			144,598
1985	8,751	5,419	87,167	5,584	4,062	110,983	165,000	125,000	27,863			192,863
1986	8,414	3,365	56,139	3,533	1,958	73,409	100,000	97,600	27,883			127,883
1987	8,780	5,139	77,706	2,289	6,786	100,700	147,100	126,500	27,320			174,420
1988	8,503	7,876	98,371	695	7,518	124,653	199,600	151,200	33,421			233,021
1989	6,169	5,896	68,089	95	3,308	83,557	97,500	151,200	44,112			141,612
1990	8,316	10,705	77,545	243	4,049	102,627	172,900	151,200	38,778			211,678
1991	17,878	2,024	73,619	538	1,498	97,010	130,800	151,200	24,576			155,376
1992	14,310	1,298	80,807	395	2,227	100,227	136,000	125,000	31,967			167,967
1993	10,731	2,376	81,478	556	2,662	98,464	105,089	151,200	31,573			136,662
1994	9,872	3,174	64,509	339	2,045	80,099	80,099	151,200	22,241			102,340
1995	3,191	7,235	48,481	302	3,049	62,499	62,499	80,000	18,248			80,747
1996	2,049	3,305	42,708	6,340	3,476	58,068	58,068	57,000	15,913	1,450	11,745	87,176
1997	1,759	2,926	40,357	6,816	4,019	56,117	56,117	57,000	20,552	2,340	20,261	99,270
1998	1,405	1,494	67,433	2,231	4,464	77,027	77,027	90,000	20,091	4,120	5,591	106,829
1999	1,235	4,764	64,432	1,660	5,461	77,552	77,552	105,000	18,644	5,618	12,646	114,460
2000	1,012	4,738	78,010	823	701	85,284	85,284	100,000	16,829	4,283	2,182	108,578
2001	0	4,001	62,004	1,857	3,708	71,570	71,570	78,000	20,209	6,006	12,503	110,288
2002	367	5,257	69,894	393	1,143	77,054	77,054	78,000	11,874	10,375	7,039	106,342
2003	0	8,860	79,140	439	921	89,360	89,360	93,000	9,003	9,162	998	108,523
2004	0	5,659	69,015	225	3,130	78,029	78,029	83,000	20,686	6,924	4,165	109,804
2005	0	2,601	43,487	566	2,245	48,899	48,899	50,000	13,055	6,311	5,263	73,528
2006	0	930	45,002	719	2,508	49,159	49,159	50,000	12,863	6,566	9,809	78,397
2007	0	1,847	46,045	1,334	1,130	50,356	50,356	50,000	30,944	5,240	5,385	91,925
2008	0	2,000	50,022	15	2,524	54,561	54,561	55,000	6,447	3,704	918	65,631

^Annual landings by purse seiners are defined for the period from October 15 of the preceding year to October 14 of the current year.

*Adjusted totals includes misreporting adjustments for 1978-84 (Mace 1985) and for 1985-93 (Stephenson 1993, Stephenson et al 1994)

All landings by other gear types are for the calendar year.

Table 48 Revised Monthly Weir Landings (t) for Weirs Located in New Brunswick, 1978 to 2008

PROVINCE	YEAR	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Total
N.B.	1978	3				512	802	5,499	10,275	10,877	4,972	528	132	33,599
	1979	535	96			25	1,120	7,321	9,846	4,939	5,985	2,638	74	32,579
	1980					36	119	1,755	5,572	2,352	1,016	216		11,066
	1981					70	199	4,431	3,911	2,044	2,435	1,686	192	14,968
	1982		17			132	30	2,871	7,311	7,681	3,204	849	87	22,181
	1983					65	29	299	2,474	5,382	3,945	375		12,568
	1984					6	3	230	2,344	2,581	3,045	145		8,353
	1985					22	89	4,217	8,450	6,910	4,814	2,078	138	26,718
	1986	43				17		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		12	1	90	657	287	5,993	11,975	8,375	8,457	2,343	43	38,235
	1989		24		95	37	385	8,315	15,093	10,156	7,258	2,158		43,520
	1990					93	20	4,915	14,664	12,207	7,741	168		39,808
	1991					57	180	4,649	10,319	6,392	2,028	93		23,717
	1992				15	50	774	5,477	10,989	9,597	4,395	684		31,981
	1993					14	168	5,561	14,085	8,614	2,406	470	10	31,328
	1994				18		55	4,529	10,592	3,805	1,589	30		20,618
	1995					15	244	4,517	8,590	3,956	896	10		18,228
	1996					19	676	4,819	7,767	1,917	518	65		15,781
	1997				8	153	1,017	6,506	7,396	5,316				20,396
	1998					560	713	3,832	8,295	5,604	525			19,529
	1999					690	805	5,155	9,895	2,469	48			19,063
	2000					10	7	2,105	7,533	4,940	1,713	69		16,376
	2001					35	478	3,931	8,627	5,514	1,479			20,064
	2002					84	20	1,099	6,446	2,878	1,260	20		11,807
	2003					257	250	1,423	3,554	3,166	344	10		9,003
	2004					21	336	2,694	8,354	8,298	913	3		20,620
	2005						213	802	7,145	3,729	740	11		12,639
	2006					8	43	1,112	3,731	3,832	2,328	125	462	11,641
	2007	182		20	30	84	633	3,241	11,363	7,637	6,567	314	73	30,145
	2008						81	1,502	2,479	1,507	389	49	32	6,041
NB Average Catch (t)		160	34	9	38	134	331	3,673	8,390	5,657	3,087	682	119	21,829

Table 49 Overall Effort from New Brunswick and Nova Scotia Weirs for Catch (t), Number of Active Weirs and Catch per Weir (t), 1978 – 2008

	Annual Catch (t)			No. Active Weirs			Catch per weir (t)		
Year	NB	NS	Total Catch	NB	NS	Total No.	NB	NS	Average
1978	33,599	7,858	41,458	208	31	239	162	253	173
1979	32,579	6,339	38,918	210	27	237	155	235	164
1980	11,066	2,383	13,449	120	29	149	92	82	90
1981	14,968	1,824	16,793	147	28	175	102	65	96
1982	22,181	1,130	23,311	159	19	178	140	59	131
1983	12,568	896	13,464	143	23	166	88	39	81
1984	8,353	2,702	11,056	116	13	129	72	208	86
1985	26,718	4,055	30,774	156	14	170	171	290	181
1986	27,516	1,957	29,473	105	18	123	262	109	240
1987	26,621	6,776	33,397	123	21	144	216	323	232
1988	38,235	7,480	45,715	191	21	212	200	356	216
1989	43,520	3,296	46,817	171	20	191	255	165	245
1990	39,808	4,132	43,940	154	22	176	258	188	250
1991	23,717	1,498	25,216	143	20	163	166	75	155
1992	31,981	2,224	34,206	151	12	163	212	185	210
1993	31,328	2,662	33,990	145	10	155	216	266	219
1994	20,618	2,045	22,662	129	11	140	160	186	162
1995	18,228	3,049	21,277	106	10	116	172	305	183
1996	15,781	3,476	19,257	101	12	113	156	290	170
1997	20,396	4,019	24,415	102	15	117	200	268	209
1998	19,529	4,048	23,577	108	15	123	181	270	192
1999	19,063	4,537	23,600	100	14	114	191	324	207
2000	16,376	683	17,058	77	3	80	213	228	213
2001	20,064	3,708	23,772	101	14	115	199	265	207
2002	11,807	1,143	12,950	83	9	92	142	127	141
2003	9,003	921	9,924	78	8	86	115	115	115
2004	20,620	3,130	23,750	84	8	92	245	391	258
2005	12,639	2,245	14,884	76	10	86	166	225	173
2006	11,641	2,491	14,132	89	6	95	131	415	149
2007	30,145	1,130	31,275	97	8	105	311	141	298
2008	6,041	2,524	8,565	76	8	84	79	315	102
Average	21,829	3,108	24,938	124	15	140	175	218	179

7.0 ENVIRONMENTAL IMPACTS OF MANAGEMENT ALTERNATIVES

7.1 BIOLOGICAL IMPACTS

7.1.1 Impacts on the Atlantic Herring Resource

The purpose of this amendment is to establish a management process for the herring fishery consistent with the new provisions of the MSA. The herring fishery specifications process is the foundation of the Atlantic herring management program, which seeks to minimize biological impacts to the herring fishery. In and of themselves, however, the measures proposed in this amendment are not expected to have any direct impacts on the biology of the fishery as they are primarily administrative or procedural. Although quantitative analysis of the biological impacts cannot be completed based on the administrative and procedural nature of these alternatives and options, indirect positive biological effects may occur through the standardization of the specifications setting process, explicit consideration of the OFL, scientific uncertainty, ACL, management uncertainty, and implementation the of AMs, all of which are considered below.

7.1.1.1 Herring Resource Impacts of Establishing ACLs– *Alternative 1/No Action* (Non-Preferred)

Under the no action alternative no process for setting ACLs would be established, and TAC overages would not be addressed. There are currently management measures in place to prevent overfishing of the resource and protect other non-target species, including hard TACs in various management areas. By not establishing ACLs, however, the alternative fails to comply with the MSA or NS1 Guidelines, and presents the small possibility that that overages could be produced, however that possibility is remote.

7.1.1.2 Herring Resource Impacts of Establishing ACLs – *Alternative 2* (Proposed Action)

Compared to the no action alternative, the Proposed Action meets the provisions of the MSA by establishing ACLs and modifying the specifications process, and therefore does more to better manage the fishery and prevent overfishing than the No Action alternative does. It also meets the requirements of National Standard 1 Guidelines to consider species caught incidentally or as bycatch in the herring fishery. The alternative is mostly administrative, however, and the actual establishment of terms and changes to the process should not have a direct biological impact. By making the process explicit and incorporating the SSC into the specification process, however, the alternative serves to indirectly benefit the herring resource by presenting the opportunity to better preventing overfishing. The implementation of the resulting specifications are likely to have some positive benefit over the status quo process by possibly creating a more sustainable fishery. This amendment, however, does not set the specifications, and the direct impact of setting the specifications will be evaluated further when the numbers are set.

Definitions

Establishing the definition of the terms OFL, ABC, ACL and AM as well was relating the term "catch" to the new ACL definition is purely administrative. Defining OFL, ACL, and AM and establishing a process for considering scientific and management uncertainty could improve the specifications process. While this process is similar to the status quo process, making the it explicit and transparent has the increased potential to result in appropriate quotas, and perhaps, a

more sustainable fishery. The actual values assigned to these terms, however, are not defined in this amendment, and their effect will be analyzed in future specification packages when they are set. Similarly, defining "stocks in the fishery" does not specify any other species besides Atlantic Herring as a "stock", and therefore is not expected to have a biolgocal impact. The setting of the interm ABC control rule may have an indirect positive impact for the herring resource by helping to ensure that the ABC is not exceeded, however the definition of the interim ABC control rule itself will have no direct impact on the target species. The direct impacts of the ABC specification has been evaluated in the 2010-2012 specifications package. Overall there are expected to be negligible direct biological impacts as a result of these definitions. Indirectly, however, these new definitions are intended to better manage the fishery and prevent overfishing, therefore indirect biological benefits may be expected from the explicit consideration of these terms.

Options for Fisheries Specifications – Option 1 **(Non-Preferred)**
This option will leave the current specifications process largely unchanged, aside from the adjustments to comply with the MSA. The changes include administrative adjustments such as including the OFL, ABC, ACL, and AMs in the specifications process. These alterations manipulate how calculations for the specifications package will be performed, but the factors considered remain the same. The ultimate harvest effort, amount, and location are not expected to change as this option maintains status quo, and therefore this Proposed Action is not expected to have any additional biological impacts to the herring resouce in comparison to the no action alternative.

Options for Fisheries Specifications – Option 2 **(Proposed Action)**
This option is, in part, the same as Option 1, and therefore would have the same neutral biological impact. This option differs in the removal of setting JVP, IWP, TALFF and a TAC reserve. In recent years the specifications packages have set the four specifications to zero. There is no expectation that they would be set higher than zero in the future but it still is possible for a foreign country to request TALFF at a later date. This option therefore eliminates the need to specify JVP, IWP, TALFF and a TAC reserve each time new specifications are set. This option is purely administrative, therefore will not have a direct biological impact on herring. Indirect positive biological benefits, however, may result from the standardization and simplification of the specifications setting process.

Sub ACLs
This portion of the Proposed Action is meant to prevent overfishing on a sub-component level by defining sub-ACLs. If the Council chooses, AMs can be specified for the sub-ACLs within the specifications process, which could reduce the risk of overfishing the sub-components of the herring stock which are not considered in stock-wide measures. The inshore and offshore components of the fishery could, by extension, be protected better. This amendment does not specify the sub-ACLs, however, it only defines them; the direct impact will be analyzed further in future specifications process when they are set. Overall there is no expected impact of defining sub-ACLs on the herring resource.

Administration: Specifications Process
A strictly administrative portion of the specifications process, the Proposed Action specifies how the PDT and SSC will guide the recommendation process for the reference points within the

specifications packages. This measure is procedural and is expected to have no biological impact as a result of implementation.

7.1.1.3 Herring Resource Impacts of Establishing AMs – *Alternative 1/No Action* (Non-Preferred)

Under the no action alternative AMs would not be established, and could therefore render the Atlantic herring FMP out of compliance with the MSA and NMFS's National Standard Guidelines. AMs have been required as a means of protection for the herring biological resources, and a lack of implementation may have a negative effect. There are, however, current measures in place which already act as an AM, although they are not defined as such. As a result, this action would be neutral with respect to biological impacts on target and non-target species as it would maintain the status quo.

7.1.1.4 Herring Resource Impacts of Establishing AMs – *Alternative 2* (Proposed Action)

Option 1 – ACL Overage Deduction **(Proposed Action)**

The overall biological impacts of the Proposed Action are expected to be negligable. The Proposed Action is a reactive AM designed to provide consequences for area quota overages during a fishing year. Since reactive AMs are designed to respond to exceeding ACLs, if invoked, the AM may have a positive biological impact that will prevent catches from exceeding OFL in the future and by compensating somewhat for past overages. In recent years, however, current management measures have prevented overfishing. Any overages that are likely to occur with respect to the herring ACLs are therefore likely to be very small because of the measures already in place to ensure that the sub-ACLs are not exceeded (ex., closing the directed fishery when 95% of the sub-ACL is projected to be reached). Overall the biological impacts of the proposed action are therefore expected to be minimal, however indirectly the measure may benefit the herring resource by increasing accountability.

Option 2 – Haddock Catch Cap Accountability Measure **(Proposed Action)**

The Proposed Action is not expected to affect the herring resource. This option limits or restricts the possession of haddock when the catch cap is reached and is consistent with the establishment of the catch cap as a sub-ACL in the groundfish fishery (Amendment 16), and therefore is not expected to have a direct biological impact on herring. Furthermore, these measures have already been established in the herring fishery through Framework Adjustment 43 to the Northeast Multispecies FMP, and the re-definition of this measure as an AM is not likely to have an impact on the herring resource. Some indirect benefits to the resource could result, however, from the managerial clarification.

Amendment 4 seeks to implement only a process for establishing ACLs and AMs for the herring fishery and will not change catch levels of herring or incidental and bycatch species. Therefore, none of the alternatives under consideration are expected to have any direct biological impacts on the herring fishery, due to the administrative and procedural nature of the Proposed Action. These new administrative procedures are intended to better manage the fishery and prevent overfishing and an indirect positive biological effect from standardizing the process and explicitly considering OFL, scientific uncertainty, and management uncertainty. The following discussion addresses the few other biological impacts that may result from the options and alternatives proposed in this amendment, however, external to herring. A description of the fishery and its economic factors can be found in Section 6.2 of this document.

7.1.2 Habitat and EFH

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

This action brings the Atlantic Herring FMP into compliance with the MSA by redefining catch levels and thresholds to comport with ACL requirements and by formalizing/establishing AMs.

Table 50 Comparison of status quo and proposed Atlantic herring fishery specifications, options 1 and 2.

CURRENT SPECIFICATIONS	PROPOSED SPECIFICATIONS Non-Preferred Action	PROPOSED SPECIFICATIONS Proposed Action
Allowable Biological Catch (ABC)	Overfishing Limit (OFL)	Overfishing Limit (OFL)
	Acceptable Biological Catch (ABC)	Acceptable Biological Catch (ABC)
U.S. Optimum Yield (OY)	U.S. Optimum Yield (OY) (Stock-Wide ACL)	U.S. Optimum Yield (OY) (Stock-Wide ACL)
Domestic Annual Harvesting (DAH)	Domestic Annual Harvesting (DAH)	Domestic Annual Harvesting (DAH)
Domestic Annual Processing (DAP)	Domestic Annual Processing (DAP)	Domestic Annual Processing (DAP)
Total Joint Venture Processing (JVPt)	Total Joint Venture Processing (JVPt)	N/A
Joint Venture Processing (JVP)	Joint Venture Processing (JVP)	N/A
Internal Waters Processing (IWP)	Internal Waters Processing (IWP)	N/A
U.S. At-Sea Processing (USAP)	U.S. At-Sea Processing (USAP)	U.S. At-Sea Processing (USAP)
Border Transfer (BT)	Border Transfer (BT)	Border Transfer (BT)
Total Allowable Level of Foreign Fishing (TALFF)	Total Allowable Level of Foreign Fishing (TALFF)	N/A
RESERVE	RESERVE	N/A
TAC Area 1A	TAC Area 1A (sub-ACL)	TAC Area 1A (sub-ACL)
TAC Area 1B	TAC Area 1B (sub-ACL)	TAC Area 1B (sub-ACL)
TAC Area 2	TAC Area 2 (sub-ACL)	TAC Area 2 (sub-ACL)
TAC Area 3	TAC Area 3 (sub-ACL)	TAC Area 3 (sub-ACL)
Research Set-Aside	Research Set-Aside (and/or Other Set-Aside)	Research Set-Aside (and/or Other Set-Aside)

Table 50 compares the current terminology (no action alternative) with the new terminology (ACL Proposed Action). Within the Proposed Action the difference between option 1 and option 2 is that because option 2 was selected by the Council, JVPt, JVP, IWP, TALFF, and RESERVE

are no longer be specified. Two new AMs are proposed in the Proposed Action as a single alternative: reactive ACL overage payback provisions, and haddock catch cap.

An assessment of the potential effects of the directed Atlantic herring commercial fishery on EFH for Atlantic herring and other federally-managed species in the Northeast region of the U.S. was conducted as part of an EIS that evaluated impacts of the Atlantic herring fishery on EFH (NMFS 2005). This analysis was included in Appendix VI, Volume II of the FSEIS for Amendment 1 to the Atlantic Herring FMP. It found that midwater trawls and purse seines do occasionally contact the seafloor and may adversely impact benthic habitats utilized by a number of federally-managed species, including EFH for Atlantic herring eggs. However, after reviewing all the available information, the conclusion was reached that if the quality of EFH is reduced as a result of this contact, the impacts are minimal and/or temporary and, pursuant to MSA, do not need to be minimized, i.e., that there was no need to take specific action at that time to minimize the adverse effects of the herring fishery on benthic EFH. This conclusion also applied to pelagic EFH for Atlantic herring larvae, juveniles, and adults, and to pelagic EFH for any other federally-managed species in the region. The various species and life stages that might be affected are listed in the Affected Environment, Physical Environment and EFH section of this document. Because the fishery as a whole has minimal and temporary impacts on EFH (the conclusion of the 2005 EIS), evaluations of the impacts to EFH in the 2007-2009 and 2010-2012 specifications packages stated that changes in the amount of herring caught and the distribution of the catch by area would have a negligible impacts on EFH.

In summary, it can be concluded that the herring fishery continues to have no more than minimal and temporary impacts on EFH and as a result of the Proposed Action. This is based on: (1) the previous finding that the fishery, as it existed in 2005, was not having more than a minimal or temporary impacts on EFH, and, (2) the fact that the Proposed Action is administrative in nature and is therefore not expected to change fishery operations in a way that would alter the extent of these temporary and minimal impacts to EFH in comparison with the no action alternative. Therefore, neither additional action to minimize adverse impacts to EFH, nor an EFH assessment, are required.

7.1.3 Impacts on Protected Species

The impacts of the herring fishery on marine mammals and ESA listed species were discussed in the Atlantic Herring FMP from September 1999 and subsequent amendments. Likewise, framework adjustments and specification packages that followed the FMP have addressed the impacts of the fishery and new management actions on potentially impacted species.

The following discussion addresses the impacts of the two Proposed Actions and the two no action alternatives on the protected resources described in Section 6.1.3 of this document. Protected species interactions have been well-documented in the major gear types currently used in the Atlantic herring fishery. Also included in the section is a description of the fishery gear used in the Atlantic herring fishery, as well as the listed classifications for that gear from the *List of Fisheries for 2009* and a list of species interactions.

Some quantitative information exists for those species potentially affected by the herring fishery. For instance, estimates of mortality and Potential Biological Removal (PBR) were provided in the marine mammal stock assessment report (Waring et al. 2009) for white-sided dolphin and pilot whales. Both short-finned and long-finned pilot whales had a PBR of 249, as it was not possible to estimate them separately. The total annual estimated average of fishery-related mortality or serious injury to both short-finned and long finned pilot whales combined during 2002-2006 was 167 (CV 0.14). For both species the estimated annual fishery related mortalities in the Northeast Midwater trawl fishery, which included pair trawl, were (CV in parentheses): unknown in 2001-2002, 1.9 (CV=0.56) in 2003, 1.4 (CV=0.58) in 2004, 1.1(CV=.68) in 2005, and 0 in 2006. The Mid-Atlantic midwater Trawl fishery values, which also included the pair trawl, were (CV in parentheses): unknown in 2001-2002, 3.9 (CV=0.46) in 2003, 8.1 (CV=0.38) in 2004, 7.5 (CV=.76) in 2005, and 0 in 2006. The Atlantic white-sided dolphin had a PBR of 509 and a total annual estimated average fishery-related mortality or serious injury of 352 (CV=0.10) for 2002-2006. For the Northeast midwater trawl fishery, which included pair trawl, the estimated annual fishery related mortalities (CV in parentheses) were: unknown in 2001-2002, 24 (0.56) in 2003, 19 (0.58) in 2004, 15(.68) in 2005, and 19 (.44) in 2006. For the Mid-Atlantic midwater Trawl fishery, which also included the pair trawl, the values were (CV in parentheses): unknown in 2001-2002, 51 (0.46) in 2003, 105 (0.38) in 2004, 97(.76) in 2005, and 54 (.57) in 2006.

Overall, it is difficult to predict how the fishery will react to Proposed Action without a fully developed model and more information. This amendment, however, is mostly administrative and procedural, and the effects of the Proposed Action can be evaluated qualitatively. The nature of the Proposed Action indicates that there might not be impacts to protected species.

7.1.3.1 Protected Species Impacts of Establishing ACLs – *Alternative 1/No Action* (Non-Preferred)

Under this alternative the status quo specifications process would be maintained, meaning no action would be taken to comply with the provisions of the MSA by establishing ACLs. The herring fishery effects on protected species would likewise remain at status quo levels, with few shifts in effort, change in amount of forage available, changes in the gear used or in the timing of the fishery expected. Impacts to protected species under this alternative would therefore remain at current levels. Threatened and endangered species, as well as critical habitat, are not likely to be impacted further.

7.1.3.2 Protected Species Impacts of Establishing ACLs – *Alternative 2* (Proposed Action)

The Proposed Action complies with the MSA by modifying the specifications process. Although several processes may be altered, the overall impact will be mostly procedural and is expected to have negligible consequences for those protected species affected by the herring fishery.

Definitions

Relating the term “catch” to the new ACLs is administrative, and should have no effect on protected species. Similarly, re-defining the term “stocks in the fishery” is administrative. Setting the interim ABC control rule should not alter the process in a way that would increase or decrease benefits to protected species, as it would only change the way the value is derived. The

effects of the ABC value will be evaluated in the specifications process. The OFL, ABC, ACL and AM definitions are likewise administrative; although the process for limiting herring catch is slightly altered it still considers all the same factors in creating the specifications, so there would be no indirect or direct benefits to protected species.

Options for Fisheries Specifications – Option 1 **(Non-Preferred)**
In this option the specifications process remains largely unchanged, aside from the adjustments to comply with the MSA. The changes include administrative adjustments such as including the OFL, ABC, ACL, and AMs in the specifications process. These alterations manipulate where calculations for the specifications package will be performed, but the factors considered remain the same. Although it is difficult to predict, the ultimate harvest effort, amount and location are not expected to change. Therefore, the impacts to protected species are likely to be negligible.

Options for Fisheries Specifications – Option 2 **(Proposed Action)**
The proposed option is essentially the same as Option 1, and therefore would have the same predicted effect on protected species. This Option differs, however, in the removal of setting JVP, IWP, TALFF and a TAC reserve. In recent years the specifications packages have set the four specifications to 0. There is no expectation that they would be set higher in the future and the understanding remains that TALFF can be requested, when needed, at a later date. The proposed option is therefore eliminating the trouble of setting the levels each time new specifications are set. Removal of the terms would therefore have no effect on the impact to protected species.

Sub ACLs
This portion of the Proposed Action is meant to prevent overfishing on a sub-component level by defining sub-ACLs. If the Council chooses, AMs can be specified for the sub-ACLs within the specifications process, further reducing the risk of overfishing. By limiting the possibility of overfishing the potential measures also have the opportunity to create indirect benefits for protected species. The shift in timing, location, and gear types in the fishery will be unknown until the sub-ACL values are set, however, and therefore the direct impact of the setting will be analyzed further in the future specifications process.

Administration: Specifications Process
The Proposed Action is meant to guide the administrative portion of the specifications process by specifying how the PDT and SSC will guide the recommendation process for the reference points within the specifications packages. As such, this part of the Proposed Action should not increase or decrease interactions of protected species with the fishery and therefore should have no impact on protected species.

7.1.3.3 Protected Species Impacts of Establishing AMs – *Alternative 1/No Action* (Non-Preferred)

Under the no action or status quo alternative, impacts to the herring resource would remain largely unchanged from the present. In-season adjustments to management area TACs would still be permitted in order to minimize the risk of overfishing individual stock components. This scenario, however, is not written to be compliant with the recent MSA.

7.1.3.4 Protected Species Impacts of Establishing AMs – *Alternative 2* (Proposed Action)

Option 1 – ACL Overage Deduction **(Proposed Action)**

The proposed option is a reactive AM designed to provide consequences for overages during a fishing year. The consequences are enforced in the year after the final catch is tallied, typically resulting in a 1-year delay of consequences, given the timing of the fishery. Any overages that are likely to occur with respect to the herring ACLs are probably will be very small because of the measures already in place to ensure that the sub-ACLs are not exceeded (ex., closing the directed fishery when 95% of the sub-ACL is projected to be reached).Therefore this option it will likely only have negligible effects on protected species that have the potential to interact with the gear types used in the fishery, as the behavior of the fishery should not be expected to change.

Option 2 – Haddock Catch Cap Accountability Measure **(Proposed Action)**

Haddock is not listed as a protected species and therefore the benefits to the haddock stock complexes through reduction of bycatch are not relevant to this protected species section. Many of the protected species which interact with the herring fishery could benefit from the reduction in haddock catch; some of the dolphin, seals, and whales listed above prey on haddock in one of its life stages. These measures have already been established in the herring fishery through Framework Adjustment 43 to the Northeast Multispecies FMP, however, and the re-definition of this measure as an AM should not be expected to have an impact on protected species.

7.1.3.5 Monitoring

None of the actions under consideration are expected to result in an increase in observer coverage at sea. More monitoring for the fishery would prove beneficial to protected species analysis as a more accurate rate of interaction with the fishery could be calculated. Amendment 5 will most likely address some of these issues. Until that time, all options under consideration will therefore have no effect on the monitoring of protected species.

7.1.3.6 Forage Species Availability

It should be noted that the uncertainty associated with conflicting stock assessment estimates makes it difficult to calculate the amount of surplus herring biomass that is currently available as forage for predators. Consequently, while management overall has been viewed as a benefit to protected resources inhabiting the herring management area for providing more forage, the impact of the fishery relative to prey availability has not been analyzed. There is therefore no expected impact of the Proposed Actions and the alternatives.

It should be noted that any shift in available forage ought to be sufficiently small as to not impact the status of any protected species. The effects of fishing would continue to occur, with impacts principally on the species expected to interact with the fishery, but the herring fishery as a whole would not likely jeopardize the continued existence of threatened or endangered species or critical habitat.

7.1.4 Impacts on Non-Target Bycatch Species

7.1.4.1 Impacts of Establishing ACLs on Non-Target/Bycatch Species – *Alternative 1/No Action* (Non-Preferred)

The No Action Alternative would not establish any of the new terms or incorporate them into the process and no process for setting ACLs would be established.. The specifications process would continue unchanged and sub-ACLs would not be defined. There are currently management measures in place to protect other non-target/bycatch species, including hard TACs in various management areas. The impacts of the No Action Alternative are therefore expected to ne negligible, although it would not bring the Atlantic Herring FMP into compliance with the MSA or the NS 1 Guidelines.

7.1.4.2 Impacts of Establishing ACLs on Non-Target/Bycatch Species – *Alternative2* (Proposed Action)

The Proposed Action would bring the Atlantic Herring FMP into compliance with the MSA and NS 1 Guidelines. Compared to the no action alternative, the Proposed Action meets the provisions of the MSA and therefore does more to ensure that targets will be met than the No Action alternative does. This includes limiting the catch of non-target/bycatch species, particularly through the limit to the fishery placed by the interim ABC control rule. It also meets the requirements of National Standard 1 Guidelines to consider species caught incidentally or as bycatch in the herring fishery. The alternative is mostly administrative, however, and the actual establishment of terms and changes to the process should not have a direct biological impact. The Proposed Action may indirectly benefit non-target/bycatch species by making the process explicit and incorporating the SSC into the specification process which, in turn, may better prevent their catch. This amendment does not set the specifications themselves, however, and the direct impact on non-target/bycatch species will be evaluated further during the process of setting the specific numbers.

Definitions
Establishing the definitions for OFL, ABC, ACL and AM and relating the term “catch” to the new ACL definition is purely administrative. Some indirect positive effect could result from these establishments for non-target/bycatch species. The process will become more explicit, which could result in more appropriate quotas and by extension, reduce the interaction with non-target/bycatch species. The interim ABC control rule could likewise provide ancillary benefits to the afore mentioned species as the ABC was reduced as a result of the rule. The actual numbers assigned to these terms, however, are not defined in this amendment, and the effect of these numbers will be analyzed in future specification packages when they are used. Similarly, defining “stocks in the fishery” to include non-target species in the specifications process in the future could have positive biological impacts on non-target species in the future, however this amendment does not specify any other species besides Atlantic Herring as a “stock”. The setting of the interm ABC control rule may also have an indirect positive impact for the non-target/bycatch species by helping to ensure that the ABC is not exceeded, however the definition of the interim ABC control rule itself will have no direct impact; the direct impacts of the ABC

specification has been evaluated in the 2010-2012 specifications package. Overall there are expected to be negligible direct biological impacts as a result of these definitions.

Options for Fisheries Specifications – Option 1 **(Non-Preferred)**
This option will leave the current specifications process largely unchanged, aside from the adjustments to comply with the MSA. The changes include administrative adjustments such as including the OFL, ABC, ACL, and AMs in the specifications process. These alterations manipulate how calculations for the specifications package will be performed, but the factors considered remain the same. The impacts are therefore expected to be neutral as a result of this option.

Options for Fisheries Specifications – Option 2 **(Proposed Action)**
This option is, in part, the same as Option 1, and therefore would have the same neutral impact on non-target/bycatch species. This option differs in the removal of setting JVP, IWP, TALFF and a TAC reserve, but these should have no effect on the aforementioned species, as they have recently been set to 0 in previous specification packages. Indirect positive biological benefits, however, may result from the standardization and simplification of the specifications setting process.

Sub ACLs
This portion of the Proposed Action is meant to prevent overfishing on a sub-component level by defining sub-ACLs. Through this action sub-ACLs can be individually addressed by the Council by measures such as individual AMs for each sub-ACL. This has the potential to reduce the impacts of non-target species by protecting the inshore and offshore components of the fishery better. Although sub-ACLs are being defined in this amendment, the specific value for each sub-ACL is not being assigned. When the specifications process does set these numbers, the direct impacts to non-target/bycatch species will be addressed. Overall there is no expected impact of defining sub-ACLs on the non-target/bycatch species.

Administration: Specifications Process
A strictly administrative portion of the specifications process, the Proposed Action specifies how the PDT and SSC will guide the recommendation process for the reference points within the specifications packages. This measure is procedural and is expected to have no biological impact as a result of implementation.

7.1.4.3 Impacts of Establishing AMs on Non-Target/Bycatch Species – *Alternative 1/No Action* (Non-Preferred)

The No Action Alternative would not bring the Atlantic Herring FMP into compliance with the MSA or the NS 1 Guidelines. Under the no action alternative no AMs would be established, and TAC overages would not be addressed. AMs have been required as a means of protection for the herring resource, and by extension, have the ability to positively effect non-target/bycatch species, such as herring, mackerel and spiny dogfish. By not establishing ACLs the alternative presents the small possibility that that overages, and therefore more catch of non-target/bycatch species could occur, however that possibility is remote, as there are currently other management measures in place to protect other non-target/bycatch species.

7.1.4.4 Impacts of Establishing AMs on Non-Target/Bycatch Species – *Alternative 2* (Proposed Action)

Option 1 – ACL Overage Deduction **(Proposed Action)**

The overall effect of the Proposed Action on non-target/bycatch species is expected to be neutral. Although the AM is reactive and designed to provide consequences for area quota overages during a fishing year, the overages do not apply to non-target/bycatch species. An indirect benefit to the species may come from the potential prevention of the herring fishery exceeding OFL, as the Proposed Action is designed to do, and from the compensation for past overages. Both could result in a potential decrease in bycatch. Such indirect benefits are likely to be limited, however, as current management measures have prevented overfishing in recent years. Any overages that are likely to occur with respect to the herring ACLs are probably will be very small because of the measures already in place to ensure that the sub-ACLs are not exceeded (ex., closing the directed fishery when 95% of the sub-ACL is projected to be reached). Overall the impacts to non-target/bycatch species are expected to be negligible, with a few potential indirect benefits from increased accountability.

Option 2 – Haddock Catch Cap Accountability Measure **(Proposed Action)**

The Proposed Action could have a positive biological impact to the herring stock by reducing incidental haddock mortality, as this option limits or restricts the possession of haddock when the catch cap is reached. It is consistent with the establishment of the catch cap as a sub-ACL in the groundfish fishery (Amendment 16). As Framework Adjustment 43 to the Northeast Multispecies FMP states:

> *(T)his measure should discourage herring vessels from catching large amounts of haddock as bycatch since all bycatch counts towards the overall cap for the fishery. The potential incentive to avoid catching haddock as bycatch is why this measure is proposed at this time. The overall catch cap would place a backstop on the total amount of haddock that could be caught as bycatch in the herring fishery. Moreover, this measure was widely supported by industry and other members of the public when it was originally proposed by the Bycatch Committee in March 2005.*

The measure was put in place in the herring fishery with Framework Adjustment 43 to the Northeast Multispecies FMP in 2006, however. As a result, the opportunity for the positive biological effects that this AM could have on non-target/bycatch species has passed; this amendment re-defines the procedure as an accountability measure rather than altering it. The establishement of this measure as an AM should therefore not be expected to have an effect on non-target/bycatch species. Compared to the No Action Alternative this option may result in indirect benefits to the resource because it offers managerial clarification that the No Action Alternative will not bring to the FMP.

7.2 HUMAN IMPACTS

7.2.1 Economic Impacts

7.2.1.1 Economic Impacts of Establishing ACLs – *Alternative 1/No Action* (Non-Preferred)

Under this alternative the status quo specifications process would be maintained; no action would be taken to comply with the provisions of the MSA by establishing ACLs. The long term stability of the herring fishery stands to benefit from ACL establishment, which would in turn result in economic benefits to the fishery. Current regulations are already in place through the Atlantic herring FMP to prevent overfishing, however, and therefore the impacts of the No Action Alternative are therefore expected to be negligible.

7.2.1.2 Economic Impacts of Establishing ACLs – *Alternative 2* (Proposed Action)

Contrasted against the No Action Alternative, the Proposed Action complies with the MSA by modifying the specifications process and defining terms in the herring FMP. Although several processes may be altered, the overall impact will be mostly procedural and is expected to have negligible economic impacts for the herring fishery. Indirect benefits may also result economically from making the process explicit and incorporating the SSC into the specification process, thereby presenting the opportunity to better preventing overfishing and possibly creating a more sustainable fishery. This amendment does not set the specifications, however, and the direct impacts of setting the specifications will be evaluated separately.

Definitions

The definitions in the Proposed Action are intended to bring the FMP into compliance with the MSA, whereas the No Action Alternative does not. Re-defining the term "catch" to the new ACLs is administrative, and should have no economic effect on the herring fishery. Similarly, re-defining the term "stocks in the fishery" is administrative for now. Should other species be considered in the future the impacts will be evaluated in future specifications packages. The OFL, ABC, ACL and AM definitions are also administrative; although the process for limiting herring catch will be slightly altered it still considers all the same factors in creating the specifications, so there would be no direct benefits. Some indirect, positive economic effect could result from these new definitions, however. The process will become more explicit, which could result in more appropriate quotas and by extension, could act to ensure the longevity of the fishery as an economic resource.

The setting of the interim ABC control rule is not expected to have a direct economic impact on the fishery. Although the control rule is based on the average catch from 2006-2008, which will lower the ABC value compared to the 2007-2009 abc value, this amendment does not set the ABC value. The economic effects of setting the ABC are addressed in the 2010-2012 specifications package. There are not expected to be direct economic effects due to the setting of the interim ABC control rule, in comparison, as the interim ABC control rule is a definition and will not set a number directly.

Options for Fisheries Specifications – Option 1 **(Non-Preferred)**

In this option the specifications process remains largely unchanged, aside from the adjustments to comply with the MSA. The No Action Alternative, by contrast, does not. The changes include administrative adjustments such as including the OFL, ABC, ACL, and AMs in the specifications process. The changes also include changing where the specifications are considered in the process. These alterations manipulate where calculations for the specifications package will be performed, but the factors considered remain the same. The ultimate harvest effort, amount and location are not expected to change; therefore there are no economic impacts expected for the fishery.

Options for Fisheries Specifications – Option 2 **(Proposed Action)**
The proposed option is very similar to Option 1, and therefore would have the same neutral economic impact on the herring fishery. The major difference between Option 1 and the proposed option is that JVP, IWP, TALFF and a TAC reserve are removed from the specifications process in the proposed option. In recent years the specifications packages have set the four specifications to 0. There is no expectation that they would be set higher in the future and the understanding remains that TALFF can be requested, if needed, at a later date. The Proposed Action eliminates the regulatory burden on the Council associated with setting these four levels each time new specifications are set. A potential negative economic impact could occur in the future if requests for TALFF factors took a long time to be granted approval; there may be a negative effect on US employment and revenues in both the processing and harvesting sectors. For example, if a TALFF were requested with the intent of US processors processing the landed herring and the request was delayed or denied then US processors could experience an economic impact. The possibility of such delay occurring is remote, and no requests are likely fourthcoming. The Proposed Action should therefore not have a direct economic impact. Indirect positive biological benefits, however, may result from the standardization and simplification of the specifications setting process.

Sub ACLs
This portion of the Proposed Action is meant to prevent overfishing on a sub-component level by defining sub-ACLs. If the Council chooses, AMs can be specified for the sub-ACLs within the specifications process, providing further incentives to avoid overfishing a sub-component of the herring stock. Economically there should be no impacts as a result of defining sub-ACLs, as it is an administrative action. The value of each sub-ACLs will be analyzed further when they are implemented in future actions, with regards to the economic impact.

Administration: Specifications Process
A strictly administrative portion of the specifications process, the Proposed Action specifies how the PDT and SSC will guide the recommendation process for the reference points within the specifications packages. Timing, however, is important in terms of providing the industry with sufficient information to make business arrangements and plans for the following years. It will be important economically to try to develop the specifications well in advance of the following fishing year so that the industry has sufficient notice as to what the upcoming ACLs, sub-ACLs, and AMs may be. Overall, however, this measure is procedural and is expected to have no economic impact as a result of implementation.

7.2.1.3 Economic Impacts of Establishing AMs – *Alternative 1/No Action* (Non-Preferred)

Under the no action or status quo alternative, impacts to the herring resource would remain largely unchanged from the present. In-season adjustments to management area TACs would still be permitted in order to minimize the risk of overfishing individual stock components. This scenario, however, is not written to be compliant with the recent MSA. There is therefore likely to be no direct economic impact as a result of taking no action.

7.2.1.4 Economic Impacts of Establishing AMs – *Alternative 2* (Proposed Action)

Option 1 – ACL Overage Deduction **(Proposed Action)**

The overall economic impact of the proposed option is expected to be neutral. This action would bring the Atlantic Herring FMP into compliance with the MSA, as opposed to the No Action Alternative. The Proposed Action is a reactive AM designed to provide consequences for overages during a fishing year. The consequences are enforced in the year after the final catch is tallied, typically resulting in a one year delay of consequences, given the timing of the fishery. There is a possibility that the one year delay could cause an economic consequence for those owners who will be new to the fishery or who will not be fishing part of the overage. Participants in the fishery during a year in which ACLs are exceeded will benefit from those high levels of catch. In the subsequent years in which the AM is active participants will experience a reduction in the amount of herring they can harvest and therefore may suffer negative economic impacts. However, this aggregate economic impact would be nullified over the three year process if the vessel fishes in all years. The aggregate economic impact of the Proposed Action to the fishery, therefore, should be neutral. An indirect economic benefits from the increase in accountability should be expected as a result of this option as well.

Option 2 – Haddock Catch Cap Accountability Measure **(Proposed Action)**

The proposed AM is consistent with the establishment of the catch cap as a sub-ACL in the groundfish fishery (Amendment 16) and consistent with current regulations regarding the catch cap. In it possession of haddock is limited or restricted when the catch cap is reached. Although this AM can limit the amount of herring that can be harvested, this measure is already in place and therefore maintains the status quo. There should be no further economic impacts for the herring fishery as a result of the Proposed Action. Some indirect benefits to the resource could result, however, from the managerial clarification that this option offers the FMP. The economic impacts of changes to the haddock catch cap will be evaluated in the future, as necessary, through the specifications process.

7.2.2 Social and Community Impacts

A description of the social aspects of the herring fishery can be found in Section 6.2 of this document. Overall the measures proposed in this Amendment are not expected to have a social impact to the herring fishery, as they are primarily administrative and procedural in nature. The No Action Alternative would not bring the Atlantic Herring FMP into compliance with the MSA, as compared to the proposed action, which would. Not bringing the FMP unto compliance with the MSA could have some social and community impacts. The social impacts are difficult to predict, however, because the reaction of the fishery and the related social consequences to these

procedural measures is difficult to estimate. In the following sections a brief review of potential social impacts has been compiled which tries to predict such fishery behavior.

7.2.2.1 Social Impacts of Establishing ACLs – *Alternative 1/No Action* (Non-Preferred)

This alternative would fail to comply with the provisions of the MSA by not establishing the required ACLs. As a result the status quo specifications process would be maintained and no social impact would be expected.

7.2.2.2 Social Impacts of Establishing ACLs – *Alternative 2* (Proposed Action)

The Proposed Action is mostly procedural and complies with the MSA by modifying the specifications process. There are no expected social impacts of this measure, however.

Definitions

Relating the term "catch" to the new ACLs is administrative, and should have no significant direct impact on fishermen. Similarly, re-defining the term "stocks in the fishery" is mostly administrative. In the future if non-target species are considered for inclusion in the specification package then the further impacts to the fishery will be evaluated at that time. The OFL, ABC, ACL and AM definitions are likewise administrative; although the process for limiting herring catch is slightly altered it still considers all the same factors in creating the specifications, so there would be no indirect or direct social benefits for the fishery.

Similar to the economic impacts, the setting of the interim ABC control rule is not expected to have any direct impact on fishermen. The social effects of setting the actual number for the ABC are addressed in the 2010-2012 specifications package. The interim control rule, by comparison, is being defined in this amendment and will not set a number directly, therefore it can be expected to have no social impact.

Options for Fisheries Specifications – Option 1 **(Non-Preferred)**

In the non-preferred option the specifications process remains largely unchanged, aside from the adjustments to comply with the MSA. The changes include administrative adjustments such as including the OFL, ABC, ACL, and AMs in the specifications process, and altering the definition of ABC. These alterations manipulate where calculations for the specifications package will be performed, but the factors considered remain the same. The ultimate harvest effort, amount and location are not expected to change and therefore there are no social impacts expected for the fishery as a result of this option.

Options for Fisheries Specifications – Option 2 **(Proposed Action)**

Option 1 is very similar to the proposed option, and the proposed option is expected to have the same neutral social impact on the herring fishery. The proposed option differs in the removal of setting JVP, IWP, TALFF and a TAC reserve. In recent years the specifications packages have set the four specifications to zero. There is no expectation that they would be set higher in the future and the understanding remains that TALFF can be requested, when needed, at a later date. The Proposed Action is therefore eliminating the trouble of setting the levels each time new specifications are set. A potential negative economic and by extension, social impact could occur in the future if requests for TALFF took a long time to be granted approval; there may be a negative effect on US employment and revenues in both the processing and harvesting sectors. For example, if a TALFF were requested with the intent of US processors processing the landed

herring and the request was delayed or denied then US processors could experience an economic impact, which could become a social impact. The possibility of such delay occurring is remote, and no requests are likely fourthcoming. The Proposed Action is therefore not expected to have a direct social impact.

Sub ACLs
The Proposed Action is meant to prevent overfishing on a sub-component level by defining sub-ACLs. If the Council chooses, AMs may be specified for the sub-ACLs within the specifications process, further reducing the risk of overfishing. The direct social impacts of these definitions expected to be neutral, as the measure is administrative. The value for each sub-ACLs, when implemented in the future, will be analyzed further in regards to the social impact, however at this time there is no direct social impact associated with establishing sub-ACLs.

Administration: Specifications Process
A strictly administrative portion of the specifications process, the Proposed Action specifies how the PDT and SSC will guide the recommendation process for the reference points within the specifications packages. This measure is procedural and is expected to have no biological impact as a result of implementation. Timing, however, is important in terms of providing the industry with sufficient information to make business arrangements and plans for the following years. The proposed ACL/AM process is more complicated and may be more time-consuming for the Council and NMFS. It will be important to try to develop the specifications well in advance of the following fishing year so that the industry has sufficient notice as to what the upcoming ACLs, sub-ACLs, and AMs may be.

7.2.2.3 Social Impacts of Establishing AMs – *Alternative 1/No Action* (Non-Preferred)

Under the no action or status quo alternative, impacts to the herring resource would remain largely unchanged from the present. In-season adjustments to management area TACs would still be permitted in order to minimize the risk of overfishing individual stock components. There is likely to be no direct social impact as a result of taking no action .

7.2.2.4 Social Impacts of Establishing AMs – *Alternative 2* (Proposed Action)

Option 1 – ACL Overage Deduction **(Proposed Action)**
The overall economic impact of the proposed option is expected to be neutral. This option is a reactive AM designed to provide consequences for overages during a fishing year. The consequences are enforced in the year after the final catch is tallied, meaning the overage will be deducted in the year following determination of the overage. There is a possibility that the one year delay could cause an economic consequence, and therefore there could be a social consequence for those owners who will be new to the fishery or who will not be fishing part of the overage. Participants in the fishery during a year in which ACLs are exceeded will benefit from those high levels of catch. In the subsequent years in which the AM is active participants will experience a reduction in the amount of herring they can harvest and therefore may suffer negative economic impacts. However, this aggregate economic impact would be nullified over the three year process if the vessel fishes in all years, neutralizing the social impact. The aggregate social impact of the Proposed Action to the fishery, therefore, should be neutral for most participants. The time between the overage and the deduction in the subsequent year eliminates the possibility that ACLs will change during a fishing year, which should help improve the industry's ability to make business decisions and plan for the future fishing year(s).

An indirect social benefit from the increase in accountability should be expected as a result of this option as well.

Option 2 – Haddock Catch Cap Accountability Measure
The proposed AM is consistent with the establishment of the catch cap as a sub-ACL in the groundfish fishery (Amendment 16) and consistent with current regulations regarding the catch cap. In it possession of haddock is limited or restricted when the catch cap is reached, and though this could potentially prohibit the amount of herring the fishery could harvest, the measure is already in place and therefore maintains the status quo. There would therefore be no expected additional social impacts for the herring fishery as a result of the Proposed Action.

7.3 CUMULATIVE EFFECTS

The term "cumulative effects" is defined in the Council of Environmental Quality's (CEQ) regulations in 40 CFR Part 1508.7 as:

> *The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.*

Cumulative effects are linked to incremental actions or policy changes that individually may have small outcomes, but that, in the aggregate and combined with other factors, can result in greater environmental effects on the affected environment. At the same time, the CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action on the universe; analyses focus on those effects that are truly meaningful.

The following analysis will identify and characterize the impact on the environment from the Proposed Action when analyzed in the context of other past, present, and reasonably foreseeable future actions. The analysis is generally qualitative in nature because of the limitations of determining effects over the large geographic areas under consideration. This analysis is also based on the comprehensive cumulative effects analysis presented in the Final Amendment 1 EIS document and updates information as appropriate. The Amendment 1 cumulative effects analysis (Section 8.7 of Amendment 1, completed May 2006) should be referenced for additional information. Additional information about cumulative effects related to the Atlantic herring fishery can be found in the 2007-2009 and 2010-2012 herring specifications package.

Consistent with the guidelines for CEA, cumulative effects can be more easily identified by analyzing the impacts of the Proposed Action on valued ecosystem components (VECs). The affected environment is described in this document based on VECs that were identified for consideration relative to the proposed specifications. The VECs described in this document and considered in this CEA include: Atlantic herring resource; habitat and essential fish habitat (EFH); protected resources (marine mammals and protected species); non-target/bycatch species; and the Atlantic herring fishery (fishery-related businesses and communities).

VECs represent the resources, areas, and human communities that may be affected by a Proposed Action or alternatives and by other actions that have occurred or will occur outside the Proposed Action. VECs are generally the "place" where the impacts of management actions are exhibited. An analysis of impacts is performed on each VEC to assess whether the direct/indirect effects of an alternative adds to or subtracts from the effects that are already affecting the VEC from past, present and future actions outside the Proposed Action (i.e., cumulative effects).

Changes to the Herring FMP have the potential to directly affect the Atlantic herring resource. The habitat and EFH VEC focuses on habitat types vulnerable to activities related to directed fishing for herring. The protected resources VEC focuses on those protected species with a history of encounters with the herring fishery. The herring fishery VEC could be affected directly or indirectly through a variety of complex economic and social relationships associated with either the managed species (herring) or any of the other VECs.

The geographic area that encompasses the physical, biological and human environmental impacts to be considered in the cumulative effects analysis is described in detail in Section 7.0 of the Amendment 1 document and updated in Section 7.3 of this document. The physical environment, including habitat and EFH, is bounded by the range of the Atlantic herring fishery, from the GOM through the mid-Atlantic Bight, and includes adjacent upland areas (from which non-fishing impacts may originate). The geographic range for impacts to fish species is the range of each fish species in the western Atlantic Ocean. For Protected Species, the geographic range is the total range of Atlantic herring. The geographic range for the human environment is defined to be those fishing communities bordering the range of the herring fishery.

Overall, while the effects of the historical herring fishery are important and are considered in the analysis, the temporal scope of past and present actions for Atlantic herring, the physical environment and EFH, protected species, fishery-related businesses and communities, and non-target species is focused principally on actions that have occurred since 1996, when the MSRA was enacted and implemented new fisheries management and EFH requirements. The temporal scope for marine mammals begins in the mid-1990s, when NMFS was required to generate stock assessments for marine mammals that inhabit waters of the U.S. EEZ that create the baseline against which current stock assessments are evaluated. For turtle species, the temporal scope begins in the 1970s, when populations were noticed to be in decline. The temporal scope for Atlantic herring is focused more on the time since the Council's original Herring FMP was implemented at the beginning of the 2001 fishing year. This FMP serves as the primary management action for the Atlantic herring fishery and has helped to shape the current condition of the resource.

Consistent with the cumulative effects analysis in Amendment 1, the temporal scope of future actions for all VECs, which includes the proposed amendment , extends five years into the future. This period was chosen because of the dynamic nature of resource management and lack of specific information on projects that may occur in the future, which make it difficult to predict impacts beyond this time frame with any certainty. This is also the rebuilding time frame for the Atlantic herring resource, as defined in the Herring FMP, should the resource become overfished and subject to a rebuilding program in the future.

Additional discussion of VECs for the Herring FMP and the application of this approach can be found in the Final Amendment 1 EIS document.

7.3.1 Atlantic Herring Resource

Past and Present Actions: Atlantic herring management measures were implemented in two related, but separate FMPs in 1999 – one by the federal government (NEFMC 1999, amended in 2006) and one by the states (ASMFC 1999, amended in 2006). The status of the herring resource is updated in Section 6.1.1 of this document, and the herring fishery is summarized in Section 6.2.1 of this document. The offshore stock has recovered from its collapse in the early 1970s and, overall, the coastal Atlantic herring resource is not overfished, and overfishing is not occurring. There is more concern for the inshore stock since it receives more fishing pressure, and recent survey trends in the inshore Gulf of Maine are declining. Additional past and present actions that affect the herring resource are discussed in the other VEC sections.

The ASMFC adopted Amendment 2 in March of 2006 to herring management in state waters which revised management area boundaries, biological reference points, the specification process, research set-asides, internal waters processing operations, and measures to address fixed gear fisheries and required fixed gear fishermen to report herring catches through the IVR program. Further discussion can be found in the 2007-2009 Atlantic Herring specifications package.

The ASMFC recently developed an Addendum which proposes modifications to Amendment 1 (Amendment 1) and Amendment 2 (Amendment 2) to the Interstate Fisheries Management Plan for Atlantic Sea Herring that would change the specification setting process and associated definitions. Based on the difficulty of having two sets of acronyms, one for the NEFMC plan and one for the ASMFC plan, for one cooperatively managed species the addendum was developed to establish an identical set of definitions and acronyms as those that the NEFMC is required to use under MSRA. The addendum also proposes to establish a new specification setting process that is more in line with the ASMFC Sea Herring Section's usual process for setting specifications while taking into account the new process being enacted in this amendment.

Although difficult to quantify at this time (as the addendum has not been implemented), the impact of the ASMFC measures which implements the same language being considered in this amendment on the VECs under consideration will likely be neutral. Similar to this amendment, the action will be mainly procedural, and the effect of the change in the process will be evaluated in future considerations of the specifications. The implementation of a new specifications process, however, has the ability to alter the amount of fishery effort, and by extension positively or negatively influence the herring resource. The impact of the new specifications process on the fishery will be evaluated further once the addendum has been enacted.

Reasonably Foreseeable Future Actions: One of the reasonably foreseeable future actions that will likely affect the Atlantic herring resource is Amendment 5 to the herring FMP. Measures that will be developed under this amendment include a catch monitoring program, river herring bycatch measures, criteria for midwater trawl access to groundfish closed areas, measures to

address interactions with the Atlantic mackerel fishery, and measures to protect herring spawning components. While some elements of the amendment were complete and ready to move forward at this time, the larger, more significant components of the catch monitoring program and other measures (river herring bycatch measures, groundfish closed area access) still require additional work and/or discussion. As such, the impacts of the proposed measures cannot be predicted at this time.

Omnibus EFH Amendment is scheduled for implementation in September 2011. This amendment could positively affect Atlantic herring via increased protection of benthic habitats used by the species from the adverse effects of various regional fisheries. Further, NMFS is currently in a rule-making process to propose changes to the Harbor Porpoise Take Reduction Plan which are intended to reduce harbor porpoise mortalities (74 FR 36058, July 21, 2009). This action would likely result in vessels facing additional restrictions, possibly resulting in positive impacts to herring and other species taken incidentally.

The sea turtle Strategy is a gear-based approach to addressing sea turtle bycatch. NMFS is currently considering proposing changes to the regulatory requirements for trawl fisheries to protect sea turtles. As described in a NOI to prepare an EIS (74 FR 88 May 8, 2009), NMFS is considering expanding the use of TEDs to other trawl fisheries and modifying the geographic scope of the TED requirements. This measure is likely to be neutral for the herring resource as it will not affect herring directly.

Summary of Impacts:
Analysis of Amendment 4 to the Atlantic herring FMP has considered the potential impacts of the Proposed Action and other alternatives on the Atlantic herring resource, in combination with relevant past, present, and reasonably foreseeable future actions as well as applicable non-fishing impacts. The incremental benefits from the Proposed Action are not likely to result in significant cumulative effects on the Atlantic herring resource. The significance criteria that applies to the herring resource requires the consideration of whether or not the Proposed Action is reasonably expected to jeopardize the sustainability of any target species (herring) and whether or not the Proposed Action is expected to result in cumulative adverse impacts with a substantial effect on herring.

The Council met the requirements of the MSA and National Standard 1 when it developed the Herring FMP as well as Amendment 1, and implemented conservation and management measures that are intended to prevent overfishing and achieve, on a continuing basis, OY for the Atlantic herring fishery. Amendment 4 to the Atlantic herring FMP has been developed in accordance with the provisions and new requirements of the Magnuson-Stevens Fishery Conservation and Management Act. It allows the herring FMP to meet the requirement to establish a process for and specifications for ACLs and AMs for Atlantic herring by 2011, as Amendment 4 is scheduled to implemented prior to the start of the 2011 fishing year.

The direct and indirect impacts of the Proposed Actions on the Atlantic herring resource are discussed in detail in Section 7.1.1 of this document. By not establishing ACLs the No Action Alternative fails to comply with the MSA or NS1 Guidelines, and presents the small possibility that that overages could be produced, however that possibility is remote. The Proposed Action,

however, is mostly procedural and complies with the MSA by modifying the specifications process, and the biological analyses provided in this document suggest that the impacts of the Proposed Action on the Atlantic herring resource will not be significant. With the setting of the specifications for the ACLs and AMs in the future impacts of these measures will be evaluated further.

7.3.2 Habitat and EFH

Past and Present Actions: The Herring EFH designation, which was developed as part of an Omnibus EFH Amendment prepared by NEFMC for all its managed species, is reproduced in Section 6.1.2 of this document. The Omnibus EFH Amendment was approved for Atlantic herring by the Secretary of Commerce on October 27, 1999. The final rule implementing the Atlantic herring FMP to allow for the development of a sustainable Atlantic herring fishery was published on December 11, 2000 (65 FR 77450).

Because the gears used in the herring fishery have only occasional bottom contact with the primary substrates used by herring for egg deposition, and because the noises produced by herring fishing operations only temporarily disperse schools of juvenile and adult herring, EFH impacts assessments for the fishery have concluded that it does not have an adverse effect on herring EFH. In addition, these assessments have concluded that the herring fishery does not have an adverse impact on EFH designated for non-herring species.

Various measures have been implemented in the Northeast Region to protect the EFH of NEFMC-managed species. In particular, all bottom-tending mobile gear is prohibited from the level 3 Habitat Closed Areas (HCAs) established in 2004 under Amendment 13 to the Northeast Multispecies FMP and Amendment 10 to the Atlantic Sea Scallop FMP. In large part, these HCAs overlap with areas established in 1994 and 1998 to protect overfished stocks of cod, haddock and other groundfish species. As mobile bottom-tending gear is largely prohibited from the groundfish closures, they have incidental EFH protection benefits. Other measures to protect EFH include spatially-specific roller gear restrictions in the Multispecies and Monkfish fisheries.

Reasonably Foreseeable Future Actions: At the present time, it is not known how Amendment 5 to the herring FMP will affect EFH, however there are likely to be some effects as a result of the measures. The catch monitoring program, river herring bycatch measures, criteria for midwater trawl access to groundfish closed areas, and measures to address interactions with the Atlantic mackerel fishery all stand to alter fishing effort, thereby reducing or increase gear interaction with the seabed. However the larger, more significant components of the catch monitoring program and other measures still require additional work and/or discussion, and so the effects of the measures cannot be predicted at this time and will be evaluated thoroughly in the EIS for Amendment 5.

Reasonably foreseeable future actions that will likely affect habitat include the Omnibus EFH Amendment, currently under development. This action reviews and updates EFH designations, identifies Habitat Areas of Particular Concerns (HAPCs), reviews prey information for all managed species, reviews non-fishery impacts to EFH, and reviews the current science on

fishing impacts to habitat. It will also include coordinated and integrated measures intended to minimize the adverse impact of NEFMC-managed fishing on EFH. The net effect of new EFH and HAPC designations and more targeted habitat management measures should be positive for EFH.

The Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic Ocean and Gulf of Mexico ("Strategy") is a gear-based approach to addressing sea turtle bycatch. NMFS is currently considering proposing changes to the regulatory requirements for trawl fisheries to protect sea turtles. As described in a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) for Sea Turtle Conservation and Recovery in Relation to the Atlantic Ocean and Gulf of Mexico Trawl Fisheries (74 FR 88 May 8, 2009), NMFS is considering expanding the use of TEDs in trawl fisheries and modifying the geographic scope of the TED requirements. Since TED requirements may decrease the catch retention of some target species, vessels may tow longer to offset this loss of catch, likely resulting in negative impacts to habitat and EFH.

Summary of Impacts:
Section 7.1.2 of this document addresses the potential impacts of Amendment 4 to the Atlantic herring FMP on habitat and EFH. After review of available information it was determined that given: (1) the previous finding that the fishery, as it existed in 2005, was not having more than a minimal or temporary impacts on EFH, and (2) the fact that the Proposed Action is administrative in nature and therefore not expected to change fishery operations in a way that would cause no more than more than temporary and minimal impacts on EFH, it can be concluded that the herring fishery continues to have no more than a minimal and temporary impacts on EFH. The cumulative impact of the Proposed Action on habitat is therefore minimal and not significant. The impacts of ACLs and AMs will be evaluated further when the specifications are next set, as the extent of the effects can be better evaluated at that time.

7.3.3 Protected Resources (Marine Mammals and Protected Species)

Past and Present Actions: A general description of protected species that may be affected by the Proposed Action is provided in Section 6.1.3 of this document and in more detail in proposed Amendment 1 to the FMP.

Large whales may be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources due to trophic effects resulting from a variety of activities including the operation of commercial fisheries. Ship strikes and fishing gear entanglement continue to be the most likely sources of human-related injury or mortality for right, humpback, fin and minke whales. Sei, blue and sperm whales are also vulnerable, but fewer ship strikes or entanglements have been recorded. Mobile bottom trawls, as well as midwater trawl gear, appear to be less of a concern for the large whale species. Other marine mammals, however, such as harbor porpoise, dolphins and to a greater degree seals, are vulnerable to entanglement in net gear, including midwater trawl gear and purse seines.

In addition to these actions, NMFS has implemented specific regulatory actions to reduce injuries and mortalities from gear interactions. The ALWTRP, implemented in 1999 with subsequent rule modifications, restrictions, and extensions, includes time and area closures for trap/pot fisheries (e.g., lobster and black sea bass) and gillnet fisheries (e.g., anchored gillnet and

shark gillnet fisheries); gear requirements, including a general prohibition on having line floating at the surface in these fisheries; a prohibition on storing inactive gear at sea; and restrictions on setting shark gillnets off the coasts of Georgia and Florida and drift gillnets in the Mid-Atlantic. This plan also contains non-regulatory aspects, including gear research, public outreach, scientific research, a network to inform mariners when right whales are in an area, and increasing efforts to disentangle whales caught in fishing gear. The intent of the ALWTRP is to positively affect large whales by reducing injuries and deaths of large whales (North-Atlantic right, humpback, and fin) in waters off the United States East Coast due to incidental entanglement in fishing gear.

Turtles in general have documented entanglements in shrimp trawls, pound nets, bottom trawls and sink gillnets. Shrimp trawls are required to use turtle excluder devices. The diversity of the sea turtle life history also leaves them susceptible to many other human impacts, including impacts on land, in the benthic environment, and in the pelagic environment. Anthropogenic factors that impact the success of nesting and hatching include: beach erosion, beach armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, and an increased presence of native species (e.g., raccoons, armadillos, and opossums) which raid and feed on turtle eggs. Entanglement in debris or ingestion of marine debris are also seen as possible threats.

Reasonably Foreseeable Future Actions: Amendment 5 to the herring FMP would enact measures currently under development, which include a catch monitoring program, river herring bycatch measures, criteria for midwater trawl access to groundfish closed areas, measures to address interactions with the Atlantic mackerel fishery. While some elements of the amendment were complete and ready to move forward at this time, the larger, more significant components of the catch monitoring program and other measures (river herring bycatch measures, groundfish closed area access) still require additional work and/or discussion. As such, the impacts of the proposed measures cannot be predicted at this time, and analysis of the effects will be evaluated when the amendment is finalized.

The likely impacts of the Omnibus EFH Amendment on protected resources cannot be determined at this time. The Harbor Porpoise Take Reduction Plan for the GOM and Mid-Atlantic Coasts was originally implemented in 1998, and NMFS published a proposed rule in July 2009 indicating additional management restrictions for gillnetters. Future measures of this plan may be implemented if take reduction goals are not met, which could further reduce fishing effort and may have a positive effect on the population of this species.

The sea turtle Strategy is a gear-based approach to addressing sea turtle bycatch. Under the Strategy, NMFS has identified trawl gear as a priority for reducing sea turtle bycatch and is considering proposing changes to the TED requirements in the trawl fisheries. TED requirements are designed to have a positive effect on protected resources, specifically turtles by allowing for most turtles caught in trawl nets to escape. NMFS is working to develop and

implement bycatch reduction measures in all trawl fisheries in the Atlantic and Gulf of Mexico when and where sea turtle takes have occurred or where gear, time, location, fishing method, and other similarities exist between a particular trawl fishery and sea turtle takes have occurred by trawls (72 FR 7382, February 15, 2007). On February 15, 2007, NMFS issued an advance notice of proposed rulemaking to announce that it is considering amendments to the regulatory requirements for TEDs (72 FR 7382). On May 8, 2009, NMFS issued a NOI to prepare an EIS (74 FR 88 May 8, 2009), and held public scoping meetings throughout the East coast.

Summary of Impacts:
Section 7.1.3 of this document addresses the impacts of the proposed specifications action on protected species and supports the conclusion that no significant impacts on protected species are expected.

In general, many of the populations of potentially-affected protected species are increasing or stable with notable increases in recent years for some seal populations. Nonetheless, protected species interactions do occur and have been well-documented in the major gear types currently used in the Atlantic herring fishery. Purse seines operating in this fishery are known to take several species of seals and harbor porpoise, while midwater trawl gear (including paired midwater trawls) has had documented interactions with pilot whales, white-sided dolphins, and seals.

Because of their vulnerability to the gear types used, and also because herring is a primary prey species for seals, porpoises and some whales, protected species interactions with the herring fishery are likely to continue. The Proposed Action, however, should not affect protected species beyond status quo. Although predicting the exact impacts of the Proposed Action on protected species can be difficult, the Proposed Action is mainly administrative and procedural in nature, and should have a minimal effect on protected species. When the proposed ACLs and AMs are implemented and the specifications are set the impacts of the new measures will be evaluated further.

In summary, the cumulative effects of the Proposed Action on protected resources are expected to be minimal. This includes impacts on the amount of forage available to protected species.

7.3.4 Non-Target Species (Bycatch)

Past and Present Actions: Updated information about non-target species (bycatch) affected by the herring fishery is provided in Sections 6.0 and 6.1.4 of this document. In recent years, Atlantic herring, spiny dogfish, Atlantic mackerel, and haddock have represented the majority of observed bycatch by directed herring vessels. Bycatch of haddock in the herring fishery was addressed through Framework 43 to the Northeast Multispecies FMP, and a description of the framework can be found in the 2007-2009 Atlantic Herring Specifications in which Amendment 2 to the AMFC Interstate Herring FMP was also discussed.

Non-target species are also addressed in Amendment 1 in the context of "other fisheries," namely the mackerel and lobster fisheries. While impacts to these fisheries are considered in the analyses provided in Section 7.1.4 of this document, they are not considered in the context of this

cumulative effects analysis because of the narrow scope of the Proposed Action and the conclusions in the analysis presented in Section 5 of this document. The potential impacts of the Proposed Action on other fisheries is unclear; the seasonal supply of herring for lobster bait will most likely not be affected by the Proposed Action, as it is mostly procedural and administrative. The results of setting the specifications could have implications for the lobster industry, but that will be evaluated in future specifications when the numbers are set and the impact has a basis for anaylsis. If impacts on other fisheries do occur, they are expected to be minimal. No impacts on the mackerel fishery are expected from the Proposed Action, and future effects of the implementation of ACLs and AMs will be evaluated in the specifications process.

The ASMFC recently developed an Addendum which proposes modifications to Amendment 1 (Amendment 1) and Amendment 2 (Amendment 2) to the Interstate Fisheries Management Plan for Atlantic Sea Herring that would change the specification setting process and associated definitions. Based on the difficulty of having two sets of acronyms, one for the NEFMC plan and one for the ASMFC plan, for one cooperatively managed species the addendum was developed to establish an identical set of definitions and acronyms as those that the NEFMC is required to use under MSRA. The addendum also proposes to establish a new specification setting process that is more in line with the Section's usual process for setting specifications while taking into account the new process being enacted in this amendment.

Although difficult to quantify at this time (as the addendum has not been implemented), the impact of the ASMFC measures which implements the same language being considered in this amendment on the VECs under consideration will likely be neutral. Similar to this amendment, the action will be mainly procedural, and the effect of the change in the process will be evaluated in future considerations of the specifications. The implementation of a new specifications process, however, has the ability to alter the amount of fishery effort, and by extension positively or negatively influence the effects on non-target species by increasing or decreasing bycatch. The impact of the new specifications process on non-target species will be evaluated further once the addendum has been enacted.

Reasonably Foreseeable Future Actions: Amendment 5 to the herring FMP could result in benefits to non-target species, as measures under development such as the catch monitoring program, river herring bycatch measures, and measures to address interactions with the Atlantic mackerel fishery all have the possibility of directly and positively effecting bycatch. A criteria for midwater trawl access to groundfish closed areas is also under development and may also alter impacts of the herring fishery on non-target species. Although the analysis is not complete because the larger and more significant components of the catch monitoring program and other measures (river herring bycatch measures, groundfish closed area access) still require additional work and/or discussion, this action could produce positive impacts for non-target species. The impacts of the proposed measures cannot be predicted at this time, however.

Implementation of the Omnibus EFH Amendment may also result in additional habitat protections for which there is an indirect positive effect to bycatch species, as they would also receive protection. As with Allocated Target Species, if revisions are made to the Harbor Porpoise Take Reduction Plan, vessels could face additional restrictions, possibly resulting in positive impacts to bycatch through effort reductions.

The sea turtle Strategy is a gear-based approach to addressing sea turtle bycatch, and is discussed in more detail in Section 6.1.3.2.1. NMFS is currently considering proposing changes to the regulatory requirements for trawl fisheries to protect sea turtles. As described in a NOI to prepare an EIS (74 FR 88 May 8, 2009), NMFS is considering expanding the use of TEDs to other trawl fisheries and modifying the geographic scope of the TED requirements. TED requirements would likely have a positive effect on bycatch and discards as they would likely exclude some of these species from capture in the cod-end.

Summary of Impacts:
A more thorough discussion of non-target species, including the relationship of herring to other fisheries (mackerel and lobster), is provided in Amendment 1 to the Herring FMP. The focus of the cumulative effects analysis for Amendment 4 to the Herring FMP, as it impacts non-target species, is bycatch in the directed herring fishery. The impacts of the Proposed Action on non-target species are likely to be small; the Proposed Action is administrative in nature and therefore not expected to change fishery operations in a way that would change the impacts to non-target species from the status quo.

The Proposed Action for AMs specifically addresses haddock bycatch using a haddock catch cap, and is discussed in Section 3.2.2.2 and the impacts are discussed in Section 7.1.4.4. Haddock bycatch in the herring fishery was also addressed in Framework 43 to the Multispecies FMP (see previous discussion). This measure is meant to control bycatch of haddock by the herring fishery. It may have a slightly positive procedural impact, however the catch cap was already established as a sub-ACL in the groundfish fishery (Amendment 16), and is therefore not expected to change the fishery from the status quo.

All species caught to any degree in the herring fishery, such as alewives, spiny dogfish, blueback herring, and Atlantic mackerel are managed under other FMPs. These FMPs identify significant sources of mortality or other fisheries impacts. In summary, the cumulative effects of the Proposed Action on non-target species, when combined with past, present, and reasonably foreseeable future actions, are not expected to be significant.

7.3.5 Atlantic Herring Fishery

Past and Present Actions: Updated information about the human environment is provided in Section 6.2 of this document. Landings have declined dramatically since the 1960s but have been variable since then, averaging about 100,000 mt/year, and have not shown a definite trend. There was a shift to more mobile gear (purse seines and midwater trawls) from fixed gear in the early 1980s. With that change, the domestic fishery transformed from what was primarily a canning industry for human consumption to a fishery that supplies lobster bait and an overseas market for frozen herring. The economic and social structure of the industry has adjusted to these changes and has not changed significantly in recent years. Additional past and present actions that affect the human environment (fishery-related businesses and communities) are discussed in other sections.

The ASMFC adopted Amendment 2 in March of 2006 to herring management in state waters which revised management area boundaries, biological reference points, the specification process, research set-asides, internal waters processing operations, and measures to address fixed gear fisheries and required fixed gear fishermen to report herring catches through the IVR program. Further discussion can be found in the 2007-2009 Atlantic Herring Specifications.

The ASMFC recently developed an Addendum which proposes modifications to Amendment 1 (Amendment 1) and Amendment 2 (Amendment 2) to the Interstate Fisheries Management Plan for Atlantic Sea Herring that would change the specification setting process and associated definitions. Based on the difficulty of having two sets of acronyms, one for the NEFMC plan and one for the ASMFC plan, for one cooperatively managed species the addendum was developed to establish an identical set of definitions and acronyms as those that the NEFMC is required to use under MSRA. The addendum also proposes to establish a new specification setting process that is more in line with the Section's usual process for setting specifications while taking into account the new process being enacted in this amendment.

Although difficult to quantify at this time (as the addendum has not been implemented), the impact of the ASMFC measures which implements the same language being considered in this amendment on the VECs under consideration will likely be neutral. Similar to this amendment, the action will be mainly procedural, and the effect of the change in the process will be evaluated in future considerations of the specifications. The implementation of a new specifications process, however, has the ability to alter the amount of fishery effort, and by extension positively or negatively influence the herring fishery by increasing or decreasing revenue. The impact of the new specifications process on the fishery will be evaluated further once the addendum has been enacted.

Reasonably Foreseeable Future Actions: One of the reasonably foreseeable future actions that will likely affect the Atlantic herring fishery is Amendment 5 to the herring FMP. Measures that will be developed under this amendment include a catch monitoring program, river herring bycatch measures, criteria for midwater trawl access to groundfish closed areas, measures to address interactions with the Atlantic mackerel fishery. Although the measures and associated analysis have not been fully developed, this action would potentially reduce fishing effort and consequently reduce revenue; therefore negative impacts may occur for the herring fishery. As has been said, however, this analysis is not complete and the impacts will be discussed in future documents relating to Amendment 5.

The future actions of the Harbor Porpoise Take Reduction Plan could have negative impacts if it reduces effort, as the reduction may also mean a loss in revenue. Cumulative effects of the Omnibus EFH Amendment cannot easily be determined, but if additional effort restrictions were implemented, or if new areas are closed for habitat protection that further restrict access to fishing grounds this action too would likely have a negative impact.

The sea turtle Strategy is a gear-based approach to addressing sea turtle bycatch. NMFS is currently considering proposing changes to the regulatory requirements for trawl fisheries to protect sea turtles. As described in an NOI to prepare an EIS (74 FR 88 May 8, 2009), NMFS is considering expanding the use of TEDs to other trawl fisheries and modifying the geographic

scope of the TED requirements. TED requirements would likely have a negative economic effect because of the costs associated with adding and/or modifying TEDs to comply with the new regulation and the costs associated with a decrease in landed species if vessels would not offset a loss in catch.

Summary of Impacts:
The social and economic impacts of the Proposed Action are discussed in detail in Section 7.2 of this document. There are no expected economic or social impacts as a result of the proposed implementation of ACLs or AMs in the herring FMP. The no-action alternative offers slightly less economic and social benefits; the Proposed Action brings the herring FMP into compliance with the MSA, which will aid in prevention of overfishing and contributing to the long term stability of the resource, and therefore the economic and social stability of the fisheries. Overall, however, the social and economic impact of the Proposed Action will be mostly procedural, and is expected to have negligible effects. The cumulative impact of the Proposed Action is therefore minimal and not significant. The impacts of ACLs and AMs will be evaluated further when the specifications are next set, as the extent of the effects can be better evaluated at that time.

7.3.6 Non-Fishing Effects: Past, Present, Reasonably Foreseeable Future Actions

Non-fishing activities that occur in the marine nearshore and offshore environments and their watersheds can cause the loss or degradation of habitat and/or affect the species that reside in those areas. The following discussions of impacts are based on past assessments of activities and assume these activities will likely continue into the future as projects are proposed. More detailed information about these and other activities and their impacts are available in the publications by Hansen (2003) and Johnson et al. (2008).

Construction/Development Activities and Projects: Construction and development activities include, but are not limited to, point source pollution, agricultural and urban runoff, land (roads, shoreline development, wetland loss) and water-based (beach nourishment, piers, jetties) coastal development, marine transportation (port maintenance, shipping, marinas), marine mining, dredging and disposal of dredged material and energy-related facilities, all of which are discussed in detail in Johnson et al. (2008). These activities can introduce pollutants (through point and non-point sources), cause changes in water quality (temperature, salinity, dissolved oxygen, suspended solids), modify the physical characteristics of a habitat or remove/replace the habitat altogether. Many of these impacts have occurred in the past and present and their project effects would likely continue in the reasonably foreseeable future. It is likely that these projects would have negative impacts caused from disturbance, construction, and operational activities in the area immediately around the affected project area. However, given the wide distribution of the affected species, minor overall negative effects to offshore habitat, protected resources, and target and non-target species are anticipated since the affected areas are localized to the project sites, which involve a small percentage of the fish populations and their habitat. Thus, these activities for most biological VECs would likely have an overall low negative effect due to limited exposure to the population or habitat as a whole. Any impacts to inshore water quality from these permitted projects, including impacts to planktonic, juvenile, and adult life stages, are uncertain but likely minor due to the transient and limited exposure. It should be noted that wherever these activities co-occur, they are likely to work additively or synergistically to

decrease habitat quality and, as such, may indirectly constrain the sustainability of the target species, other non-target species, and protected resources.

Similar to the discussion above on non-fishing impacts to fish habitat, generally the closer the proximity of herring stocks to the coast, the greater the potential for impact (although predation, a non-fishing impact, would be one threat that would occur everywhere). Herring reside in both inshore and offshore areas at different stages of their lives and during different seasons throughout the year.

These projects are permitted by other federal and state agencies that conduct examinations of potential biological, socioeconomic, and habitat impacts. In addition to guidelines mandated by the Magnuson Act, and the Fish and Wildlife Coordination Act, NMFS, the Councils, and the other federal and state regulatory agencies review these projects through a process required by the Clean Water Act; Rivers and Harbors Act; and the Marine Protection, Research, and Sanctuaries Act for certain activities that are regulated by federal, state, and local authorities. These reviews limit and often mitigate the impact of these projects. The jurisdiction of these authorities is in the "waters of the U.S." and ranges from inland riverine to marine habitats offshore in the EEZ.

Restoration Projects: Other regional projects that are restorative or beneficial in nature include estuarine wetland restoration; offshore artificial reef creation, which provides structure and habitat for many aquatic species; and eelgrass (*Zostera marina*) restoration, which can provide habitat. Due to past and present adverse impacts from human activities on these types of habitat, restorative projects likely have slightly positive effects at the local level.

Protected Resources Rules: The NMFS final Rule on Ship Strike Reduction Measures (73 FR 60173, October 10, 2008) is a non-fishing action in the United States-controlled North-Atlantic that is likely to affect endangered species and protected resources. The goal of this rule is to significantly reduce the threat of ship strikes on North-Atlantic right whales and other whale species in the region. Ship strikes are considered the main threat to North-Atlantic right whales; therefore, NMFS anticipates this regulation will result in population improvements to this critically endangered species.

Energy Projects: Cape Wind Associates (CWA) proposes to construct a wind farm on Horseshoe Shoal, located between Cape Cod and Nantucket Island in Nantucket Sound, Massachusetts. The CWA project would have 130 wind turbines located as close as 4.1 miles off the shore of Cape Cod in an area of approximately 24 square miles with the turbines being placed at a minimum of 1/3 of a mile apart. The turbines would be interconnected by cables, which would relay the energy to the shore-based power grid. If constructed, the turbines would preempt other bottom uses in an area similar to oil and natural gas leases. The potential impacts associated with the CWA offshore wind energy project include the construction, operation, and removal of turbine platforms and transmission cables; thermal and vibration impacts; and changes to species assemblages within the area from the introduction of vertical structures.

Other offshore projects that can affect VECs include the construction of offshore liquefied natural gas (LNG) facilities such as the project "Neptune." The first phase of this project

construction was completed in September 2008, which includes the installation of a 13-mile subsea pipeline. The second phase will connect the new pipeline to an existing pipeline network called HubLine east of Marblehead, and will install the two off-loading buoys 10 miles off the coast of Gloucester, Massachusetts. Upon completion, the LNG facility will consist of an unloading buoy system where specially designed vessels will moor and offload their natural gas into a pipeline, which will deliver the product to customers in Massachusetts and throughout New England. This project is expected to have small, localized impacts where the pipelines and buoy anchors contact the bottom.

Summary of Impacts: In summary, the cumulative effects of non-fishing activities pose a risk to the herring resource. As discussed in detail in the Final EIS for Herring EFH (NMFS, January 7, 2005), impacts resulting from non-fishing activities like projects permitted under the Clean Water Act and Ocean Dumping Act, pollution, loss of coastal wetlands, marine transportation, and marine mining are unknown and/or unquantifiable. In general, the greatest potential for adverse impacts to herring and herring EFH occurs in close proximity to the coast where human induced disturbances, like pollution and dredging activities, are occurring. Because inshore and coastal areas support essential egg, larval and juvenile herring habitats, it is likely that the potential threats to inshore and coastal habitats are of greater importance to the species than threats to offshore habitats. It is also likely that these inshore activities will continue to grow in importance in the future. Activities of concern include chemical pollutants, sewage, changes in water temperature, salinity and dissolved oxygen, suspended sediment and activities that involve dredging and the disposal of dredged material. These impacts are discussed thoroughly in Amendment 1 to the Herring FMP.

Though largely unquantifiable, it is likely that the non-fishing activities noted above would have negative impacts on habitat quality from disturbance and construction activities in the area immediately around the affected area. Given the wide distribution of the affected species, minor overall negative effects to offshore habitat are anticipated since the affected areas are localized to the project sites, which involve a small percentage of the fish populations and their habitat. Any impacts to inshore water quality from permitted projects and other non-fishing activities, including impacts to planktonic, juvenile, and adult life stages, are unknown but likely to be negative in the immediate vicinity of the activity.

8.0 CONSISTENCY WITH APPLICABLE LAWS

8.1 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The Proposed Action in Amendment 4 was developed to modify the Atlantic Herring FMP to comply with the new provisions of the MSA, including the establishment of ACLs and AMs, and is presumed also to be consistent with the National Standards and other required provisions of the MSA. Once Amendment 4 is implemented the current specifications (2010-2012) for the herring fishery will be brought into compliance with the MSA.

8.2 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

NEPA provides a mechanism for identifying and evaluating the full spectrum of environmental issues associated with federal actions, and for considering a reasonable range of alternatives to avoid or minimize adverse environmental impacts. This document is designed to meet the requirements of both the MSA and NEPA. The Council on Environmental Quality (CEQ) has issued regulations specifying the requirements for NEPA documents (40 CFR 1500 – 1508). All of those requirements are addressed in this document, as referenced below.

8.2.1 Environmental Assessment

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

- The need for this action is described in Section 1.2;
- The alternatives that were considered are described in Section 3.0 (Proposed Action) and Section 4.0 (Other Alternatives/Options Considered by the Council);
- A brief description of the affected environment is in Section 5.0.
- The environmental impacts of the Proposed Action are described in Section 7.0;
- A Finding of No Significant Impact is in Section 8.2.2.
- The agencies and persons consulted on this action are listed in Section 9.0.

This document includes the following additional sections that are based on requirements for an Environmental Impact Statement (EIS):

- An Executive Summary can be found at the beginning of this document
- A table of contents can be found at the beginning of this document.
- Background and purpose are described in Section 1.0.
- Cumulative impacts of the Proposed Action are described in Section 7.3.
- A list of preparers is in Section 9.0.

8.2.2 Finding of No Significant Impact (FONSI)

National Oceanic and Atmospheric Administration (NOAA) Administrative Order 216-6 (NAO 216-6) (May 20, 1999) contains criteria for determining the significance of the impacts of a Proposed Action. On July 22, 2005, NOAA published a Policy Directive with guidelines for the preparation of a Finding of No Significant Impact (FONSI). In addition, the Council on Environmental Quality (CEQ) regulations at 40 CFR 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant in making a finding of significant impact and has been considered individually, as well as in combination with the others. This significance of this action is analyzed based on the NAO 216-6 criteria, the recent Policy Directive from NOAA, and CEQ's context and intensity criteria. These include:

1) ***Can the Proposed Action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?***

Response: No, the Proposed Action is not reasonably expected to jeopardize the sustainability of the Atlantic herring resource as discussed in Section 6.1.1. Most of the actions are administrative in nature, designed to bring the FMP into required compliance with the new provisions of the MSA by 2011. The AMs being established are expected to increase the sustainability of the herring if utilized, and none of the other modifications are expected to cause large increases in fishing mortality that would jeopardize the sustainability of the herring resource.

2) ***Can the Proposed Action reasonably be expected to jeopardize the sustainability of any non-target species?***

Response: No, the Proposed Action is not reasonably expected to jeopardize the sustainability of any non-target species. As was stated above most of the actions are administrative in nature, and those that do directly influence herring catch and bycatch are meant to reduce effort when overages occur (AMs). Section 7.1 summarizes the impacts of the Proposed Action on non-target species.

3) ***Can the Proposed Action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat (EFH) as defined under the Magnuson-Stevens Act and identified in FMPs?***

Response: No, the Proposed Action is not reasonably expected to cause substantial damage to the ocean and coastal habitats and/or EFH. The conclusion in the EFH Assessment (Section 7.1.2) is that the actions in this amendment will have minimal impact on EFH. Measures to protect EFH were implemented in Amendment 1, and are not expected to change with Amendment 4.

4) ***Can the Proposed Action be reasonably expected to have a substantial adverse impact on public health or safety?***

Response: No, the Proposed Action is not reasonably expected to have substantial adverse impacts on public health or safety. The Proposed Action is administrative in nature and would not affect safety at sea. When developing management measures, the Council usually solicits extensive comments from affected members of the public regarding the safety implications of measures under consideration. The Council has received no comments from affected members of the public suggesting that such impacts could be expected from the amendment; the proposed measures are administrative in nature. Future impacts on public health and safety resulting from the establishment of ACLs and AMs will be evaluated as part of the analysis for the specifications package.

5) ***Can the Proposed Action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?***

Response: No, the Proposed Action is not reasonably expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species. Section 6.1.3 describes the endangered or threatened species that are found in the affected area. Section 7.1.3 summarizes the impacts of the Proposed Action on endangered and threatened species; overall, none of the proposed measures are expected to have a significant impact on these species. Future specifications package analysis will evaluate any further impacts to endangered and threatened species that result from the establishment of ACLs and AMs when the numbers are set.

6) ***Can the Proposed Action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?***

Response: The Proposed Action is not expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area. Section 6.1.1.4 describes the role of Atlantic herring in the Northeast Region ecosystem, and acknowledges their role as an important forage species. While herring is recognized as one of many important forage fish for marine mammals, other fish, and birds throughout the region, the resource appears to be large enough at this time to accommodate all predators including Atlantic bluefish, Atlantic striped bass, and several other pelagic species such as shark and tunas. The Atlantic herring itself is not known to prey on other species of fish but prefers chaetognaths and euphausiids.

The proposed measures are administrative in nature and alter the specifications process only slightly; direct impacts to the biodiversity or ecosystem function in the area as a result of the establishment of ACLs and AMs will be evaluated further as a part of the specifications package.

7) ***Are significant social or economic impacts interrelated with natural or physical environmental effects?***

Response: There are no significant social and economic impacts of the Proposed Action that are interrelated with natural or physical environmental effects. Discussion of the impacts of the Proposed Action is presented in Section 7.2.1 and 7.2.2 of this document. The establishment of the administrative measures will not have significant social or economic impacts, and the environmental assessment documents that no significant natural or physical effects will result from the implementation of the Proposed Action. Therefore the social and economic impacts of the Proposed Action are not interrelated with significant natural or physical environmental effects.

8) ***Are the effects on the quality of the human environment likely to be highly controversial?***

Response: No, the effects on the quality of the human environment are not expected to be highly controversial. Sections 7.2.1 and 7.2.2 assess both the economic and social impacts of the Proposed Action, and Section 7.3 describes the potential cumulative effects of this action on the human environment. All three sections found that the human environment will be minimally impacted by both the ACL and AM measures taken. The need to maintain a sustainable herring

resource is grounded in Federal fisheries law and forms the basis of the goals and objectives of the herring management program, as described in the Herring FMP. The Council developed Amendment 4 while considering the needs of herring fishery participants, other fishery-related interests, and the long-term health of the Atlantic herring resource.

9) ***Can the Proposed Action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?***

Response: No, unique areas, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas are not located within the affected area; therefore, there are no impacts on these components of the environment from the Proposed Action. The Proposed Action affects fishing for herring in the U.S. Exclusive Economic Zone and is not expected to have any impacts on shoreside historical and/or cultural resources. In addition, the Proposed Action is not expected to substantially affect fishing and other vessel operations around the unique historical and cultural resources encompassed by the Stellwagen Bank National Marine Sanctuary.

10) ***Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?***

Response: No, the effects on the human environment are not likely to be highly uncertain or involve unique or unknown risks. As the actions considered within the Amendment are not expected to effect the human environment significantly there are no unknown risks to be taken and they will not be uncertain.

11) ***Is the Proposed Action related to other actions with individually insignificant, but cumulatively significant impacts?***

Response: No, the Proposed Action would not have any significant impacts when considered individually or in conjunction with any of the other actions presented in Section 7.3 (fishing and non-fishing related). Section 7.3 describes the expected cumulative effects that may occur as a result of this Amendment. In summary, the Atlantic sea herring resource, protected species, habitat, non-target/bycatch species and the human communities have been impacted by past and present actions in the area and are likely to continue to be impacted by these actions in the future. In general, the Proposed Action will bring the FMP into the required compliance with the new provisions of the MSA, which were established in order to have positive impacts on the long-term success of the program at preventing overfishing and achieving optimum yield. Any cumulative impacts as a result of the ACLs and AMs will be evaluated further in the specifications process however in Amendment 4 they are process-related and administrative in nature.

12) ***Is the Proposed Action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?***

Response: No districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places are located in the affected area, nor is the Proposed Action expected to cause loss or destruction to significant scientific, cultural, or historical resources; therefore there are no impacts on these resources from the Proposed Action. The Proposed Action is administrative in nature and furthermore is for the Atlantic herring fishery, which occurs primarily in the Exclusive Economic Zone (EEZ).

13) Can the Proposed Action reasonably be expected to result in the introduction or spread of a nonindigenous species?

Response: No, the Proposed Action is not reasonably expected to result in the introduction or spread of a nonindigenous species. The Proposed Action relates specifically to removals of Atlantic herring in the Northeast Region using traditional fishing practices. Vessels affected by the Proposed Action are those currently engaged in the Atlantic herring fishery. The fishing-related activity of these vessels is anticipated to occur solely within the Northeast Region and should not result in the introduction or spread of a non-indigenous species.

14) Is the Proposed Action likely to establish a precedent for future actions with significant effects or represents a decision in principle about future consideration?

Response: No, the Proposed Action is not likely to establish a precedent for future action with significant effects, and it does not represent a decision in principle about future consideration. Long-term impacts of these actions, which are administrative in nature and designed to increase the sustainability of the fishery, are therefore not expected to set a precedent for future action that would significantly affect the fishery, target species, non-target species, or EFH. Significant effects and future considerations as a result of the ACL and AM establishment will be evaluated every three years as a part of the analysis for the specifications package.

15) Can the Proposed Action reasonably be expected to threaten a violation of Federal, State or local law or requirements imposed for the protection of the environment?

Response: No, the Proposed Action is not reasonably expected to threaten a violation of Federal, State or local law or requirements imposed for the protection of the environment. This action does not propose any changes that would provide incentive for environmental laws to be broken, instead it is the opposite; most of the Amendment is designed to bring the FMP into compliance with environmental laws. NMFS will determine whether this action is consistent with the Coastal Zone Management Act (CZMA) requirements of the affected States.

16) Can the Proposed Action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

Response: No, the Proposed Action is not reasonably expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species; as described in the sub-sections contained in Section 7.0 of this document, impacts on resources encompassing herring and other stocks are expected to be minimal. The Proposed Action is administrative in nature, designed to bring the FMP into the required compliance with the new

provisions of the MSA by 2011. The Proposed Action would not cause any cumulative adverse effects and may have positive impacts on both target and non-target species.

FONSI DETERMINATION:
In view of the analysis presented in this document, the EA/RIR/IRFA for the 2010-2012 Atlantic herring fishery specifications and the EA for Amendment 4 to the Atlantic herring FMP, establishment of Amendment 4 will not have a significant effect on the human environment, with specific reference to the criteria contained in Section 6.02 of NOAA Administrative Order NAO 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act, May 20, 1999. Accordingly, the preparation of a Supplemental Environmental Impact Statement for the action proposed in this document is not necessary.

_____ _____
Assistant Administrator for Fisheries, NOAA Date

8.3 MARINE MAMMAL PROTECTION ACT (MMPA)

Section 6.1.3 contains a description of the marine mammals potentially affected by the herring fishery and Section 7.0 provides a summary of the impacts of the alternatives presented in this Amendment. The NEFMC has reviewed the impacts of Amendment 4 to the Atlantic Herring FMP on marine mammals and has concluded that the management actions proposed are consistent with the provisions of the MMPA, and will not alter existing measures to protect the species likely to inhabit the herring management unit. Most of the actions are administrative in nature, designed to bring the FMP into the required compliance with the new provisions of the MSA by 2011. They would therefore have limited to no effect on marine mammals. The AMs being established would decrease fishing effort when triggered, and therefore have the potential to decrease the negative impacts on marine mammals in regards to both forage availably and negative interactions, but only if they are triggered.

8.4 ENDANGERED SPECIES ACT (ESA)

Section 7 of the ESA requires Federal agencies conducting, authorizing, or funding activities that affect threatened or endangered species to ensure that those effects do not jeopardize the continued existence of listed species. The Council has concluded that the proposed (Amendment 4) for the Atlantic herring fishery and the prosecution of the associated fisheries are not likely to result in jeopardy to any ESA-listed species under NOAA Fisheries Service jurisdiction, or alter or modify any critical habitat, based on the analysis in this document. For further information on the potential impacts of the fisheries and the proposed management action, see Section 7.0 of this document. The most recent consultation, signed (February 9, 2010), considered ESA-listed Atlantic salmon after new information revealed that the herring fisheries may affect Atlantic salmon to an extent not previously considered. This reinitiated section 7 consultation, concluded that the continued authorization of the herring fishery was not likely to adversely affect any ESA-listed cetaceans, sea turtles, or fish species and would not result in the destruction or adverse modification of designated critical habitat under NMFS jurisdiction.

8.5 PAPERWORK REDUCTION ACT (PRA)

The purpose of the PRA is to control and, to the extent possible, minimize the paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by or for the Federal Government. The authority to manage information and recordkeeping requirements is vested with the Director of the Office of Management and Budget (OMB). This authority encompasses establishment of guidelines and policies, approval of information collection requests, and reduction of paperwork burdens and duplications.

The proposed amendment contains no new or additional collection-of-information requirements.

8.6 INFORMATION QUALITY ACT (IQA)

Pursuant to NOAA Fisheries guidelines implementing Section 515 of Public Law 106-554 (Information Quality Act), all information products released to the public must first undergo a Pre-Dissemination Review to ensure and maximize the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by Federal agencies. The following section addresses these requirements.

Utility

Utility means that disseminated information is useful to its intended users. "Useful" means that the content of the information is helpful, beneficial, or serviceable to its intended users, or that the information supports the usefulness of other disseminated information by making it more accessible or easier to read, see, understand, obtain or use. The information presented in this document is helpful to the intended users (the affected public) by presenting a clear description of the purpose and need of the Proposed Action, the measures proposed, and the impacts of those measures. A discussion of the reasons for selecting the Proposed Action is included so that intended users may have a full understanding of the Proposed Action and its implications. The intended users of the information contained in this document are participants in the Atlantic herring fishery and other interested parties and members of the general public. The information contained in this document may be useful to owners of vessels holding an Atlantic herring permit as well as Atlantic herring dealers and processors since it serves to notify these individuals of any potential changes to management measures for the fishery. This information will enable these individuals to adjust their fishing practices and make appropriate business decisions based on the new management measures and corresponding regulations.

The information being provided in the Amendment 4 document concerning the status of the Atlantic herring fishery is updated based on landings and effort information through the 2008 fishing year. Information presented in this document is intended to support the proposed changes to the FMP to establish ACLs and AMs, which have been developed through a multi-stage process involving all interested members of the public. Consequently, the information pertaining to management measures contained in this document has been improved based on comments from the public, fishing industry, members of the Council, and NOAA Fisheries.

The media being used in the dissemination of the information contained in this document will be contained in a *Federal Register* notice announcing the Proposed and Final Rules for this action.

This document is available in several formats, including printed publication, CD-ROM, and online through the Council's web page. The *Federal Register* notice that announces the Proposed Rule and the Final Rule and implementing regulations will be made available in printed publication, on the website for the Northeast Regional Office, and through the Regulations.gov website.

Integrity

Integrity refers to security – the protection of information from unauthorized access or revision, to ensure that the information is not compromised through corruption or falsification. Prior to dissemination, information associated with this action, independent of the specific intended distribution mechanism, is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information. All electronic information disseminated by NOAA Fisheries Service adheres to the standards set out in Appendix III, "Security of Automated Information Resources," of OMB Circular A-130; the Computer Security Act; and the Government Information Security Act. All confidential information (e.g., dealer purchase reports) is safeguarded pursuant to the Privacy Act; Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business, and financial information); the Confidentiality of Statistics provisions of the Magnuson-Stevens Act; 50 CFR 229.11, Confidentiality of Information collected under the Marine Mammal Protection Act; and NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics.

Objectivity

Objective information is presented in an accurate, clear, complete, and unbiased manner, and in proper context. The substance of the information is accurate, reliable, and unbiased; in the scientific, financial, or statistical context, original and supporting data are generated and the analytical results are developed using sound, commonly-accepted scientific and research methods. "Accurate" means that information is within an acceptable degree of imprecision or error appropriate to the particular kind of information at issue and otherwise meets commonly accepted scientific, financial, and statistical standards.

For purposes of the Pre-Dissemination Review, this document is considered to be a "Natural Resource Plan." Accordingly, the document adheres to the published standards of the Magnuson-Stevens Act; the Operational Guidelines, Fishery Management Plan Process; the Essential Fish Habitat Guidelines; the National Standard Guidelines; and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act. Several sources of data were used in the development of this document, including the analysis of potential impacts. These data sources include, but are not limited to: landings data from vessel trip reports, landings data from individual voice reports, information from resource trawl surveys, data from the dealer weighout purchase reports, descriptive information provided (on a voluntary basis) by processors and dealers of Atlantic herring, and ex-vessel price information. Although there are some limitations to the data used in the analysis of impacts of management measures and in the description of the affected environment, these data are considered to be the best available.

This information product uses information of known quality from sources acceptable to the relevant scientific and technical communities. Stock status (including estimates of biomass and fishing mortality) reported in this product are based on either assessments subject to peer-review through the Transboundary Resource Assessment Committee (TRAC) or on updates of those assessments. Landing and revenue information is based on information collected through the Vessel Trip Report, Interactive Voice Response, and Commercial Dealer databases. Information on catch composition and bycatch is based on reports collected by the NOAA Fisheries Service observer program and incorporated into the sea sampling or observer database systems. These reports are developed using an approved, scientifically valid sampling process. In addition to these sources, additional information is presented that has been accepted and published in peer-reviewed journals or by scientific organizations. Original analyses in this document were prepared using data from accepted sources, and the analyses have been reviewed by members of the Herring Plan Development Team.

The policy choices (i.e., management measures) proposed in this amendment document are supported by the best available scientific information. The supporting science and analyses, upon which the policy choices are based, are summarized and described in Section 5.0 of this document. All supporting materials, information, data, and analyses within this document have been, to the maximum extent practicable, properly referenced according to commonly accepted standards for scientific literature to ensure transparency. Qualitative discussion is provided in cases where quantitative information was unavailable, utilizing appropriate references as necessary.

The review process for any action under an FMP involves the Northeast Regional Office (NERO) of NOAA Fisheries, the Northeast Fisheries Science Center (Center), and NOAA Fisheries Headquarters (Headquarters). The Council review process involves public meetings at which affected stakeholders have the opportunity to provide comments on the proposed changes to the FMP. Reviews by staff at NERO are conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. The Center's technical review is conducted by senior-level scientists with specialties in population dynamics, stock assessment methodology, fishery resources, population biology, and the social sciences.

Final approval of this amendment document and clearance of the Proposed and Final Rules is conducted by staff at NOAA Fisheries Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget. This review process is standard for any action under an FMP, and provides input from individuals having various expertise who may not have been directly involved in the development of the Proposed Action. Thus, the review process for any FMP modification, including the changes to the management program proposed in this amendment, is performed by technically-qualified individuals to ensure the action is valid, complete, unbiased, objective, and relevant.

8.7 IMPACTS ON FEDERALISM/E.O. 13132

The Executive Order on Federalism established nine fundamental federalism principles to which Executive agencies must adhere in formulating and implementing policies having federalism

implications. The E.O. also lists a series of policy making criteria to which agencies must adhere when formulating and implementing policies that have federalism implications. However, no federalism issues or implications have been identified relative to the Proposed Action.

The Proposed Action does not contain policies with federalism implications sufficient to warrant preparation of an assessment under E.O. 13132. The affected States have been closely involved in the development of the proposed amendment through their involvement in the Regional Fishery Management Council process (i.e., all affected states are represented as voting members on at least one Council) and the ASMFC process. The proposed amendment was developed with the full participation and cooperation of the state representatives of the New England Council and the ASMFC Atlantic Herring Section. No comments were received from any state officials relative to any federalism implications of the proposed amendment.

8.8 ADMINISTRATIVE PROCEDURES ACT (APA)

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

8.9 COASTAL ZONE MANAGEMENT ACT (CZMA)

Section 307(c)(1) of the Federal CZMA of 1972 requires that all Federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. Pursuant to the CZMA regulations at 15 CFR 930.35, a negative determination may be made if there are no coastal effects and the subject action: (1) Is identified by a state agency on its list, as described in § 930.34(b), or through case-by-case monitoring of unlisted activities; or (2) which is the same as or is similar to activities for which consistency determinations have been prepared in the past; or (3) for which the Federal agency undertook a thorough consistency assessment and developed initial findings on the coastal effects of the activity.

Upon the Council's submission of Amendment 4, NMFS will review the amendment for consistency with the approved coastal management programs of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina.

8.10 REGULATORY FLEXIBILITY ACT/E.O. 12866

8.10.1 Regulatory Impact Review and Initial Regulatory Flexibility Analysis (IRFA)

This section provides the analysis and conclusions to address the requirements of Executive Order 12866 and the Regulatory Flexibility Act (RFA). Since many of the requirements of these

mandates duplicate those required under the Magnuson-Stevens Act and NEPA, this section contains references to other sections of this document. The following sections provide the basis for concluding that the Proposed Action is not significant under E.O. 12866 and will not have a significant impact on a substantial number of small entities based on the provisions of the RFA.

8.10.2 Description of Management Objectives

The goals and objectives of the management plan for the Atlantic herring resource are stated in Section 2.0 of this amendment document. The goals and objectives of the management plan for the Atlantic herring resource are stated in Section 2.3 of the Atlantic Herring FMP and are modified in Section 3.2 of Amendment 1. The Proposed Action is consistent with these goals and objectives and is designed to achieve many of the objectives, as discussed in Section 2.1 of this document.

8.10.3 Description of the Fishery

Section 4.0 of the Herring FMP contains a detailed description of the Atlantic herring fishery. Section 7.4 of Amendment 1 updates the information in the Herring FMP and provides a comprehensive description of fishery-related businesses and communities. In addition, following development of the Herring FMP, Stock Assessment and Fishery Evaluation (SAFE) Reports have been prepared by the Herring PDT for each fishing year. The 2007-2009 herring fishery specifications updates the information provided in Amendment 1 through the 2005 and 2006 fishing year where possible. This amendment document provides updated information about the Atlantic herring fishery through the 2008 fishing year where possible. The updated fishery information is presented in Section 6.2.1 of this document.

8.10.4 Statement of the Problem

The statement of the problem(s) that this amendment addresses can be found in the Purpose and Need for Action section of this document (Section 1.2) and should be referenced for additional information.

8.10.5 Description of the Alternatives

The Proposed Action is described in Section 3.0 of this document. Alternatives to the Proposed Action that were considered during the development of the amendment, in addition to the no action alternative, are described in Section 4.0 of this document

8.10.6 Economic Analysis

The economic impacts of the Proposed Action as well as other alternatives considered during the development of the amendment are discussed in detail in Section 7.2.1 of this document. The proposed action brings the FMP into compliance with the MSA, as opposed to the No Action Alternative, which does not. There are no economic impacts expected to result from the implementation of the proposed action in this amendment.

8.10.7 Determination of Significance Under E.O. 12866

NMFS Guidelines provide criteria to be used to evaluate whether a Proposed Action is significant. A significant regulatory action means any regulatory action that is likely to result in a rule that may:

1. *Have an annual effect on the economy of $100 million or more, or adversely effect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local or tribal governments or communities.*

The Proposed Action will not have an effect on the economy in excess of $100 million (see Section 7.2.1 for additional information). The Proposed Action is not expected to adversely impact in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local or tribal governments or communities.

2. *Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency.*

The Proposed Action will not create a serious inconsistency with or otherwise interfere with an action taken or planned by another agency. No other agency has indicated that it plans an action that will affect the Atlantic herring fishery in the EEZ.

3. *Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof.*

The Proposed Action will not materially alter the budgetary impact of entitlements, grants, user fees or loan programs, or the rights and obligations of their participants.

4. *Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.*

The Proposed Action does not raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in E.O. 12866.

8.10.8 Initial Regulatory Flexibility Analysis

The following sections contain analyses of the effect of the Proposed Action on small entities. Under Section 603(b) of the RFA, each initial regulatory flexibility analysis is required to address:

1. Reasons why the agency is considering the action,
2. The objectives and legal basis for the proposed rule,
3. The kind and number of small entities to which the proposed rule will apply,
4. The projected reporting, record-keeping and other compliance requirements of the proposed rule, and
5. All Federal rules that may duplicate, overlap or conflict with the proposed rule.

8.10.8.1 Reasons for Considering the Action

The reasons for considering the management action proposed in Amendment 4 are discussed in the Purpose and Need for Action section of this document (Section 1.2). Overall, the need for this amendment is to implement new management measures to address the new applicable provisions of the MSA. The new measures reflect an update of the original MSA and retain key

provisions of the Sustainable Fisheries Act (1996) while making adjustments to the legislation designed to improve national compliance with the Act. Accordingly, the two primary purposes of this amendment are to establish ACLs and AMs within the specifications process.

8.10.8.2 Objectives and Legal Basis for the Action

The goals and objectives of the management plan for the Atlantic herring resource are stated in full in Section 2.0 of this amendment document. The primary goal is to develop an amendment to the Herring FMP to ensure compliance with the new requirements of the MSA. The objectives are: to implement Annual Catch Limits (ACLs) and Accountability Measures (AMs) consistent with the MSA; to implement other management measures as necessary to ensure compliance with the new provisions of the MSA; in the context of Objectives above, to consider the health of the herring resource and the important role of herring as a forage fish and a predator fish throughout its range. The Proposed Action is consistent with these goals and objectives and has been developed in accordance with the Magnuson-Stevens Fishery Conservation and Management Act, National Environmental Policy Act, and all other applicable laws, which are addressed in various sections of this document (see Table of Contents).

8.10.8.3 Description and Number of Small Entities to Which the Rule Applies

All of the potentially-affected businesses are considered small entities under the standards described in NOAA Fisheries guidelines because they have gross receipts that do not exceed $4 million annually and employ fewer individuals than the denoted thresholds. A complete description of the number of small entities to which this rule applies is provided in Section 6.2 of this document. Summary information about vessels catching herring is provided below, but the above sections of this document should be referenced for more information.

Table 51 classifies all ***active*** vessels – those that reported landing herring by principal gear (based on the gear which earned the most revenue for the vessel in a given year) and permit category (in 2005 and 2006, there were two open access permit categories based on intended level of herring catch).

Table 51 Number of Vessels by Principal Herring Gear 2005-2008

	2005	2006	2007	2008
Purse Seine	4	6	11	9
Midwater Trawl	11	11	7	3
Midwater Pair Trawl	12	15	14	17
Bottom Trawl	58	68	88	68
Seine/Weir	1	1	50	4
Other	58	57	N/A	38
Total	144	158	170	139

One of the major features of Amendment 1 was the establishment of a limited access program in the herring fishery. There are four permit categories: 1) limited access permit for all management areas (Category A); 2) limited access permit for access to Areas 2 and 3 only (Category B); 3) limited access incidental catch permit for 25 mt per trip (Category C); and 4) an open access incidental catch permit for 3 mt per trip (Category D).

With the implementation of the limited access permit program in Amendment 1, the following numbers of vessels applied for and received permits in 2008:

- Category A – 41 vessels;
- Category B – 4 vessels;
- Category C – 50 vessels; and
- Category D – 2,275 vessels.

Based on dealer weighout reports, herring revenues by permit category during the 2008 fishing year were:

- Category A - $19.9 million;
- Category B – cannot report, less than three vessels;
- Category C - $19,500;
- Category D - $86,700.

As compared to 2007, the total value of landings were significantly lower in 2008 for Category C and D vessels. Category C value of landings were $485,000 in 2007 and $207,000 for Category D vessels. Conversely, Category A landings rose to $19.9 million from $15.7 million.

8.10.8.4 Recordkeeping and Reporting Requirements

The Proposed Action does not introduce any new reporting, recordkeeping, or other compliance requirements.

8.10.8.5 Duplication, Overlap, or Conflict with Other Federal Rules

The Proposed Action does not duplicate, overlap or conflict with any other Federal rules.

8.10.8.6 Economic Impacts on Small Entities Resulting from the Proposed Action

The management measures included in the Proposed Action are not likely to directly impact fishery-related businesses and communities. A full description of the expected economic impacts to the fishery can be found in Section 7.2.1. The Proposed Action complies with the MSA by modifying the specifications process and defining terms in the herring FMP. Although several processes may be altered, the overall economic impact will be mostly procedural and is expected to have negligible economic impacts for the herring fishery. Indirect benefits may result economically from making the process explicit and incorporating the SSC into the specification process, thereby presenting the opportunity to better preventing overfishing and possibly creating a more sustainable fishery. This amendment does not set the specifications themselves, however, and the direct impact of will be evaluated further when the numbers are set.

9.0 LIST OF PREPARERS AND CONTRIBUTORS

This document was prepared by the New England Fishery Management Council and the National Marine Fisheries Service, in consultation with the Atlantic States Marine Fisheries Commission and the Mid-Atlantic Fishery Management Council. Members of the New England Fishery

Management Council's Herring Plan Development Team and the ASMFC Herring Technical Committee include:

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The following agencies were consulted during the development of the herring fishery specifications, either through direct communication/correspondence and/or participation on the Herring Committee or PDT:

- NOAA Fisheries, National Marine Fisheries Service, Northeast Regional Office, Gloucester MA
- Northeast Fisheries Science Center, Woods Hole MA
- Atlantic States Marine Fisheries Commission and Atlantic Herring Section
- Mid-Atlantic Fishery Management Council

Letters were also sent to the potentially-affected States for the purposes of reviewing the consistency of the Proposed Action relative to each State's Coastal Zone Management Program (see Section 8.9 of this document for a list of States that were contacted).

10.0 LIST OF ACRONYMS

abc	allowable biological catch
ABC	Acceptable Biological Catch

ACL	Annual Catch Limits
ACOE	Army Core of Engineers
AHE	Affected Human Environment
AM	Accountability Measure
APA	American Pelagic Association
ASMFC	Atlantic States Marine Fisheries Commission or Commission
B	Biomass
BT	Border Transfer
CAA	Catch at Age
CEQ	Council on Environmental Quality
CHOIR	Coalition for the Atlantic Herring Fishery's Orderly, Informed, and Responsible Long-Term Development
CZMA	Coastal Zone Management Act
DAH	Domestic Annual Harvest
DAP	Domestic Annual Processing
DEA	Data Envelopment Analysis
DMF	Division of Marine Fisheries
DMR	Department of Marine Resources
DSEIS	Draft Supplemental Environmental Impact Statement
DWF	Distant-Water Fleets
EA	Environmental Assessment
ECPA	East Coast Pelagic Association
ECTA	East Coast Tuna Association
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
E.O.	Executive Order
ESA	Endangered Species Act of 1973
F	Fishing Mortality Rate
FEIS	Final Environmental Impact Statement
FMP	Fishery Management Plan
FSEIS	Final Supplemental Environmental Impact Statement
FY	Fishing Year
GB	Georges Bank
GEA	Gear Effects Evaluation
GIFA	Governing International Fisheries Agreement
GMRI	Gulf of Maine Research Institute
GOM	Gulf of Maine

GRT	Gross Registered Tons
HAPC	Habitat Area of Particular Concern
HCA	Habitat Closed Area
HPTRP	Harbor Porpoise Take Reduction Plan
ICNAF	International Commission for the Northwest Atlantic Fisheries
IRFA	Initial Regulatory Flexibility Analysis
IOY	Initial Optimal Yield
IVR	Interactive Voice Response
IWC	International Whaling Commission
IWP	Internal Waters Processing
JVP	Joint Venture Processing
LWTRP	Large Whale Take Reduction Plan
M	Natural Mortality Rate
MA DMF	Massachusetts Division of Marine Fisheries
MAFMC	Mid-Atlantic Fishery Management Council
ME DMR	Maine Department of Marine Resources
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistical Survey
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
mt	Metric Tons
NAO	North Atlantic Oscillation
NB	New Brunswick
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NS	National Standard
NT	Net Tonnage
NSGs	National Standard Guidelines
OCS	Outer Continental Shelf
OFL	Overfishing Limit
OLE	Office of Law Enforcement
OY	Optimum Yield
PBR	Potential Biological Removal
PDT	Plan Development Team

PS/FG	Purse Seine/Fixed Gear
PRA	Paperwork Reduction Act
RFA	Regulatory Flexibility Act
RFFA	Reasonably Foreseeable Future Action
RIR	Regulatory Impact Review
SARC	Stock Assessment Review Committee
SAV	Submerged Aquatic Vegetation
SAW	Stock Assessment Workshop
SSB	Spawning Stock Biomass
SSC	Scientific and Statistical Committee
SFA	Sustainable Fisheries Act
TAC	Total Allowable Catch
TALFF	Total Allowable Level of Foreign Fishing
TC	Technical Committee
TRAC	Transboundary Resource Assessment Committee
TRT	Take Reduction Team
USAP	U.S. At-Sea Processing
USFWS	US Fish and Wildlife Service
VEC	Valued Ecosystem Component
VMS	Vessel Monitoring System
VPA	Virtual Population Analysis
VTR	Vessel Trip Report

11.0 GLOSSARY

Adult stage – one of several marked phases or periods in the development and growth of many animals. In vertebrates, the life history stage where the animal is capable of reproducing, as opposed to the juvenile stage.

Adverse effect – any impact that reduces quality and/or quantity of EFH. May include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include sites-specific of habitat wide impacts, including individual, cumulative, or synergistic consequences of actions.

Aggregation – a group of animals or plants occurring together in a particular location or region.

Anadromous species – fish that spawn in fresh or estuarine waters and migrate to ocean waters

Amphipods – a small crustacean of the order Amphipoda, such as the beach flea, having a laterally compressed body with no carapace.

Allowable Biological Catch (ABC) – the amount of fish that can be safely harvested from a stock. It is usually calculated by applying the target fishing mortality to the estimated biomass size.

Amendment – a formal change to a fishery management plan (FMP). The Council prepares amendments and submits them to the Secretary of Commerce for review and approval. The Council may also change FMPs through a "framework adjustment procedure" (see below). The Commission prepares amendments and submits them to the Commission's Atlantic Herring Section for approval. Implementing regulations are adopted by the states.

Atlantic herring – *Clupea h. harengus*. The species that will be managed by the management plans developed by the Council and the Commission and described in this document. Sometimes referred to as sea herring.

Benthic community – *Benthic* means the bottom habitat of the ocean, and can mean anything as shallow as a salt marsh or the intertidal zone, to areas of the bottom that are several miles deep in the ocean. *Benthic community* refers to those organisms that live in and on the bottom.

B_{MSY} – stock biomass that would produce MSY when fished at a fishing mortality rate equal to F_{MSY}. For most stocks, B_{MSY} is about ½ of the carrying capacity. The proposed overfishing definition control rules call for action when biomass is below ¼ or ½ B_{MSY}, depending on the species.

$B_{threshold}$ – 1) A limit reference point for biomass that defines an unacceptably low biomass i.e., puts a stock at high risk (recruitment failure, collapse, reduced long term yields, etc). 2) A biomass threshold that the SFA requires for defining when a stock is overfished. A stock is overfished if its biomass is below $B_{threshold}$.

B_{target} –desirable biomass to maintain fishery stocks. This is usually synonymous with B_{MSY} or its proxy.

Biota – all the plant and animal life of a particular region.

Bycatch – fish that are harvested in a fishery, but which are not sold or kept for personal use. This includes economic discards and regulatory discards. The fish that are being targeted may be bycatch if they are not retained.

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

Catch – the sum total of fish killed in a fishery in a given period. Catch is given in either weight or number of fish and may include landings, unreported landings, discards (bycatch), and incidental deaths.

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

Crustaceans – invertebrates characterized by a hard outer shell and jointed appendages and bodies. They usually live in water and breathe through gills. Higher forms of this class include lobsters, shrimp and crawfish; lower forms include barnacles.

Days absent – an estimate by port agents of trip length. This data was collected as part of the NMFS weighout system prior to May 1, 1994.

Days –at –sea (DAS) – the total days, including steaming time that a boat spends at sea to fish.

Demersal species – most often refers to fish that live on or near the ocean bottom. They are often called benthic fish, groundfish, or bottom fish.

Ecosystem-based management – a management approach that takes major ecosystem components and services—both structural and functional—into account, often with a multispecies or habitat perspective.

Egg stage – one of several marked phases or periods in the development and growth of many animals. The life history stage of an animal that occurs after reproduction and refers to the developing embryo, its food store, and sometimes jelly or albumen, all surrounded by an outer shell or membrane. Occurs before the *larval* or *juvenile stage*.

Elasmobranch – any of numerous fishes of the class Chondrichthyes characterized by a cartilaginous skeleton and placoid scales: sharks; rays; skates.

Embayment – a bay or an indentation in a coastline resembling a bay.

Environmental Impact Statement (EIS) – an analysis of the expected impacts of a fishery management plan (or some other Proposed Action) on the environment and on people, initially prepared as a "Draft" (DEIS) for public comment. After an initial EIS is prepared for a plan, subsequent analyses are called "Supplemental" (i.e., DSEIS, FSEIS).

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

Exclusive Economic Zone (EEZ) – for the purposes of the Magnuson-Stevens Fishery Conservation and Management Act, the area from the seaward boundary of each of the coastal states to 200 nautical miles from the baseline.

Exploitation rate – the percentage of catchable fish killed by fishing every year. If a fish stock has 1,000,000 fish large enough to be caught by fishing gear and 550,000 are killed by fishing during the year, the annual exploitation rate is 55%.

Fathom – a measure of length, containing six feet; the space to which a man can extend his arms; used chiefly in measuring cables, cordage, and the depth of navigable water by soundings.

Fishing effort – the amount of time and fishing power used to harvest fish. Fishing power includes gear size, boat size and horsepower.

Fishing mortality (F) – (see Mortality)

FMP (fishery management plan) – also referred to as a "plan," this is a document that describes a fishery and establishes measures to manage it. The New England Fishery Management Council prepares FMPs and submits them to the Secretary of Commerce for approval and implementation. The Atlantic States Marine Fisheries Commission prepares FMPs and implementing regulations are adopted by the States.

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

Gonadosomatic Index (GSI) – a measure of the stage of spawning condition.

GRT –gross registered tons. Measure of vessel size based on volume.

Individual Fishing Quota (IFQ) – federal permit under a limited access system to harvest a quantity of fish, expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by an individual person or entity

Internal Waters Processing (IWP) – an operation by a foreign vessel processing fish caught by U. S. vessels. The foreign vessel is located in the internal waters of a state. "IWP" is usually a reference to the fish allocated for these operations.

Joint Venture (JV) – any operation by a foreign vessel assisting fishing by U.S. fishing vessels, including catching, scouting, processing and/or support. (A joint venture generally entails a foreign vessel processing fish received from U.S. fishing vessels and conducting associated support activities.) "JVP" is usually a reference to the fish allocated for joint venture operations.

Juvenile stage – one of several marked phases or periods in the development and growth of many animals. The life history stage of an animal that comes between the *egg* or *larval stage* and the *adult stage*; juveniles are considered immature in the sense that they are not yet capable of reproducing, yet they differ from the larval stage because they look like smaller versions of the adults.

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

Larvae (or Larval) stage – one of several marked phases or periods in the development and growth of many animals. The first stage of development after hatching from the *egg* for many fish and invertebrates. This life stage looks fundamentally different than the juvenile and adult stages, and is incapable of reproduction; it must undergo metamorphosis into the juvenile or adult shape or form.

Limited entry (or access) – a management system that limits the number of participants in a fishery. Usually, qualification for this system is based on historic participation and the participants remain constant over time (with the exception of attrition).

Meter – a measure of length, equal to 39.37 English inches, the standard of linear measure in the metric system of weights and measures. It was intended to be, and is very nearly, the ten millionth part of the distance from the equator to the north pole, as ascertained by actual measurement of an arc of a meridian.

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

Mortality

Fishing mortality (F) – (see also exploitation rate) a measurement of the rate of removal of fish from a population by fishing. Fishing mortality (F) is that rate at which fish are harvested at any given point in time. ("Exploitation rate" is an annual rate of removal, "F" is an instantaneous rate.)

$\mathbf{F_{target}}$ – the fishing mortality that management measures are designed to achieve.

Natural mortality (M) – a measurement of the rate of fish deaths from all other causes other than fishing such as predation, disease, starvation and pollution. The rate of natural mortality may vary from species to species.

Total mortality – the rate of mortality from all sources (fishing, natural, pollution). Total mortality can be expressed as an instantaneous rate (called Z and equal to F + M) or Annual rate (called A and calculated as the ratio of total deaths in a year divided by number alive at the beginning of the year).

Minimum biomass level – the minimum stock size (or biomass) below which there is a significantly lower chance that the stock will produce enough new fish to sustain itself over the long term. If a stock is at this level, fishing mortality must be reduced to as near zero as possible until the stock rebuilds.

Observer – any person required or authorized to be carried on a vessel for conservation and management purposes by regulations or permits under this action.

Open access – describes a fishery or permit for which there is no qualification criteria to participate. Open-access permits may be issued with restrictions on fishing (for example, the type of gear that may be used or the amount of fish that may be caught).

Optimum Yield (OY) – the amount of fish which –
(a) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;
(b) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and
(c) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Overfished – a conditioned defined when stock biomass is below minimum biomass threshold and the probability of successful spawning production is low.

Overfishing – a level or rate of fishing mortality that jeopardizes the long-term capacity of a stock or stock complex to produce MSY on a continuing basis.

Pelagic gear – mobile or static fishing gear that is not fixed, and is used within the water column, not on the ocean bottom. Some examples are midwater trawls and pelagic longlines.

Plan Development Team (PDT) – a group of technical experts responsible for developing and analyzing management measures under the direction of the Council or the ASMFC. The ASMFC uses the term **Technical Committee** during the development of a plan and **Plan Review Team** after a plan is adopted.

Prey availability – the availability or accessibility of prey (food, **forage**) to a predator. Important for growth and survival.

Primary production – the synthesis of organic materials from inorganic substances by photosynthesis.

Proposed rule – a federal regulation is usually published in the *Federal Register* as a proposed rule with a time period for public comment. After the comment period closes, the proposed regulation may be changed or withdrawn before it is published as a final rule, along with its date of implementation and response to comments.

Rebuilding schedule – a plan to increase the biomass of a fishery stock, based on a target fishing mortality applied over a period of time.

Recovery time – the period of time required for something (e.g. a habitat) to achieve its former state after being disturbed.

Recruitment – the amount of fish added to the fishery each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to fishing gear in one year would be recruitment to the fishery.

Recruitment overfishing – fishing at an exploitation rate that reduces the population biomass to a point where recruitment is substantially reduced.

Regional Administrator – Regional Administrator, NOAA/NMFS Northeast Region, Gloucester, MA.

Regulated groundfish species – cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, windowpane flounder, white hake and redfish. These species are usually targeted with large-mesh net gear.

Relative exploitation – an index of exploitation derived by dividing landings by trawl survey biomass. This measure does not provide an absolute magnitude of exploitation but allows for general statements about trends in exploitation.

Secretarial review process – a process which normally takes 140 days from the time the Council submits a plan or amendment to the Secretary of Commerce until its implementation. The Secretary of Commerce reviews and possibly approves the plan or amendment which must

meet the National Standards established by the Magnuson Stevens Fishery Conservation and Management Act as well as other federal requirements (the National Environmental Policy Act, the Marine Mammal Protection Act, the Endangered Species Act and other applicable law.)

Spawning component – reference to a group of herring that spawn in a general location. There is evidence herring return to the same areas to spawn. These fish may, in fact, comprise different "stocks" but the evidence is ambiguous; they are identified as components to allow the development of measures for their protection. A healthy herring resource depends on maintaining spawning in as many areas as possible.

Spawning stock biomass (SSB) – the total weight of fish in a stock that sexually mature, i.e., are old enough to reproduce.

Species assemblage – several species occurring together in a particular location or region

Species composition – a term relating the relative abundance of one species to another using a common measurement; the proportion (percentage) of various species in relation to the total on a given area.

Species diversity – the number of different species in an area and their relative abundance.

Species richness – see *Species diversity*. A measurement or expression of the number of species present in an area; the more species present, the higher the degree of species richness.

Status Determination – a determination of stock status relative to $B_{threshold}$ (defines overfished) and $F_{threshold}$ (defines overfishing). A determination of either overfished or overfishing triggers a SFA requirement for rebuilding plan (overfished), ending overfishing (overfishing) or both.

Stock – a grouping of fish usually based on genetic relationship, geographic distribution and movement patterns. A region may have more than one stock of a species.

Stock assessment – a process for determining the number (abundance/biomass) and status (life-history characteristics, including age distribution, natural mortality rate, age at maturity, fecundity as a function of age) of individuals in a stock.

TAC – the total allowable catch from a stock of fish based on stock size and a specified management objective.

Technical Committee – a group of biologists assembled by the Commission to assess the (herring) resource.

Tolerance – a reference to a management measure used in the original Commission herring management plan. This measure allows fishing in a spawning closure as long as only a certain percentage of the fish caught contain spawn (roe or milt).

VMS – an electronic vessel monitoring system, which may also be used for communications. Previously referred to as a vessel tracking system, or VTS.

Year class – also called cohort. Fish that were spawned in the same year. By convention, the "birth date" is set to January 1st and a fish must experience a summer before turning 1. For example, winter flounder that were spawned in February-April 1997 are all part of the 1997 cohort (or year-class). They would be considered age 0 in 1997, age 1 in 1998, etc.

12.0 REFERENCES

12.1 GENERAL REFERENCES

For the description of the affected environment (Section 4.0), the references included in Section 14.0 of the Amendment 1 document apply to this document and are incorporated by reference. The references listed below are those in addition to references in Amendment 1 and/or those that were specifically referenced for the purposes of preparing this specifications document.

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13.0 LIST OF PUBLIC MEETINGS

Date	Meeting	Location
November 6-7, 2007	Council Meeting	Newport, RI
March 26, 2008	Herring Oversight Committee	Portland, ME
April 3, 2008	Herring PDT	Mansfield, MA
April 15-17, 2008	Council Meeting	Providence, RI
April 30, 2008	Herring Advisory Panel	Peabody, MA
April 30, 2008	Amendment 4 Scoping Hearing	Peabody, MA
May 22, 2008	Amendment 4 Scoping Hearing	Portland, ME
May 22, 2008	Herring Oversight Committee	Portland, ME
June 2, 2008	Amendment 4 Scoping Hearing	Portland, MA
June 10, 2008	Amendment 4 Scoping Hearing	Atlantic City, NJ
July 30, 2008	Joint Herring Oversight & Advisory Panel	Portland, ME
August 14, 2008	Herring PDT	Danvers, MA
Sept. 30. – Oct. 1, 2008	Herring Oversight Committee	Portland, ME
October 7-9, 2008	Council Meeting	Mystic, CT
November 12, 2008	Herring PDT	Mansfield, MA
December 16, 2008	Herring Oversight Committee	Danvers, MA
February 9-11, 2009	Council Meeting	Portsmouth, NH
January 14, 2009	Herring PDT	Mansfield, MA
January 28, 2009	Herring Oversight Committee	Warwick, RI
March 24, 2009	Herring Oversight Committee	Portland, ME
April 7-9, 2009	Council Meeting	Mystic, CT
May 14, 2009	Herring Advisory Panel	Portsmouth, NH
May 26, 2009	Herring PDT	Mansfield, MA
June 4-5, 2009	Herring Oversight Committee	Portland, ME
June 22-25, 2009	Council Meeting	Portland, ME
November 17-19, 2009	Council Meeting	Newport, RI
January 6 7 11	Pubic Hearing	Gloucester, MA
January 7, 2010	Pubic Hearing	Fairhaven, MA
January 11, 2010	Pubic Hearing	Portland, ME