Fishery Management Report No. 45

of the

Atlantic States Marine Fisheries Commission

Amendment 2 to the Interstate Fishery Management Plan For Atlantic Herring

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ATLANTIC STATES MARINE FISHERIES COMMISSION

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Approved in January 2006

Amendment 2 to the
Interstate Fishery Management Plan for Atlantic Herring

Prepared by

Atlantic States Marine Fisheries Commission
Atlantic Herring Plan Development Team

In coordination with

New England Fishery Management Council
Atlantic Herring Plan Development Team

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This Management Plan was prepared under the guidance of the Atlantic States Marine Fisheries Commission's Atlantic Herring Section, Chaired by Eric Smith of Connecticut Department of Environmental Protection. Technical and advisory assistance was provided by the Atlantic Herring Technical Committee, the Atlantic Herring Stock Assessment Subcommittee and the Atlantic Herring Advisory Panel.

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EXECUTIVE SUMMARY

1.0 Introduction

The U.S. Atlantic herring fishery is currently managed as a single stock complex along the East Coast from Maine to Cape Hatteras although there is evidence to suggest there are at least two separate biological stocks. Generally, the resource has been divided into an inshore Gulf of Maine (GOM) and an offshore Georges Bank (GB) component. Individual spawning aggregations have been identified, but quantitative data on their relative size is lacking. Intermixing among these aggregations outside of the spawning season has led to difficulties in accurately assessing the status of individual stocks.

While the Atlantic herring resource is currently not overfished and overfishing is not occurring (*Section 1.2.2*), the current level of abundance and spawning stock biomass has generated competing interests in new and expanded sectors of the herring fishery including: maintaining traditional use patterns in the fishery, increasing the bait fishery and protecting herring's role as forage in the northwest Atlantic ecosystem (*Section 1.3*).

These potentially competing interests have generated different views on how the herring fishery should be managed in the future. Additionally, the interest in expansion of the fishery has raised concerns about potential overharvest, locally or on the entire stock complex. By not implementing Amendment 2 to the Interstate FMP for Atlantic herring, great risk is posed to the coastwide herring stock complex thereby posing great risk to the fishery. This potential risk is complicated by high levels of uncertainty within the herring fishery, especially regarding herring's role as forage (*Section 1.2.1.1*).

Amendment 2 was developed in close coordination with the New England Fishery Management Council as the Council developed Amendment 1 to the Federal Fishery Management Plan for Atlantic Herring. This Amendment, when fully implemented and in conjunction with the Council plan, is designed to minimize the chance of a population collapse due to overfishing, reduce the risk of recruitment failure, promote an orderly development in the offshore fishery, reduce impacts to species which are ecologically dependent upon Atlantic herring and minimize adverse effects on participants in the fishery.

2.0 Goals and Objectives

The goals of Amendment 2 to the Interstate Fishery Management Plan for Atlantic Herring are:

- To achieve, on a continuing basis, optimum yield (OY) for the United States fishing industry and to prevent overfishing of the Atlantic herring resource. Optimum yield is the amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, taking into account the protection of marine ecosystems, including maintenance of a biomass that supports the ocean ecosystem, predator consumption of herring, and biologically sustainable human harvest. Optimum yield is based on the maximum sustainable yield (MSY) as reduced by any relevant economic, social, or ecological factor, and, in the case of an overfished fishery, provides for rebuilding to a level consistent with producing MSY.

To provide for the orderly development of the offshore and inshore fisheries, taking into account the viability of current participants in the fishery.

To meet the goals of Amendment 2, the following objectives shall guide the development of the interstate management program for Atlantic herring:

- To harvest the U.S. Northwest Atlantic herring resource consistent with the definition of overfishing contained in Amendment 2.
- To prevent the overfishing of discrete spawning units consistent with the national standards.

- To avoid patterns of fishing mortality by age which adversely affect age structure of the stock.
- To provide adequate protection for spawning herring and prevent damage to herring egg beds.
- To promote U.S. and Canadian cooperation in order to establish complementary and real-time management practices.
- To implement management measures in close coordination with other Federal and State FMPs.
- To promote research and improve the collection of information in order to better understand herring population dynamics, biology, and ecology, improve science in order to move to real-time management and to improve assessment procedures and cooperation with Canada.
- To achieve full utilization from the catch of herring, including minimizing waste from discards in the fishery.
- To maximize domestic use, such as lobster bait, sardines, and other products for human consumption, and encourage value-added product utilization.
- To promote the utilization of the resource in a manner, which maximizes social and economic benefits to the nation and taking into account the protection of marine ecosystems and its value as a forage species.

2.4.1 Management Area Boundaries

Amendment 2 redefines areas 1B, 2 and 3, resulting in a larger area covered by Management Area 3. Area 3 would be redefined as originating south of Cape Cod at 4139.00 and 7000.00, northeast to a point on the EEZ at 4253.14 and 6744.35. Continuing south along the EEZ to a point at 3754.00 and 7000.00, then north along 7000.00 longitude to the Cape Cod shoreline.

2.5 Biological Reference Points

Amendment 2 sets the maximum sustainable yield for the Atlantic herring fishery at 220,000 mt. This measure establishes a proxy for maximum sustainable yield for the Atlantic herring complex. Establishing a proxy for MSY recognizes the scientific uncertainty associated with the last stock assessment for Atlantic herring (TRAC, February 2003).

3.0 Monitoring Program Specifications/Elements

The Atlantic Herring Technical Committee will meet at least once each year to review the stock assessment and all other relevant and current data pertaining to stock status. The Technical Committee will report on all required monitoring elements outlined in *Section 3* and forward any recommendations to the Atlantic Herring Section. The Technical Committee shall also report to the Management Board the results of any other monitoring efforts or assessment activities not included in *Section 3* that may be relavant to the stock status of Atlantic Herring or indicative of ecosystem health and interactions.

The Atlantic Herring Advisory Panel will meet at least once each year to review the stock assessment and all other relevant data pertaining to stock status. The Advisory Panel will forward its report and any recommendations to the Management Board.

The Atlantic Herring Plan Review Team will annually review implementation of the management plan and any subsequent adjustments (addenda), and report to the Management Board on any compliance issues that may arise. The PRT will also prepare the annual Atlantic Herring FMP Review and coordinate the annual update and prioritization of research needs (see *Section 6.0*).

4.0 Management Program Implementation

The fishing year for Atlantic herring will be from January 1-December 31; under this measure, revisions developed under the specification process will be implemented with the beginning of the fishing year, January 1.

4.2.1 Specification Process: Determining the Distribution of Area-Specific TACs

The Section annually meets with the Atlantic Herring Oversight Committee to establish area TACs that apply throughout the management area despite the border between state and federal waters. Amendment 2 expands upon the specification process outlined in Amendment 1 by allowing for the use of other analytical approaches when determining the distribution of area TACs. As such, the current process is still used but provides a specific approach to establishing the area-specific TACs. The ASMFC's Technical Committee (TC) and NEFMC's Plan Development Team (PDT) can modify the methodology to employ the best available scientific information for the Atlantic herring stock complex and its components.

4.2.2 Specification Process – Tri-annual Planning Horizon

Under this measure, the NEFMC's PDT and the ASMFC's TC will meet tri-annually to review the most recent stock status information. The PDT and TC will recommend necessary changes to the next three fishing year's specifications by July. With this type of multi-year management measure, the NEFMC and ASMFC have the ability to modify the specifications during the interim years.

4.2.3 Research Set-Asides

The Atlantic Herring Section and the New England Fishery Management Council may establish a mechanism to set aside a percentage of one or more management area TACs to help support research on the herring stock complex and fishery. This measure authorizes NEFMC and ASMFC to set-aside **0 - 3%** of the TAC from any management area(s) or the total TAC for the herring fishery to support herring-related research. The Council and Section will determine the specific percentages for the research set-asides and the management area(s) to which they apply during the fishery specification process. **The research set-aside is intended to be in addition to the current 5% set-aside for incidental catch once the directed fishery in a management area closes.**

4.3.1 Effort Controls

Effort controls are designed to control the catch rate of herring as an area's TAC approaches full utilization. The days out are also designed to allow a vessel to fish in an open area when another area is closed, moving effort out of the areas where catches are approaching the TAC. All vessels will take the same days out (that is, days out will be "no fishing" days) for a particular area. Fishing will be allowed in other areas, and catch may be landed in an area that is closed to fishing. Any vessel transiting an area closed to fishing with legally caught herring on board must have its fishing gear stowed.

By April of each fishing year, if the catch in a particular area or sub-area is projected to be harvested projections are based on historical catch rates using Atlantic herring landings for a given management area reported through the NOAA Fisheries Interactive Voice Reporting (IVR) system) before the end of a given period, states within the management area will meet to discuss implementation of the "days out" measures. To prevent an early closure of a management area or sub-area, the states will annually agree to the start date, number of days out of the fishery, as well as which consecutive days of the week will have landing restrictions. While the start time for the landing restriction may vary by state, the states must

implement the landing restriction for the same consecutive days each week. Projections indicate the specific days taken out of the fishery do not influence the catch rate or closure date. Off-loading herring caught from an area with the days out provision in effect will be permitted while the landing restriction is in place.

Fixed gear fishermen may remove and land herring from the gear (weirs and stop seines) on the days designated as a "day out" of the fishery. In addition, vessels with an Atlantic herring permit are not prohibited from participating in other fisheries for other species in restricted areas during days out of the Atlantic herring fishery.

4.3.2 Spawning Restrictions

Amendment 2 adopts a spawning area restriction for all state waters in the Gulf of Maine (Management Area 1A).

4.3.2.2 Spawning Closures & Default Dates

Spawning closures are based on commercial catch samples that are collected by at least August 1 for the Eastern and Western Maine areas, and by at least September 1 for the Massachusetts/New Hampshire area. If sufficient samples are not available, closures will begin on the default dates listed below and extend for at least four (4) weeks. Area 1A inshore spawning area closures will begin on the following dates, unless commercial catch samples show earlier spawning than the default date or continuing two weeks after the four-week closure.

Eastern Maine:	August 15
Western Maine:	September 1
Massachusetts/New Hampshire:	September 21

By default, closures will last four (4) weeks. Catch sampling of the fishery will resume at the end of the initial four-week closure period. If catch sampling indicates significant numbers of spawn herring still are being harvested, closures will resume for an additional two weeks.

4.3.2.3 Tolerance Provision – Zero Tolerance

Any vessel is prohibited to fish for, take, land, or possess "spawn" herring, as identified below, from or within a restricted spawning area. "Spawn" herring shall be identified as Atlantic herring in ICNAF gonadal stages V and VI.

Any vessel may fish for, take, land, or possess "spawn" herring from a management area outside of those identified in the Delineation of Spawning Areas. Any herring vessel having onboard spawn herring, which were caught outside of a management area that is under a herring spawning closure, may transit the closed area only if all of its fishing gear has been stowed.

4.3.2.4 Other Spawning Area Considerations – Exemption for East of Cutler Fixed Gear Fisheries

With implementation of Amendment 2, East of Cutler fixed gear fisheries are granted an exemption from spawning area considerations and are not limited on the amount of spawn herring that can be landed during a spawning closure.

4.3.3 Internal Water Processing – Prohibition of IWPs in All State Waters

Due to the uncertainty in the inshore stock status, overcapacity in Area 1 and sufficient access to the domestic shoreside processing plants in Area 1, Internal Water Processing operations will be prohibited from processing herring caught in all state waters.

4.3.4 Downeast Maine Fixed Gear Fisheries

The catch from the Downeast Maine fixed gear fishery will be included as part of the assumed catch from the New Brunswick (NB) weir fishery when determining area-specific TACs and herring fishery specifications (currently 20,000 mt). During the fishing season, catch from the Downeast Maine fixed gear fishery will not be counted against the TAC for Area 1A, and the fixed gear fishery will be allowed to continue to operate once the Area 1A TAC has been reached. This equates to an exemption for the Downeast Maine fixed gear fishery from the Area 1A TAC. Total catch in the Downeast Maine fixed gear fishery would essentially be unrestricted (with the notable exception of inshore spawning restrictions that affect catch in this fishery).

In addition to including catch from the Downeast Maine fixed gear fishery east of Cutler as part of the assumed catch from the New Brunswick (NB) weir fishery, 500 mt of the Area 1A TAC will be set aside for fixed gear fisheries operating in Area 1A (weirs and stop seines) west of Cutler (area west of the shaded area below). This set-aside will be available to fixed gear fishermen in Area 1A until November 1. If the set-aside has not been utilized by the fixed gear fisheries west of Cutler by November 1, it will then be made available to the remainder of the herring fleet fishing in Area 1A until the directed fishery in 1A closes. If 95% of the Area 1A TAC has already been reached by November 1 (and the directed herring fishery in 1A is therefore closed), the set-aside will be released as part of the 5% set-aside for incidental catch in 1A (at a 2,000 lb trip limit).

4.3.5 Use restrictions – Prohibition of Directed Mealing

The harvest of herring for the primary purpose of reduction to meal or meal-like product is prohibited. The processing, transfer, or sale of herring cuttings, by-products, and whole herring condemned for human consumption, or waste is permitted.

5.0 Compliance

A state will be determined to be out of compliance with the provisions of this fishery management plan, according to the terms of Section Seven of the ISFMP Charter if:

- its regulatory and management programs to implement *Section 4* have not been approved by the Atlantic Herring Section; or
- it fails to meet any schedule required by *Section 5.1.2*, or any addendum prepared under adaptive management (*Section 4.7*); or
- it has failed to implement a change to its program when determined necessary by the Atlantic Herring Section; or
- it makes a change to its regulations required under *Section 4* or any addendum prepared under adaptive management (*Section 4.7*) without prior approval of the Atlantic Herring Section.

5.1.1 Mandatory Elements of State Programs

To be considered in compliance with this fishery management plan, all state programs must include harvest controls/a regime of restrictions for Atlantic herring fisheries consistent with the requirements of *Sections 4.1, 4.2* and *4.3*; except that a state may propose an alternative management program under

Section 4.6, which, if approved by the Section, may be implemented as an alternative regulatory requirement for compliance.

In addition, the Atlantic Herring Section will monitor bycatch of Atlantic herring in other fisheries and report excessive bycatch problems to the management authority for the fishery causing the bycatch.

5.1.1.1 Regulatory Requirements

States may begin to implement Amendment 2 after final approval by the Commission. Each state must submit its required Atlantic herring regulatory program to the Commission through the ASMFC staff for approval by the Atlantic Herring Section. During the period from submission, until the Management Board makes a decision on a state's program, a state may not adopt a less protective management program than contained in this management plan or contained in current state law. The following lists the specific compliance criteria that a state/jurisdiction must implement in order to be in compliance with Amendment 2:

1. Each jurisdiction must enact spawning area restrictions that are at least as restrictive or more than those in (*Section 4.3)*;
2. Each jurisdiction shall prohibit the landing of herring from a management area or sub-area when the TAC has been attained in that area or sub-area (*Section 4.3*);
3. Each jurisdiction shall prohibit directed fishing for herring in state waters when the TAC has been attained in that area or sub-area (*Section 4.3*);
4. Each jurisdiction shall prohibit the landing of herring to an Internal Waters Processing (IWP) operation that were harvested from an area or sub-area closed to directed herring fishing (*Section 4.3*);
5. Each jurisdiction shall require that (daily) herring landings from fixed gear fisheries be reported on a weekly basis in order to monitor progress toward attaining the TAC (*Section 4.3)*; and
6. Each jurisdiction shall annually provide a report on any mealing activity of herring occurring in their state, specifically, the amount in weight of herring processed into meal or like product, biological sampling results and location of catch by NMFS statistical area or Management Area.

Once approved by the Atlantic Herring Management Board, states are required to obtain prior approval from the Board of any changes to their management program for which a compliance requirement is in effect. Other measures must be reported to the Board but may be implemented without prior Board approval. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (*Section 4.7*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

5.1.2 Compliance Schedule

States must implement Amendment 2 according to the following schedule:

April 1, 2006 States must submit programs to implement Amendment 2 for approval by the Atlantic

Herring Section. Programs must be implemented upon approval by the Section.*

January 1, 2007 States with approved management programs must implement Amendment 2. States may begin implementing management programs prior to this deadline if approved by the Section.*

Reports on compliance must be submitted to the Commission by each jurisdiction annually, no later than *February 1, beginning in 2008*.

5.1.3 Compliance Report Content

Each state must submit an annual report concerning its Atlantic herring fisheries and management program for the previous calendar year. A standard compliance report format has been prepared and adopted by the ISFMP Policy Board. States should follow this format in completing the annual compliance report.

6.0 Management and Research Needs

Amendment 2 contains a list of management and research needs that should be addressed in the future in order to improve the current state of knowledge of Atlantic herring biology, stock assessment, population dynamics, habitat issues, and social and economic issues. These lists of needs are not intended to be all-inclusive and they will be reviewed and updated annually through the Commission's ISFMP Review process.

7.0 Protected Species

Marine mammal interactions have been recorded in the primary fisheries (utilizing otter trawls and purse seines) that target Atlantic herring, including the Northeast mid-water trawl (including pair trawl) fishery and the Gulf of Maine Atlantic herring purse seine fishery. Marine mammal stocks of greatest concern that interact with this fishery are the western North Atlantic long-finned and short-finned pilot whales, western North Atlantic white-sided dolphin, and Gulf of Maine/Bay of Fundy harbor porpoise.

There are not data available that can be used to estimate the number of threatened or endangered sea turtles that might be taken in herring gear. Based on information collected in similar fisheries, the major gear types used in the herring fishery appear to have little or no interactions with sea turtles, although it must be acknowledged there has been an extremely low level of observer coverage in this fishery to date. In addition, there appears to be little spatial/temporal overlap in the distribution of Atlantic herring and sea turtles.

Like marine mammals and sea turtles, seabirds are vulnerable to entanglement in commercial fishing gear. Along with commercial fishing, human activities such as coastal development, habitat degradation and destruction, and the presence of organochlorine contaminants are considered to be major threats to some seabird populations. The otter trawl and the purse seine are the primary commercial gears used in the Atlantic herring fishery, accounting for the vast majority of the landings. These gears do not appear to be a significant source of incidental seabird takes.

* Amendment 2 recognizes the need of some states to go through the state legislative process to fully implement compliance requirements. States should identify these legislative needs and approximate timeline in their implementation proposals.

ACKNOWLEDGEMENTS

Amendment 2 to the Interstate Fishery Management Plan for Atlantic Sea Herring was developed under the supervision of the Atlantic States Marine Fisheries Commission's Atlantic Herring Section, chaired by Mr. Eric Smith of Connecticut. This Amendment was developed in conjunction with the development of the New England Fishery Management Council's Amendment 1 to the Federal Atlantic Herring Fishery Management Plan, with guidance provided by its Herring Oversight Committee. Members of the joint Plan Development Team (PDT) included: Ruth Christiansen (ASMFC staff), Lori Steele (New England Fishery Management Council staff), Dr. Matt Cieri (ME DMR), Steve Correia (MA DMF), Clare McBane (NH FGD), Myles Raizin (NMFS NERO), Dr. William Overholtz (NMFS-NEFSC), Drew Kitts (NEFSC), Dr. John Gates (University of Rhode Island), Dr. Madeleine Hall-Arber (Mass. Institute of Technology), Kohl Kanwit (ME DMR), Phil Logan (NEFSC), Patricia Pinto da Silva (NEFSC), Eric Dolin (NMFS NERO) and Hannah Goodale (NMFS NERO). Many thanks also to Tina Berger (ASMFC), Elizabeth Griffin (Oceana), and Megan Caldwell (NMFS) for their contributions.

The Section and Plan Development Team wish to express their thanks and appreciation to Mr. Dave Ellenton, Advisory Panel Chair, and to the other members of the Atlantic Herring Advisory Panel, who provided a wealth of information and discussion during the development of this plan. Appreciation is also extended to the many fishermen, representatives of conservation groups and members of the public who have written letters and attended public hearings to express their opinions and ideas.

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1.1.1 Statement of the Problem

The U.S. Atlantic herring fishery is currently managed as a single stock complex along the East Coast from Maine to Cape Hatteras although there is evidence to suggest there are at least two separate biological stocks. Generally, the resource has been divided into an inshore Gulf of Maine (GOM) and an offshore Georges Bank (GB) component. Individual spawning aggregations have been identified, but quantitative data on their relative size is lacking. Intermixing among these aggregations outside of the spawning season has led to difficulties in accurately assessing the status of individual stocks.

While the Atlantic herring resource is currently not overfished and overfishing is not occurring (*Section 1.2.2*), the current level of abundance and spawning stock biomass has generated competing interests in new and expanded sectors of the herring fishery including: maintaining traditional use patterns in the fishery, increasing the bait fishery and protecting herring's role as forage in the northwest Atlantic ecosystem (*Section 1.3*).

These potentially competing interests have generated different views on how the herring fishery should be managed in the future. Additionally, the interest in expansion of the fishery has raised concerns about potential overharvest, locally or on the entire stock complex. By not implementing Amendment 2 to the Interstate FMP for Atlantic herring, great risk is posed to the coastwide herring stock complex thereby posing great risk to the fishery. This potential risk is complicated by high levels of uncertainty within the herring fishery, especially regarding herring's role as forage (*Section 1.2.1.1*).

Some of the specific issues covered by this amendment, include:

- Management area boundaries
- Biological reference points
- Bycatch
- Effort control measures
- Spawning restrictions

1.1.2 Benefits of Implementation

This Amendment, when fully implemented, is designed to minimize the chance of a population collapse due to overfishing, reduce the risk of recruitment failure, promote an orderly development in the offshore fishery, reduce impacts to species which are ecologically dependent upon Atlantic herring and minimize adverse effects on participants in the fishery.

1.1.2.1 Social and Economic Benefits

The goal of the herring management plan is to achieve optimum yield for the U.S. fishing industry, to prevent overfishing and to provide for the development of the fisheries, taking into account the viability of participants. Controlling herring fishing so that it can be prosecuted all year would be a benefit to all those who depend on herring as bait (or food). Presumably, prices, accessibility and quality will improve. A fishery stable over time allows businesses to plan their investments to achieve sustainability and offers a measure of security to individuals and communities dependent on the fishery.

1.1.2.2 Ecological Benefits

When fully implemented, Amendment 2 is designed to minimize the chance of a population collapse due to overfishing, reduce impacts to species, which are ecologically dependent on Atlantic herring and minimize the adverse effects of overfishing or the management program on participants in the fishery. The Amendment is designed to complement the management program developed by the New England Fishery Management Council. This implementation of complementary management programs in state and federal waters will ensure the maintenance of a herring biomass that will support the ocean ecosystem, predator consumption of herring and biologically sustainable human harvest.

1.2 DESCRIPTION OF THE RESOURCE

Atlantic herring are distributed along the Atlantic coast from North Carolina to the Canadian Maritime provinces in inshore and offshore waters (including in every major estuary from the northern Gulf of Maine to the Chesapeake Bay) to the edge of the continental shelf. They are most abundant north of Cape Cod and become increasingly scarce south of New Jersey (Kelly and Moring, 1986; NEFMC, DRAFT SEIS, 2005). All life stages of Atlantic herring can be found in high abundance in the Gulf of Maine and in lower abundance in the mid-Atlantic, but only adult herring are found to be abundant south of Narragansett Bay (Reid et al., 1999; Stone et al., 1994; NEFMC, DRAFT SEIS, 2005). Adult herring are common in more northern locations throughout the year, but are more abundant in the fall and winter. Further south, from New York to Chesapeake Bay, they are absent in the summer and never abundant. Juveniles are more common in more northern areas throughout the year and in all locations except Chesapeake Bay in the spring. When examining months of the year and locations when both life stages are present, it becomes clear that there is a progression from north to south, with adults and juveniles in the northern estuaries and embayments throughout the year, neither life stage in more southern location in the summer, only juveniles in Great South Bay (Long Island) and along the New Jersey coast and Delaware Bay in the spring and only adults in the south in the winter (NEFMC, DRAFT SEIS, 2005). This changing seasonal distribution has given rise to both mobile and fixed gear fisheries that harvest herring of all age groups. The catch supplies domestic and foreign markets for juvenile and adult herring, which are used for human consumption, bait and food for zoo animals.

Management of the Atlantic herring resource centers on three major stocks of herring in the Gulf of Maine region that spawn in geographically discrete areas on Georges Bank (GB) and Nantucket Shoals (NS), in coastal waters of the Gulf of Maine (GOM) and off southwest Nova Scotia. Each of these major spawning areas is composed of a number of smaller spawning grounds. Observations of year to year changes in the abundance of adults on individual spawning grounds, in response to fishing pressure, tend to confirm the view that each of these areas supports a discrete spawning aggregation (or sub-stock) of herring (Stephenson, 1998).

Some degree of stock differentiation was achieved with early enzyme electrophoresis research (Ridgway et al., 1970, 1971), but more recent attempts to differentiate geographically isolated fall spawning stocks in eastern Canada and the northeast U.S. on the basis of genetic characteristics have been unsuccessful (Kornfield et al., 1982; Kornfield and Bogdanowicz, 1987; Safford and Brooke, 1992). Nevertheless, discrete spawning stocks occupy the three fairly distinct locations in the Gulf of Maine region. Evidence for separate stocks in the Gulf of Maine region is also derived from discrete larval distribution patterns (Iles and Sinclair, 1982), differences in spawning times and locations (Boyar et al., 1973; Haegele and Schweigert, 1985) and distinct biological characteristics, such as growth rates (Anthony and Waring, 1980), meristic and morphometric counts and measurements (Anthony, 1981; Safford, 1985) and the incidence of parasites (McGladdery and Burt, 1985). Despite the differences, herring that spawn on Georges Bank, Nantucket Shoals and in coastal waters of the Gulf of Maine are assessed in the U.S. as a single coastal stock complex at this time.

Each of these major spawning areas is composed of a number of smaller, discrete spawning sites. Herring that spawn on these individual sites have been observed to have distinct age compositions and their abundance from year to year changes in response to the amount of fishing that occurs at each site. These observations tend to confirm the view that each of these areas supports a discrete spawning aggregation (or sub-stock) of herring (Stephenson, 1998; NEFMC, DRAFT SEIS, 2005). Some of these discrete spawning sites are located within 10-15 miles of each other (e.g. Trinity Ledge and Lurcher Shoals off the southwest coast of Nova Scotia).

The most compelling evidence supporting the existence of separate Gulf of Maine and Georges Bank-Nantucket Shoals stocks was the collapse of the large Georges Bank-Nantucket Shoals stock in the early 1970s after several years of heavy exploitation by foreign fishing fleets. This stock remained in a depressed state for about ten years, during which time the smaller Gulf of Maine stock continued to support a strong coastal fishery. Both of these stocks are transboundary stocks since adult herring occupy both sides of the U.S.-Canada boundary on Georges Bank and because juvenile and adult herring on the New Brunswick shore of the Bay of Fundy are believed to originate from spawning grounds in U.S. and Canadian waters (Stephenson et al., 1998, NEFMC, DRAFT SEIS, 2005).

It is recognized that conspecific herring populations often differ in productivity and may not support equal levels of exploitation. Thus, appropriate fishing levels may not be the same for the different populations within the stock complex. In recent years there has been increasing emphasis on preserving all aspects of biodiversity, including within species diversity. The biological rationale for preserving this diversity is that such variation allows adaptation to changing conditions. The economic rationale is that the decrease or elimination of population richness may lead to the loss of fisheries, such as occurred during the mid 1970s when the Georges Bank herring stock collapsed (Overholtz et al., 2004).

1.2.1 Species Life History

1.2.1.1 Herring as forage

Herring is an important species in the food web of the northwest Atlantic. Herring eggs are deposited on the bottom and incubate for about 10 days. They are subject to predation by a variety of demersal fish species, including winter flounder, cod, haddock and red hake. Juvenile herring, especially “brit” (age-1 juveniles) are preyed upon heavily due to their abundance and small size.

Atlantic herring is an important prey species for a large number of piscivorous fish, elasmobranchs (sharks and skates), marine mammals and seabirds in the northeastern U.S. Unlike other pelagic fishes such as Atlantic mackerel, herring are smaller and vulnerable to predation over most, if not all, of their life (Overholtz et al., 2000). Estimates of the percent composition of Atlantic herring (or of two broader taxonomic groups that include Atlantic herring, menhaden, shad, and river herring) in the diets of 15 species of elasmobranchs and finfish in the northeast shelf ecosystem are summarized in Table 1. Stomach content data compiled from fish collected after 1990 are more indicative of current conditions since the Atlantic herring stock was in a collapsed state during the 1980s and started to recover in the early 1990s. The trends in the percentage of herrings in the diet of Atlantic cod follow this change in the population sizes for Atlantic herring.

According to the diet composition data in Table 1, the major finfish and elasmobranch species that feed heavily on Atlantic herring (or on clupeid species as a group) are Atlantic cod, silver hake, thorny skate, bluefish, goosefish, weakfish, summer flounder, white hake, and – in certain locations and times of year – Atlantic bluefin tuna (Table 1). Other species that feed on herring are spiny dogfish, Atlantic halibut, red hake, striped bass, dusky shark, and black sea bass. Spiny dogfish is, however, a much more important

predator on Atlantic herring than is indicated by diet composition data. Link et al. (2002a) estimated that spiny dogfish consumed an average of 67,660 metric tons (mt) of Atlantic herring a year during 1977-1998, with a range of 15,526 to 148,197 mt (Table 1). Thus, in some years, spiny dogfish consumed a greater quantity of herring biomass than was taken in the commercial fishery.

For many of the predator species listed in Table 1, herring made up a larger percentage of the diets of the larger size classes. This was the case for silver hake, summer flounder, white hake, bluefish, and goosefish. Link and Garrison (2002) reported that the percentages of herring in the stomachs of Atlantic cod increased from about 13% in 51-60 cm cod to 28% in 81-90 cm cod and then declined again to 6% in 111-120 cm cod. They also showed that herring made up a larger percentage of the diet of Atlantic cod in the Gulf of Maine than on Georges Bank or in southern New England. Garrison and Link (2000) reported higher percentages of Atlantic herring in the diet of silver hake on Georges Bank than in the Gulf of Maine or in southern New England. Bowman et al. (2000) reported similar results for silver hake and Atlantic cod. Chase (2002) reported very high percentages of Atlantic herring in bluefin tuna diets on Jeffreys Ledge and in the Great South Channel, but very low percentages in three other locations (Table 1). Less dramatic spatial variations were reported for striped bass by Nelson et al. (2003).

Overholtz et al. (2000) estimated the consumption of Atlantic herring by 10 species of predatory fish in northeastern U.S. waters from 1977 to 1997. It was found that the amount of herring consumed varied in response to changes in the abundance of herring and the abundance of predator populations in the late 1980s and throughout the 1990s. Consumption of Atlantic herring by these predatory fish peaked at over 200,000 metric tons (mt) during 1992 and 1993, declining to less than 100,000 mt in 1997 (Table 2). By far the most important predator on herring was spiny dogfish, followed by silver hake, cod, white hake and bluefish. The declines in consumption of herring in the late 1990s were coincident with the declines in the abundance of these five species.

Read and Brownstein (2003) used survey-based estimates of abundance for eight species of marine mammals between 1991 and 1997 to estimate the total annual consumption of Atlantic herring by these species in the Gulf of Maine (Table 2). Their estimates of marine mammal consumption ranged from about 94,000 to 190,000 mt of herring per year. Their results show that minke whales, harbor porpoises, and white-sided dolphins are major predators on Atlantic herring because of high proportions of herring (34-51%) in their diets, whereas fin and humpback whales consume large quantities of herring to sustain their large body mass. Despite a three-fold increase in the harbor seal population in the Gulf of Maine between 1981 and 1997, herring only make up 13% of their diet. Consequently, the mean consumption estimate for harbor seals is below 5,000 mt a year.

Read and Brownstein's (2003) mean (or "best") estimate of Atlantic herring consumed annually by marine mammals during 1991-1997 was about 140,000 mt, with a range of 93,000-200,000 mt (Table 2). Adding these estimates to the most current (1997) estimate of 100,000 mt of Atlantic herring consumed by fish and elasmobranch predators reported by Overholtz et al. (2000) produces a total mean estimate of 240,000 mt, with a range of 193,000-300,000 mt. During the 1990s, the total amount of herring consumed by all predators could have been as high as 400-450,000 mt.

Atlantic herring stock assessments are performed using an annual natural mortality rate that is equivalent to an 18% biomass removal from the stock. We used the difference between the results of the recent Canadian and U.S. stock assessments for the most recent year (2001/2002) to define an intermediate "best" stock size estimate of 1.2 million mt, and the most recent biomass estimates from the two assessments (0.6 and 1.8 million mt) to define the upper and lower population sizes for the resource. Multiplying these numbers by 18% generates a "reserve" of 250,000 mt as a forage base for predators (with a range of 108,000 to 324,000 mt). These calculations suggest that even if the Atlantic herring resource was being fully utilized, a sufficient biomass is being reserved to feed species of finfish,

elasmobranchs and marine mammals that rely on the resource for food. That was not the case during the early 1990s when predation rates were higher (Overholtz et al., 2000) and herring were less abundant. It would also not be true if the current estimates of herring population size were too high. However, because the Atlantic herring resource is currently under-utilized, a greater quantity of herring are available as food for predators than is provided by the natural mortality "reserve." Because of the uncertainty associated with the recent stock size estimate, however, the amount of "surplus" herring biomass that is currently available as forage for predators is not known.

Table 1. Percentage of Atlantic herring (or “herrings”) in the diets of 15 predatory fish and elasmobranch species in the Northeast continental shelf ecosystem of the U.S.

Predator species	Size (cm)	Percent herring in diet		Years	Location	Number stomachs examined	Taxon			Source
		By wt	By vol				C. harengus	Herrings	Clupeidae	
Atlantic cod	51-120+	15		1973-1975	NE shelf	8,176 over entire time period		✓		Link & Garrison 2002
		17		1976-1980	"			✓		"
		2		1981-1985	"			✓		"
		11		1986-1990	"			✓		"
		25		1991-1998	"			✓		"
	61-70	4.4		1977-1980	"	86			✓	Bowman et al. 2000
	71-80	9.7		"	"	52			✓	"
	81-90	6.5		"	"	91			✓	"
Silver hake	<20		4	1973-1997	NE shelf	8,722	✓		✓	Garrison & Link 2000
	20-50		9	"	"	26,070	✓		✓	"
	>50		25	"	"	1,037	✓		✓	"
	26-30	4.0		1977-1980	"	323	✓		✓	Bowman et al. 2000
	31-35	11.1		"	"	373	✓			"
	41-45	20.5		"	"	72	✓		✓	"
	>45	23.3		"	"	75	✓		✓	"
Summer flounder	41-45	5.5		1977-1980	NE shelf	80			✓	Bowman et al. 2000
	56-60	13.4		"	"	44			✓	"

	Mean=36	8		1990-2000	"	na		✓		Link et al. 2002b
Atlantic halibut	41-50	11.1		1977-1980	"	26			✓	Bowman et al. 2000
	Mean=58	4		1973-1998	"	155		✓		Link et al. 2002b
Spiny dogfish	51-60	2.5		1977-1980	NE shelf	235			✓	Bowman et al. 2000
	61-70	1.6		"	"	207			✓	"
	71-80	8.3		"	"	697	✓		✓	"
	81-90	0.3		"	"	368			✓	"
	91-100	1.3		"	"	423	✓			"
White hake	20-50+		20	1991-1997	"	na	✓		✓	Garrison & Link 2000
	20-50		2	1973-1997	"	5,341	✓		✓	"
	>50		13	"	"	6,049	✓		✓	"
Red hake	>50		2	"	"	1,713			✓	"
Bluefin tuna	Mean=221	87.2		1988-1992	Jeffreys Ledge	147	✓			Chase 2002
	Mean=221	48.4		"	Great South Channel	210	✓			"
	Mean=240	6		"	Stellwagen Bank	111	✓			"
	Mean=251	3.1		"	Cape Cod Bay	273	✓			"
	Mean=124	2.5		"	South of Martha's Vineyard	57	✓			"
Bluefish	"Adults"	11.3		1994	Georges Bank	50	✓			Buckel et al. 1999
	"	17.6		1995	"	44	✓			
	21-30	2.7		1977-1980	NE shelf	239			✓	Bowman et al. 2000
	31-40	2.3		"	"	71	✓			"

Striped bass	30-120	3.4		1997-2000	North shore MA	1,536	✓			Nelson et al. 2003
	25-120	0.2		"	Cape Cod Bay	1,019	✓			
	30-120	0		"	Nantucket Sound	451	✓			
Dusky shark	91-100	1.5		1977-1980	NE shelf	18			✓	Bowman et al. 2000
Thorny skate	61-70	36.5		"	"	36	✓			"
	71-80	25.5		"	"	42	✓			"
	>90	20.8		"	"	18	✓			"
Goosefish	51-60	1.9		"	"	104			✓	"
	81-90	1.2		"	"	86			✓	"
	>90	15.0		"	"	103	✓		✓	"
Black sea bass	21-25	2.3		"	"	188	✓			"
Weakfish	21-30	11.2		"	"	196			✓	"

Table 2. Annual consumption estimates (metric tons) of Atlantic herring by finfish, elasmobranchs, and marine mammal predators.

Fish and Elasmobranch Predators		**Marine Mammal Predators**	
Species	**Estimated Annual Consumption, 1977-1997**	**Species**	**Estimated Annual Consumption, 1991-1997**
Spiny Dogfish	36,000-214,000	Fin Whale	16,081-62,362
Silver Hake	11,500-36,000	Minke Whale	11,648-22,108
Georges Bank Cod	1,900-13,000	Humpback Whale	31,046-35,507
White Hake	500-20,000	Pilot Whale	149-512
Bluefish	500-13,600	Harbor Porpoise	20,863-27,655
Fluke	200-3,100	White-sided Dolphin	7,852-35,591
Pollock	200-3,100	Harbor Seal	4,853
Red Hake	200-3,100	Gray Seal	1,310
Goosefish	200-3,100		
Winter Skate	200-3,100		
Gulf of Maine Cod	200-3,100		
	Estimated Annual Consumption, 1977-1998		
Spiny Dogfish	15,526-148,197 (mean = 67,660)		
Winter Skate	20-2,329 (mean = 928)		

Sources: Overholtz et al. 2000 (finfish and elasmobranchs, 1977-1997), Link et al. 2002a (finfish and elasmobranchs, 1977-1998), Read and Brownstein 2003 (marine mammals).

Both of the most recent stock assessments (the Forward Projection Model, FPM, and ADAPT Virtual Population Analysis, VPA) for the Atlantic herring complex (see *Section 1.2.2* below) 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. In addition to the stock assessment, the management program has 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.

As calculated by the FPM, total removals broken down by natural mortality and annual catch are shown in Figure 1. 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 (Table 3).

Recently, herring and their role as forage have been a concern to many stakeholders. However, herring are only one of many forage species in the GOM/GB area. The importance of herring to any given predator is the result of many factors, including; availability, spatial and temporal overlap, selectivity, and alternate prey items. The NEFMC has put together a draft document reviewing all of the current literature on herring as a forage base for the Northeast Region (NEFMC, "Draft Research Paper: The Role of Atlantic Herring in the Northwest Atlantic Region" September 2003), which will be used in the development of the Council's DSEIS for Amendment 1, as well as the Commission's Amendment 2 to the Interstate FMP for Atlantic herring.

Figure 1. Annual Atlantic herring biomass removed due to natural mortality (including forage) and the annual catch from 1960-2002.

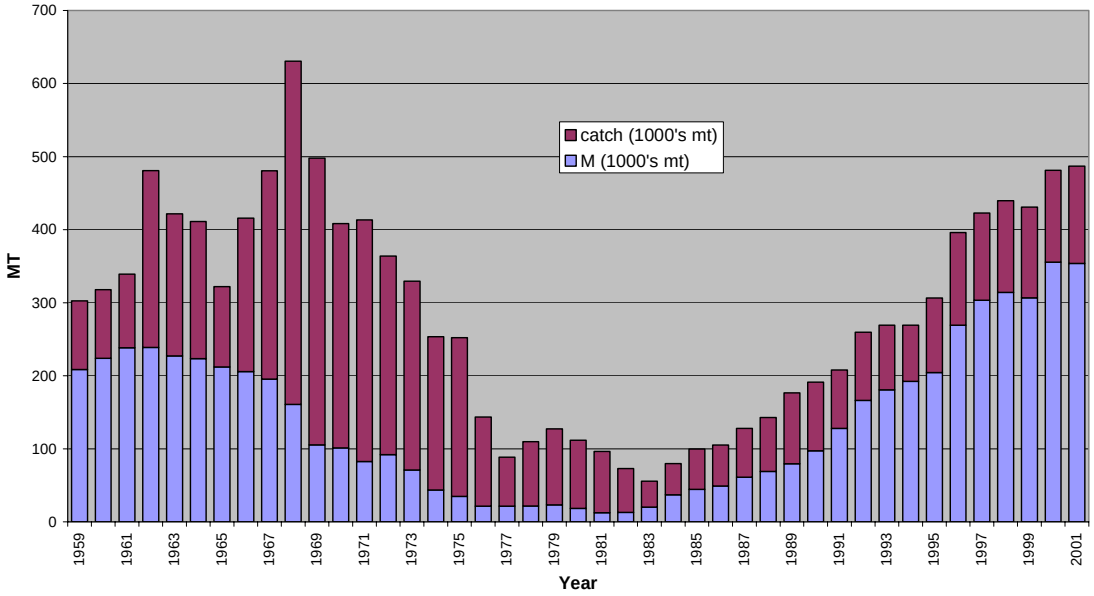


Table 3. Estimates of Total Biomass and Removals Due to M and Catch, 1959 – 2002

Year	Natural Mortality (1000's mt)	Catch (1000's mt)	Total Removals (1000's mt)	% due to Catch	Total Biomass (1000's mt)
1959	209	94	303	31	1,088
1960	224	94	318	30	1,157
1961	239	101	339	30	1,233
1962	239	242	481	50	1,307
1963	227	194	422	46	1,226
1964	224	187	411	46	1,202
1965	212	110	322	34	1,119
1966	206	210	416	51	1,134
1967	195	285	481	59	1,106
1968	161	470	631	75	1,022
1969	105	393	498	79	711
1970	101	307	408	75	617
1971	83	331	413	80	551
1972	92	272	364	75	547
1973	71	259	330	78	463
1974	44	210	254	83	313
1975	35	217	252	86	267
1976	21	122	143	85	158
1977	22	67	89	76	129
1978	22	88	110	80	143
1979	23	104	127	82	156
1980	19	93	112	83	131
1981	12	84	96	87	99
1982	13	60	73	82	86
1983	20	36	56	64	106
1984	37	42	80	53	187
1985	45	55	100	55	236
1986	49	56	105	53	263
1987	61	67	128	52	322
1988	69	74	143	52	367
1989	80	97	177	55	427
1990	97	94	191	49	507
1991	128	80	208	38	643
1992	166	93	260	36	836
1993	181	89	269	33	928
1994	193	77	269	29	991
1995	204	102	307	33	1,066
1996	269	127	396	32	1,354
1997	303	120	423	28	1,542
1998	314	126	440	29	1,627
1999	307	124	431	29	1,614
2000	356	126	481	26	1,815
2001	354	133	487	27	1,847
2002	NA	104	NA	NA	1,822

NA= Not yet availible

1.2.1.2 Age and Growth

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; NEFMC, DRAFT SEIS, 2005). Male and female herring grow at about the same rate and become sexually mature beginning at age 3, with most maturing by age 4 (Munroe, 2002; NEFMC, DRAFT SEIS, 2005). Growth rates vary greatly from year to year, and to some

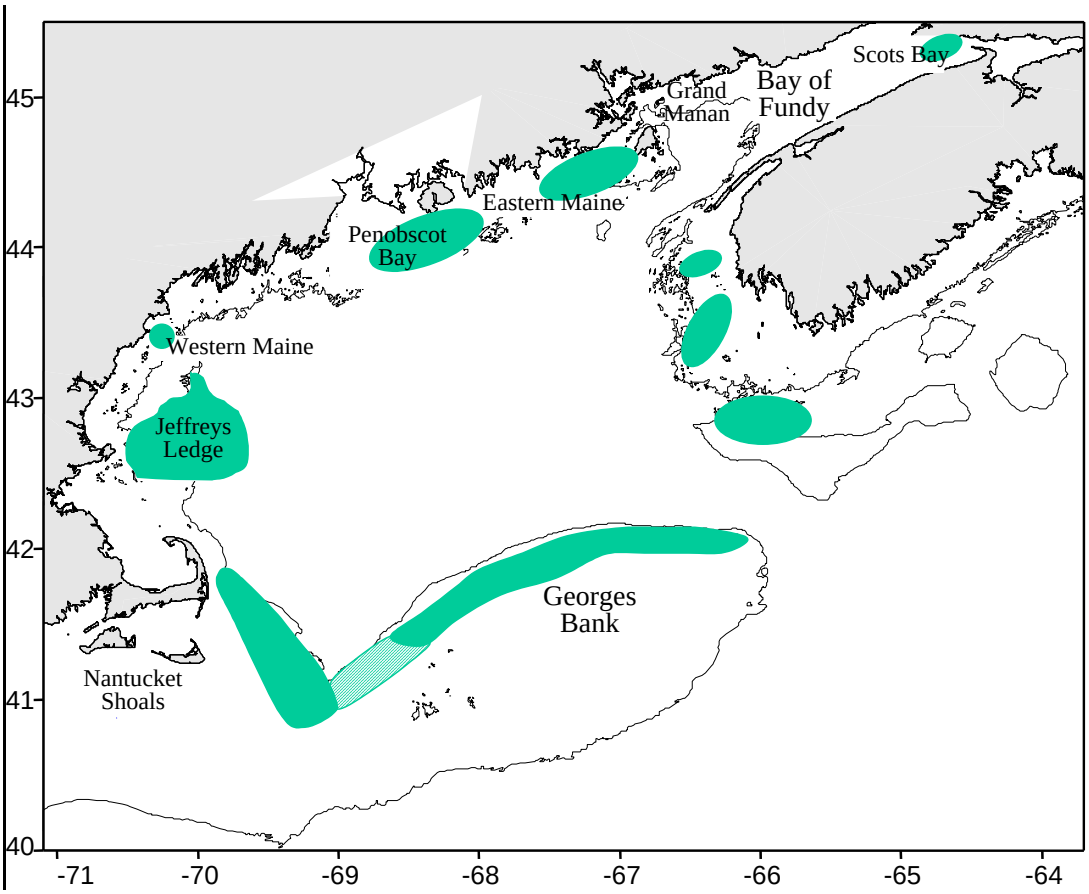
extent from stock to stock, and appear to be influenced by many factors, including temperature, food availability and population size. Juvenile growth is rapid during the first year of life, with a marked slowing at the onset of maturity. Juveniles in coastal Maine waters reach 90-125 mm by the end of their first year of life. There has been a marked reduction in size and weight-at-age of adult herring in U.S. waters of the northwest Atlantic beginning in the mid-1980s (Overholtz et al., 2004), a trend that appears to be related to increased population size and recovery of the Georges Bank spawning stock.

1.2.1.3 Spawning/Reproduction/Early Life History

Atlantic herring are believed to return to natal spawning grounds throughout their lifetime to spawn (Ridgway, 1975; Sinderman, 1979; NEFMC, DRAFT SEIS, 2005). This behavior is fundamental to the species' ability to maintain discrete spawning aggregations and is the basis for hypotheses concerning stock structure in the northwest Atlantic. Evidence for this homing behavior is provided by a tagging study in Newfoundland which showed a 73% return rate of adult Atlantic herring to the same spawning grounds where they were tagged (Wheeler and Winters, 1984) and by observations of year-to-year changes in the abundance and age composition of spawning aggregations on discrete banks and shoals off southwest Nova Scotia (Stephenson et al., 1998).

Spawning occurs in specific locations in the Gulf of Maine in depths of 20-50 meters (about 60-300 feet), on coastal banks such as Jeffreys Ledge and Stellwagen Bank located 8-40 km offshore, along the eastern Maine coast between the U.S.-Canada border and at various other locations along the western Gulf of Maine. Herring also spawn on Nantucket Shoals and Georges Bank, but not further south. In Canada, spawning occurs south of Grand Manan Island (in the entrance of the Bay of Fundy) and on various banks and shoals south of Nova Scotia (Figure 2). 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; NEFMC, DRAFT SEIS, 2005). Herring in the Gulf of Maine region usually reproduce at relatively high temperatures (10-15^{o} C) and at high salinities (Munroe, 2002; NEFMC, DRAFT SEIS, 2005). Herring do not spawn in brackish water.

Figure 2. Generalized View of the Current Major Herring Spawning Areas in the Gulf of Maine and on Georges Bank



The eastern Maine-Grand Manan spawning ground is an important source of larvae, which are transported to the southwest along the Maine coast (Graham and Townsend, 1985; Townsend et al., 1986). The larvae overwinter in bays, estuaries and nearshore waters and become juveniles in the spring. Those juvenile that survive until the following spring and summer (age-2) are harvested as sardines in the coastal fishery. Larvae that hatch on Jeffreys Ledge, another important coastal spawning ground in the Gulf of Maine, are mostly transported shoreward (Cooper et al., 1975), although some overwinter in nearshore waters on the Maine coast (Lazzari and Stevenson, 1991).

Atlantic herring spawn on the bottom in discrete locations by depositing adhesive eggs that stick to any stable bottom substrate, including lobster pots and anchor lines. In some cases, the same spawning sites are used repeatedly, sometimes more than once a year (Stevenson, 1989; NEFMC, DRAFT SEIS, 2005). Jeffreys Ledge appears to be the most important spawning ground in the Gulf of Maine based on the number of spawning and near-spawning adults found there (Boyar et al., 1973).

Eggs are laid in layers and form mats or carpets. In the Gulf of Maine region, egg mats as thick as 4-5 cm have been observed in discrete egg beds that have varied in size from 0.3-1.4 km^2. One very large egg bed surveyed on Georges Bank in 1964 covered an area of about 65 km^2 (Noskov and Zinkevich, 1967). Herring eggs in the Gulf of Maine region are deposited on gravel and rocky substrate, but are also found

on sand, shells and shell fragments and occasionally on macroalgae. Spawning sites are located in areas with strong bottom currents (1.5-3 knots), which prevents the accumulation of fine sediment and provides circulation to supply oxygen and remove metabolites (Reid et al., 1999; NEFMC, DRAFT SEIS, 2005). Hatching success remains relatively high down to 20-25% dissolved oxygen (Aneer, 1987; NEFMC, DRAFT SEIS, 2005).

Atlantic herring are synchronous spawners, producing eggs once a year once they reach maturity. Depending on their size and age, female herring can produce from 55,000 to 210,000 eggs (Kelly and Stevenson, 1983). Once they are laid on the bottom, herring eggs are preyed upon by a number of fish species, including cod, haddock, red hake, sand lance, winter flounder, smelt, tomcod, cunner, pollock, sculpins, skates, mackerel and even herring themselves (Munroe, 2002; NEFMC, DRAFT SEIS, 2005). Egg predation and adverse environmental conditions often result in high egg mortalities. Egg incubation periods are temperature dependent and range from 10-15 days in the Gulf of Maine (Munroe, 2002; NEFMC, DRAFT SEIS, 2005). Hatching success is also temperature dependent; in experimental studies, all eggs held at 15^{o} C hatched and none hatched at 0-5^{o} C or at 20^{o} C.

Larvae are about 4-10 mm (0.25 in) in length at hatching, which occurs 10-15 days after the eggs are deposited on the bottom (Fahay, 1983). The pelagic larval phase is relatively long in Atlantic herring lasting 4-8 months in the Gulf of Maine, depending on the timing of spawning (Reid et al., 1999; NEFMC, DRAFT SEIS, 2005). Larvae are transported long distances from spawning grounds where they over-winter in coastal bays and estuaries. In the Gulf of Maine, the prevailing surface currents flow to the westward, transporting larvae that hatch in eastern Maine to the Sheepscot estuary in mid-coast Maine, a straight-line distance of about 150 km (Graham, 1982; Townsend, 1992). Boyar et al. (1973) reported that most of the recently hatched larvae from the southern end of Jeffreys Ledge are transported shoreward. Herring larvae from Nantucket Shoals and Georges Bank are widely dispersed and tend to drift to the southwest (Sindermann, 1979; Lough et al., 1980; Grimm, 1983; NEFMC, DRAFT SEIS, 2005). Metamorphosis occurs in the spring at a length of about 40 mm (1.5 in). Schooling behavior begins in the late larval and early juvenile, or "brit," stages. Young-of-the-year herring undergo a general offshore movement in the summer and fall and they are believed to spend the winter in deep coastal waters.

The persistence of discrete aggregations of larvae for several months after hatching over tidally mixed continental shelf spawning grounds in the Gulf of Maine and elsewhere, despite the presence of fairly strong longshore currents, has provided the basis for a larval "retention hypothesis" (Iles and Sinclair, 1982). This hypothesis states that Atlantic herring stock structure in an area like the Gulf of Maine is determined by larval distribution and retention patterns and that the maximum stock size in that area is determined by the number, location and extent of geographically stable retention areas. Such retention areas have been described off southwest Nova Scotia, around Grand Manan Island and on Georges Bank (Iles and Sinclair, 1982). More recently, they have been described in eastern Maine waters adjacent to Grand Manan (Chenoweth et al., 1989).

Mortality of Atlantic herring in the larval stage is very high since the larvae remain vulnerable to very low temperatures and a limited food supply for a prolonged period during winter, especially in the shallow nearshore and estuarine waters (Townsend and Graham, 1981; Graham et al., 1991). Campbell and Graham (1991) developed an ecological model in order to examine which factors affected larval survival to the early juvenile stage. Some of the conclusions of that study were:

- Larval herring recruitment in Maine coastal waters is the result of a complex interaction of many processes, no one of which is truly dominant;
- Two year-old recruitment to the Maine herring fishery is established in the larval stage in some years and not until the brit stage in others;

- Larval food supply in autumn and winter, along with the quantity and distribution of spawning, are primary factors controlling herring recruitment to the brit stage for those years when the larval stage is critical;
- When larval survival is above a threshold, density-dependent predation on brit can reduce year-class size (the assumption being that the brit become the food of choice for opportunistic pelagic and demersal predators when brit exceed an abundance threshold);
- Temperature and longshore transport are secondary factors determining survival that may be most important through their interaction with primary factors;
- In most years, more larvae survive the winter in the coastal areas than in the estuaries and embayments; and
- The distribution of larvae along the Maine coast in springtime is largely a function of the variable movement of larvae.

1.2.1.4 Migration

Adult herring undertake extensive seasonal migrations between summer spawning grounds on Georges Bank and in the Gulf of Maine and overwintering areas in southern New England and the mid-Atlantic region. Stock mixing occurs during the winter and spring as fish migrate south. Thermal oceanic fronts between colder, less saline continental shelf water and warmer, more saline continental slope water provide an abundance of plankton and other food sources and greatly influence the migratory behavior of this species (Sindermann, 1979; Kelly and Moring, 1986; NEFMC, DRAFT SEIS, 2005).

There are distinct migratory patterns for each spawning stock off the northeast coast of the U.S.:

- The Nova Scotia stock spends the summer and fall months in southwest Nova Scotia and overwinters in Chedabucto Bay in northeastern Nova Scotia, but also mixes to some extent with the two southern stocks.
- The Georges Bank/Nantucket Shoals stock overwinters south of Cape Cod, can be found feeding in the Gulf of Maine in the spring and early summer and spawn southeast of Nantucket or on Georges Bank in the fall (Sindermann, 1979; Tupper et al., 1998; Munro, 2002; NEFMC, DRAFT SEIS, 2005;). After spawning, adults from Georges Bank move south again to overwinter with the oldest and largest fish migrating as far south as Chesapeake Bay.
- The migratory patterns of the coastal Gulf of Maine herring stock is not as well documented. It is believed that they may migrate southwest along the coast after spawning to overwinter south of Cape Cod, in Massachusetts Bay and other coastal areas of southern New England (Tupper et al., 1998; Reid et al., 1999; NEFMC, DRAFT SEIS, 2005). The waters off Cape Cod seem to constitute a mixing area for these stocks, where different groups pass at various times of the year (Sindermann, 1979; NEFMC, DRAFT SEIS, 2005).

Migration patterns of individual herring stocks are usually persistent year to year (Creaser and Libby, 1988; Reid et al., 1999; NEFMC, DRAFT SEIS, 2005). The spatial and temporal isolation of these different stocks occurs chiefly during spawning, with intermixing of these groups occurring during the non-spawning phases of migration (Sinclair and Iles, 1985; Reid et al., 1999; Munro, 2002; NEFMC, DRAFT SEIS, 2005). Adults from the two U.S. stocks mix during their winter migration to southern New England and mid-Atlantic waters and separate out onto their respective spawning grounds following a return northward migration in the spring. Adults that spawn off southwest Nova Scotia are not believed to mix to any significant degree with herring that spawn on Georges Bank or in the Gulf of Maine (Stephenson et al., 1998; NEFMC, DRAFT SEIS, 2005).

Juvenile herring in all stocks tend to remain in coastal areas throughout the year (Stewart and Arnold, 1994; NEFMC, DRAFT SEIS, 2005). Juveniles overwinter closer to the coast than adult herring, moving

into the deeper waters of bays or offshore in the winter where they stay close to the bottom (Reid et al., 1999; Overholtz, 2004; NEFMC, DRAFT SEIS, 2005). Smaller fish have greater temperature tolerances and juvenile Atlantic herring have been found to produce higher levels of antifreeze proteins than adults, adaptations that may allow them to withstand the colder coastal waters in the winter (NEFMC, DRAFT SEIS, 2005 ; Munro, 2002). Tagging studies have also indicated that juveniles migrate little during the summer (Waring, 1981; Stobo, 1983; Overholtz et al., 2004; NEFMC, DRAFT SEIS, 2005). Juveniles from several populations may mix in a given area (Stewart and Arnold, 1994) and aggregations of juvenile herring along the coast of Maine and New Brunswick are likely derived from a variety of spawning grounds (Overholtz et al., 2004; NEFMC, DRAFT SEIS, 2005).

1.2.1.5 Schooling

Despite the vast amount of literature available on the herring resource, there still exists a significant lack of knowledge about herring behavior and the impacts of fishing and various activities on fish behavior. There are several important characteristics about herring to acknowledge:

- Herring are obligate schoolers. They prefer to swim in large schools and cease to act as individual fish, but rather act as one unit in a large school.
- The sensory systems of herring are very well developed. The ability of herring to hear, see, and sense movement (through the lateral line) allows them to sense other fish in the area, school in the dark, and react to changes in water pressure. These factors also influence the way herring react to fishing gear.
- Herring have sensitivity to a wide frequency range and are most sensitive to sounds in the frequency region where fishing vessels (and research vessels) have the maximum sound energy output. Herring are very sensitive to noise and have been shown to make directed responses to approaching vessels. Results of some studies indicate that the fish can hear trawlers at distances up to 3 kilometers.
- The visual senses of herring allow the fish to see at very low light levels (10^{-5} lux). Herding responses are mainly visual, and visually elicited avoidance reactions have been observed.
- Herring exhibit distinct migratory patterns, both seasonally (large-scale) and diurnally (night/day, small-scale). Migration is also affected by food availability and other environmental conditions (temperature, salinity, predators).
- Herring have very good buoyancy control. They can gulp and release air to fill and void their swim bladders as needed. The fish can sink very quickly if necessary.

Pelagic fishes school for hydrodynamic reasons, for reproduction, migration and feeding and to aid in surviving predatory attack (Freon and Misund, 1999; NEFMC, DRAFT SEIS, 2005). Schooling is a natural state for pelagic fishes and given a stimulus, fish like herring will react and then return to this state. When confronted by danger such as a predator or mid-water trawl, pelagic fish will quickly decrease their interfish distance (packing density) and try to avoid the stimulus (Freon et al., 1992; NEFMC, DRAFT SEIS, 2005). This will result in contortion, compression and stretching of the school and may result in short-term distortion or dispersion of the fish (Freon et al., 1993; NEFMC, DRAFT SEIS, 2005). This avoidance behavior will cease, however, as soon as the fish are out the near field (proximity) of the trawl or predator (Freon and Misund, 1999; NEFMC, DRAFT SEIS, 2005). The normal reaction of herring to a trawl or purse seine is to increase their swimming speed and dive downwards, thereby trying to avoid the gear. In a study of Finnish pair trawling, visual and acoustic observations suggest that herring displayed an avoidance reaction in 34% of 493 midwater trawl hauls where fish were near the trawl mouth (Suuronen et al., 1997; NEFMC, DRAFT SEIS, 2005). Fish were observed to swim rapidly downward when they were within 5 m of the trawl and then return to their previous depth as soon as the trawl had passed. Herring react to midwater trawl and purse seines in much the same manner that they react to predators by trying to avoid and then regroup.

A recent study of the spatial dynamics of the Gulf of Maine/Georges Bank herring complex showed that herring maintained their school structure and interschool integrity in spite of very large reduction in overall biomass during the 1970s (Overholtz, 2004; NEFMC, DRAFT SEIS, 2005). Landings records from purse seine and midwater trawl vessels indicate that there were herring present in the Jeffreys Ledge region during all the months from April to October of 2001. Observations during herring acoustic cruises conducted by NMFS during 1997-2000 indicate nothing more than short-term disturbance of herring during midwater trawling and acoustic surveying operations. Fishing operations by at least a dozen large midwater trawlers conducted over a several month period during 2001 on Georges Bank caused no apparent changes in the distribution of pre-spawning herring as evidenced by hydroacoustic surveys conducted during September and October 2001 (NEFMC, DRAFT SEIS, 2005). There appears to be no scientific evidence either local or worldwide that midwater trawling or purse seining causes any long-term dispersal of herring.

1.2.2 Stock Assessment Summary

1.2.2.1 Abundance and Present Condition

Currently, Atlantic herring are not overfished and overfishing is not occurring. The Transboundary Resource Assessment Committee (TRAC) met during February 2003 to assess the Gulf of Maine-Georges Bank Atlantic herring complex. Some data were preliminary (i.e. 2002 landings) at the time of the meeting and all analyses were completed with these data. Two assessments were presented at the meeting, a forward projection analysis and an ADAPT assessment; the review committee did not reject either assessment.

The assessment focused on the fishery during 1959-2002. The fishery on Atlantic herring in the region shifted from fixed gear with landing dominated by juvenile herring in the 1950s and 1960s to an intense foreign trawl fishery that occurred offshore (Georges Bank) by ICNAF countries in the mid 1960s through the late 1970s. In recent years, the fishery captures adult herring and landings are dominated by mid-water trawlers. Landings during the last 15 years have averaged slightly over 100,000 mt, and almost 123,000 mt during 1998-2002 (Overholtz et al., 2004).

The herring assessment utilized research survey data from a variety of sources. Indices are available from NMFS research bottom trawl surveys (winter 1992-2002, spring 1968-2002, autumn 1963-2002), Canadian research bottom trawl surveys (winter 1986-2002), U.S. and Canadian larval herring surveys (U.S. 1971-1994, Canada 1987-1995), U.S. herring acoustic surveys on Georges Bank (1998-2002) and Maine DMR inshore herring acoustic surveys (1999-2002). Trends from U.S. and Canadian bottom trawl surveys indicate a decline in herring during the late 1960s through the 1970s, a very low period of abundance during the late 1970s through the late 1980s and recovery during the 1990s. Both larval herring surveys indicate an increasing trend during the late 1980s and early 1990s. The U.S. herring acoustic survey on Georges Bank indicates that a major recovery of herring has occurred on Georges Bank and a large herring biomass is present, while the acoustic survey in Maine inshore waters indicates a relatively stable biomass for the inshore component (Overholtz et al., 2004).

The forward projection analysis suggests that a major recovery of the entire herring complex occurred during the 1990s. Fishing mortality increased steadily to about F=0.8 during the late 1960s and then increased further to above F=1.0 in the mid to late 1970s and early 1980s. Fishing mortality declined in the late 1980s and 1990s and has remained low during recent years (F2002=0.06). Total stock biomass declined from a high of 1.4 million mt in 1962 to a low of 87,000 mt in 1982. Stock biomass increased gradually thereafter to 1.0 million mt in 1994 and 1.8 million mt in 2000. Trends in spawning biomass are very similar to the pattern observed in total stock biomass, reaching 1.6 million mt in 2001.

Recruitment was very poor during the late 1970s and 1980s, but steadily improved in the 1990s with two very large year-classes, the 1994 and 1998 cohorts (Overholtz et al., 2004).

Results for the ADAPT assessment also suggest that Atlantic herring from the Gulf of Maine-Georges Bank complex have also recovered from low biomass in the 1980s. Fishing mortality increased steadily from the late 1960s through the late 1970s, reaching F=1.1 in 1980. After 1980, fishing mortality declined and averaged F=0.3 during 1983-1997. Recent F's have averaged about F=0.2 with F2002=0.18. Stock biomass declined from a high of about 1.2 million mt in 1967 to less than 100,000 mt in 1982. Total stock biomass recovered very slowly during 1983-1994 to about 220,000 mt and then more quickly to about 700,000 mt in 2002. Spawning biomass followed the same pattern, reaching about 600,000 mt in 2002. Recruitment was relatively low during 1972-1994 and two large year classes occurred in 1994 and 1998 (Overholtz et al., 2004).

The prognosis from forward projection model results suggested that fishing the stock at an F=0.1 would produce a catch of 170, 000 mt in 2004 and a 2+ biomass of about 1.79 million mt in 2005. An F=0.2 would produce a catch of 323,000 mt in 2004 and a beginning year stock size of 1.64 million mt in 2005. Corresponding projections with the ADAPT results produced a 2004 catch of 60,000 mt (F=0.1) and a 3+ biomass of 550,000 mt. Fishing the stock at an F=0.2 would produce a 2004 catch of 100,000 mt and a 2005 biomass of 500,000 mt (Overholtz et al., 2004).

Assessment results from the two modeling approaches suggests a threefold difference in 2002 biomass (1.8 million vs. 600,000 mt) and F (0.06 vs. 0.18) (Overholtz et al., 2004).

1.3 DESCRIPTION OF THE FISHERY

1.3.1 Commercial Fishery

Herring fisheries have existed in Europe for over 1,000 years and in the Northwest Atlantic for about 450 years. The U.S. Atlantic herring fishery occurs over the Mid-Atlantic shelf region from Cape Hatteras to Maine. In recent years, vessels have also pursued fish on Georges Bank. While fixed gear dominated the U.S. fishery in the 1960s, purse seines became the dominant gear type in the 1980s and early 1990s. Since the mid-1990s, the herring fishery has evolved and is now prosecuted primarily by midwater trawl (single and paired) vessels, most with refrigerated seawater systems to address quality concerns.

Most U.S. commercial catches occur between May and October in the Gulf of Maine, consistent with the peak season for the lobster fishery. In addition, there is a relatively substantial winter fishery in southern New England, and catches from Georges Bank have increased somewhat in recent years.

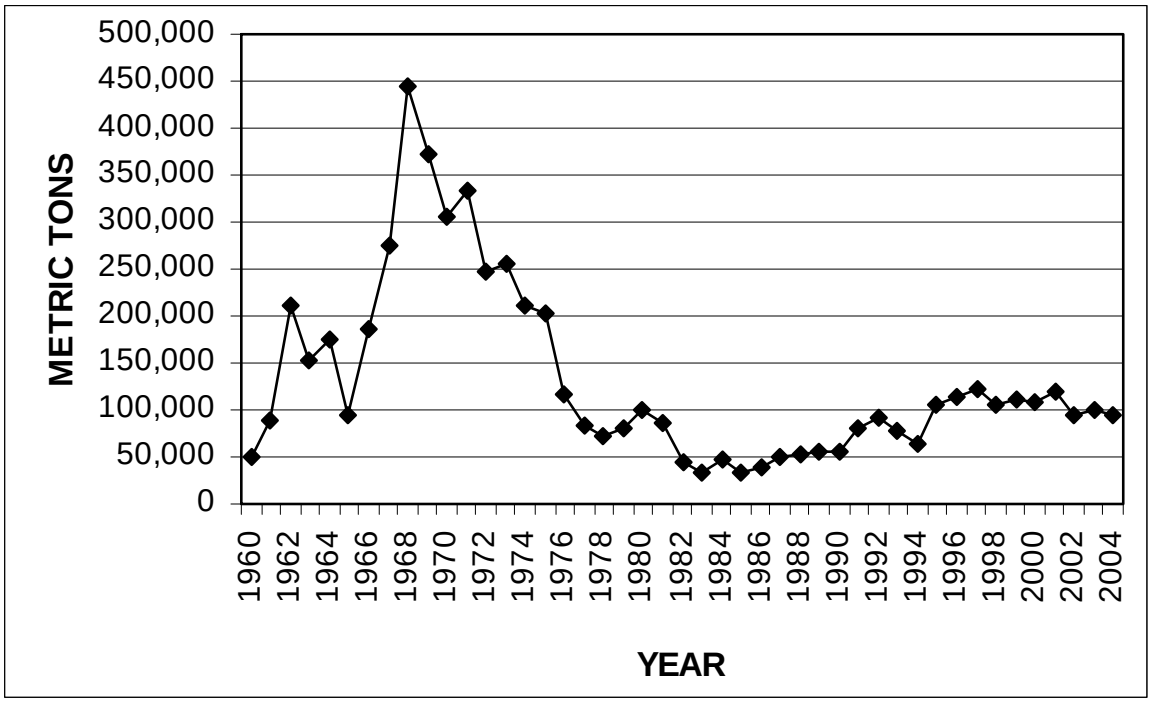
Purse seines, midwater trawls (single) and pair trawls are the three primary gears involved in the Atlantic herring fishery. In 2004 (preliminary data), the gear type that brought the largest amount of herring to market was the midwater pair trawl at 57,186 mt. This is a 15.4% decrease from 2003 levels. Overall landings also declined by 9.5%. The recent trend, however, has been a movement from single midwater trawl and purse seine vessels to pair trawling. Single vessel midwater trawls accounted for 14,093 mt of herring, which is a 42% decline from 2002 landings. Purse seine landings totaled 19,496 mt; a 4% decline from 2002. Bottom trawl gear accounted for 3,083 metric tons, about a 2,000 mt increase from 2002 and 2003 levels. Landings by U.S. weirs in 2004 amounted to 4.4 mt.

In general, herring landings have hovered around 100,000 metric tons since 1995, with a high of 123,845 mt during that time period (1997). Historical catches of herring were extremely high during a period of foreign fishing, which eventually led to the collapse of the Georges Bank stock component in the 1970s.

The average catch from 1965-1975 was 266,242 mt, more than double the amount that the U.S. fishery is currently catching, and more than the proposed value for MSY.

Preliminary data for 2004 suggest that herring landings were about 94,250 mt, down 6.5% from 2003 but consistent with 2002 landings. Herring landings averaged 103,417 mt from 2000-2004, the time period under Amendment 1. Prior to implementation of Amendment 1, landings averaged 113,307 mt from 1995-1999.

Figure 3 Annual Landings of Atlantic Herring, 1960-2004 (VTR Data).



**2004 data are preliminary.*

Most herring sold in 2004 was taken from Area 1A (60,070 mt) which is capped at 60,000 mt. Area 1B landings (13,282 mt) were 82.7% higher than they were in 2002. The Area 2 landings were 11,689 metric tons, which is 29% less than 2003 landings but even with 2002 levels. Area 3 landings were 8,659 metric tons, which is 38.8% lower than 2002 landings. Table 4 shows landings from the various gears used in 2002 through 2004 and the activities of each in the herring management areas.

Table 4. Metric Tons of Herring Sold by Gear and Management Area in 2002 – 2004.

Gear Type	Year	Area 1A	Area 1B	Area 2	Area 3	Unknown	Total
Bottom Trawl	**2002**	76.2	0.9	1,130.4	12.1	0.5	1,220.0
	2003	100.8	1.2	861.0	85.3	1.0	1,049.2
	2004	1,526.2	4.8	1,549.6	1.9		3,082.6
Midwater Pair Trawl	**2002**	26,740.6	5,307.2	6,021.9	8,758.7	426.6	47,255.0
	2003	33,800.5	4,230.6	11,376.4	17,603.7	549.6	67,560.7
	2004	30,825.2	11,790.9	7,343.7	7,177.2	49.0	57,186.0
Midwater Trawl	**2002**	13,416.7	1,299.9	4,148.2	5,372.4	42.9	24,280.0
	2003	7,816.6	1,000.9	4,237.9	3,645.2	43.1	16,743.6
	2004	8,362.6	1,486.7	2,764.5	1,479.7		14,093.4
Purse Seine	**2002**	19,445.6	660.8			241.3	20,347.7
	2003	18,157.8	132.4			121.1	18,411.3
	2004	19,352.9				143.6	19,496.5
Weir	**2002**			0.8			0.8
	2003			0.5			0.5
	2004			4.4			4.4
Other	**2002**	2.6		7.1	10.7	0.3	20.6
	2003	14.5	0.8	13.3			28.7
	2004	3.8	0.0	26.9		0.8	31.5
All Gear Types	**2002**	59,681.6	7,268.8	11,308.3	14,153.8	711.4	93,123.9
	2003	59,890.2	5,365.9	16,489.0	21,334.1	714.8	103,794.0
	2004	60,070.7	13,282.4	11,689.1	8,658.7	193.4	93,894.3

Table 5. Number of Vessels by Management Area and Principal Herring Gear for 2002 – 2004.

	2002	2003	2004
Bottom Trawl	67	56	56
Midwater Pair Trawl	13	16	13
Midwater Trawl	15	10	9
Purse Seine	7	6	4
Other	45	52	43
Total	**147**	**140**	**125**

In the 2004 fishing year, there were 40 vessels, defined as directed herring vessels, which sold 93,673 metric tons of herring. This is five more vessels than in 2002. However, most of this is attributed to an increase in the bottom trawl sector. There was a decline of two vessels since 2002 in the single midwater trawl fleet and the purse seine fleet dropped from seven to four. Thirteen vessels pair trawled in 2002 and 2004 while 16 did so in 2003.

Prices for herring have been relatively stable for the 2001 through 2003 time period (2004 dealer data is not available). Since U.S. producers of herring products are price takers in a world herring market, U.S. prices do not vary with landings. The weighted average price of herring sold in 2003 was $163 per mt. Multiplying this average price by total landings provides an estimate of $15,304,722 of the total value of all herring sold in 2004.

Table 6 shows the breakdown of quantity and value of landings by state landed and gear used. Maine landed 45,618 mt of herring in 2004 at a value of $7.4 million. Massachusetts follows next in the ranking with landings of 35,230 mt and a value of $5.7 million. Rhode Island and other New England states have significantly less landings of herring. Each of these regions has landings in the range of 6,000 to 7,000 mt at a value of about $1.1 million.

Table 6. Landings and Value by Gear Used and State

Gear Type		Year	MA	ME	RI	Other New England	Mid-Atlantic
Bottom Trawl	**Landings (mt)**	2002	33	3	1,000	55	129
		2003	18	9	819	181	23
		2004	1,428	8	1,488	106	53
	Value	2002	5,416	566	162,967	8,970	20,946
		2003	2,879	1,490	133,445	29,452	3,759
		2004	232,788	1,223	242,476	17,335	8,634
Midwater Pair Trawl	**Landings (mt)**	2002	21,748	14,458	5,262	5,188	600
		2003	36,713	21,013	3,228	6,126	481
		2004	31,777	16,622	3,184	5,597	7
	Value	2002	3,544,851	2,356,638	857,706	845,563	97,800
		2003	5,984,186	3,425,082	526,218	998,481	78,431
		2004	5,179,576	2,709,423	518,945	912,264	1,110
Midwater Trawl	**Landings (mt)**	2002	4,275	14,936	4,827	101	141
		2003	2,353	10,686	3,021	684	
		2004	2,005	10,038	2,051		
	Value	2002	696,885	2,434,589	786,819	16,412	22,931
		2003	383,529	1,741,836	492,387	111,459	
		2004	326,804	1,636,124	334,295		
Purse Seine	**Landings (mt)**	2002		19,800		548	
		2003	456	16,736		1,219	
		2004	15	18,949		533	
	Value	2002		3,227,327		89,342	
		2003	74,372	2,727,952		198,713	
		2004	2,365	3,088,757		86,811	
Other	**Landings (mt)**	2002	0	2		11	7
		2003	10	6		0	13
		2004	1	1	0	2	27
	Value	2002	44	350		1,762	1,193
		2003	1,663	905		8	2,095
		2004	184	191	18	259	4,476
Weir	**Landings (mt)**	2002	1				
		2003	0				
		2004	4				
	Value	2002	126				
		2003	73				
		2004	717				
Total	**Landings (mt)**	**2002**	**26,057**	**49,199**	**11,089**	**5,902**	**877**
		2003	**39,550**	**48,449**	**7,068**	**8,209**	**517**
		2004	**35,230**	**45,618**	**6,722**	**6,237**	**87**
	Value	**2002**	**4,247,322**	**8,019,470**	**1,807,492**	**962,049**	**142,870**
		2003	**6,446,702**	**7,897,264**	**1,152,050**	**1,338,114**	**84,284**
		2004	**5,742,435**	**7,435,718**	**1,095,733**	**1,016,668**	**14,220**

Processing of Atlantic herring is for lobster bait (salted and barreled, fresh or frozen); sardines (canned) and food export (frozen whole). The shoreside processing sector of the Atlantic herring fishery has expanded substantially in the last few years. Consequently, there is no longer an allocation for foreign at-sea processing (joint venture and internal waters processing operations). New herring processing plants have come on-line in New Bedford and Gloucester, Massachusetts and Cape May, New Jersey. Though the canneries that were once a mainstay of employment in Maine have virtually disappeared, the one remaining cannery is to be renovated so that it becomes a state-of-the-art facility.

Trucking is an important support component of the industry. Trucks are used to move herring to the canneries, to the dealers, bring in barrels and salt, ice, etc.

The communities likely to be affected most by changes in herring management are those that are predominantly dependent on lobster fishing, have relatively large landings of herring, and/or are the sites of processing plants. The DSEIS for the NEFMC's herring amendment identifies Portland, Rockland, Stonington/Deer Isle, Vinalhaven, Lubec/Eastport, Prospect Harbor, Bath and Sebasco Estates, Maine; NH Seacoast (Newington, Portsmouth, Hampton/Seabrook); Gloucester and New Bedford, Massachusetts; Southern Rhode Island (Point Judith, Newport, and No. Kingston); and Cape May New Jersey as "communities of interest" for their herring plan.

A more detailed description of social and economic information related to the Atlantic herring fishery, such as community profiles, processing facilities information, spatial distribution of fishing effort, landings by port and explanations of the data sources (VTR and IVR), is provided in the DEIS for Amendment 1 to the NEFMC's Atlantic herring FMP.

Examination of the catch at age matrix for the entire herring fishery reveals interesting trends within the data. Table 7 presents a catch-at-age matrix for the Atlantic herring fishery based on VTR data through 2004. However, due to timing, only the updated VTR data for the 2004 fishing year were available to construct this matrix; the updated historical VTR data have not been incorporated into the CAA matrix at this time. Therefore, the CAA matrix should be interpreted with caution. Changes in how much herring was caught in historical years as well as where it was caught will affect the CAA matrix. The model that produces this matrix will be updated and re-run as time permits.

Nevertheless, the CAA matrix appears to be helpful to track strong year classes and provide a better understanding of the proportion of juveniles versus adults harvested in the Atlantic herring fishery. Strong year classes are noticeable particularly for 1994, 1998, and 2001 (Table). The 1994 and 1998 year classes seem particularly strong on a complex-wide basis. The 2001 year class appears to be very strong and may be the cause for increased catches of two-year olds in 2003 and one-year olds in 2002. Other strong year classes (notably from 1994 and 1998) were similarly observed as increased juvenile catch during recent years.

Overall, the age structure of Atlantic herring catch has shifted to older individuals in recent years. This trend may be attributable to many factors, including the abundance of older age classes due to increased recruitment and low fishing mortality, and industry/market trends towards landing larger fish. The apparent large increase in juvenile (ages 1-2) catch over the last five years is most likely the result of strong recruitment to the herring complex and may not be the result of a deliberate shift in the target fish size for the fishery. Similar catches of juvenile fish have heralded other large year classes and their entry into the fishery (e.g. 1994 & 1998).

Table 7. Herring Catch at Age in Percentage by Weight and Number*

By Percentage Weight

	1	2	3	4	5	6	7	8	9	10	11 +	Total
1998	0.00	0.13	0.11	0.47	0.10	0.06	0.07	0.04	0.01	0.00	0.00	1.00
1999	0.00	0.06	0.27	0.10	0.31	0.13	0.07	0.04	0.01	0.00	0.00	1.00
2000	0.00	0.14	0.05	0.16	0.24	0.30	0.09	0.03	0.01	0.00	0.00	1.00
2001	0.00	0.04	0.32	0.06	0.13	0.18	0.21	0.05	0.01	0.00	0.00	1.00
2002	0.00	0.06	0.11	0.35	0.14	0.12	0.14	0.07	0.01	0.00	0.00	1.00
2003	0.00	0.16	0.14	0.09	0.30	0.11	0.12	0.06	0.01	0.00	0.00	1.00
2004	0.00	0.04	0.39	0.12	0.12	0.22	0.08	0.03	0.00	0.00	0.00	1.00

By Percentage Numbers

	1	2	3	4	5	6	7	8	9	10	11 +	Total
1998	0.00	0.30	0.14	0.40	0.07	0.04	0.04	0.02	0.01	0.00	0.00	1.00
1999	0.00	0.13	0.34	0.10	0.26	0.10	0.04	0.02	0.01	0.00	0.00	1.00
2000	0.00	0.26	0.06	0.16	0.21	0.23	0.06	0.02	0.00	0.00	0.00	1.00
2001	0.00	0.08	0.42	0.06	0.11	0.14	0.15	0.03	0.01	0.00	0.00	1.00
2002	0.02	0.13	0.14	0.35	0.11	0.10	0.10	0.05	0.01	0.00	0.00	1.00
2003	0.00	0.30	0.18	0.08	0.23	0.08	0.07	0.04	0.01	0.00	0.00	1.00
2004	0.00	0.09	0.49	0.11	0.10	0.15	0.05	0.02	0.00	0.00	0.00	1.00

**Data from years prior to 2004 need to be updated; a revised CAA matrix will be provided in this document as time permits.*

1.3.1.1 Description of State Fisheries

Detailed descriptions of Atlantic herring fisheries by state is included in the Source Document for Amendment 1.

1.3.1.2 Internal Waters Processing

Detailed descriptions of Atlantic herring IWP fisheries is included in the Source Document for Amendment 1.

1.3.1.3 Vessels and Domestic Harvesting Capacity

Detailed description of Atlantic herring vessels and domestic harvesting capacity is included in the Source Document for Amendment 1.

1.3.2 Recreational Fishery

A small recreational fishery for Atlantic herring exists, providing late fall to early spring fishing opportunities for both shore and boat anglers. Most Atlantic herring catches are reported during March-April and November-December, with some catches reported from September-October. The Marine Recreational Fishery Statistics Survey (MRFSS) does not sample during January-February in the north or mid-Atlantic subregions and because herring may be taken during this period, total catch may be underestimated. The herring caught by hook and line anglers are taken as a secondary species in a mixed fishery with Atlantic mackerel (*Scomber scombrus*).

A recreational fishery for herring in the northern one-third of New Jersey is associated with the Atlantic mackerel and silver hake fisheries. The catch of herring is an incidental catch in these two directed recreational fisheries. The herring are taken on small "teasers" (plastic tubes covering a long shanked hook) used for mackerel, as well as small bucktails and metal jigs. Most of the fish are kept for home consumption, being pickled or smoked, or used as bait, either cut or whole. The great majority of the

recreational fishery is conducted from party boats, and to a lesser extent, from charter boats that operate between November and April.

1.3.3 Subsistence Fishing

There is no known subsistence fishery for Atlantic herring along the east coast of the U.S.

1.3.4 Non-Consumptive Factors

Non-consumptive factors for herring are indirect. It is actually herring's role as forage for marine mammals and seabirds that is important. For example, the whale watch industry has expanded in the past few years and seabirds attract additional "non-consumptive" attention.

1.3.5 Interactions with Other Fisheries, Species, or Users

Forage: Atlantic herring are an important forage species for many marine finfish, marine mammals and birds in the Northwest Atlantic ecosystem. While available information to quantify the importance of herring as a forage species is not available at this time, there is a substantial amount of literature (Volume II, *The Role of Atlantic Herring, Clupea harengus, in the Northwest Atlantic Ecosystem* by the NEFMC) that describes the role that herring plays in the ecosystem and estimates the amount of herring consumed by various fish, marine mammal and seabird species. The first step to account for the importance of herring as a forage species in the herring management program is to compile and consider available information on the subject; the second step is to identify where information is lacking and prioritize research needs to fill the data gaps.

ASMFC began investigating multispecies and ecosystem assessment methods through the Management and Science Committee (MSC) in 1999. At the same time, NMFS published Ecosystem-Based Fishery Management: A report to Congress by the Ecosystems Principles Advisory Panel. Given the widespread attention on multispecies and ecosystem approaches to fisheries management, the ASMFC held a workshop on multispecies and ecosystem assessment models in August 2000, to determine if current model techniques could be applied to available data. During that workshop, four types of models were presented focused on different levels of interactions. Multispecies Virtual Population Analysis (MSVPA) is the first logical extension of single species approaches, but only looks at a few species. Spatial models are also limited to a few species, but provide more environmental factors and regional information. Trophic dynamic models are based on a large food web and are therefore very inclusive, with results focused on system-wide biomass targets. Finally, Ecopath models include the full spectrum of the ecosystem of interest, and can be used for long range policy simulations, but in many cases do not include the details managers are interested in at the single species level. In general, all of these models can provide biological reference points similar to single species Virtual Population Analyses (VPA), but provide varying levels of information on trophic interactions and more detailed spatial scales. However, it is important to note that all of these approaches are complementary and should be done in addition to single species methods.

Based on that workshop, the MSC chose to limit the development of multispecies models to four species under Commission management that had a role in predator-prey interactions and also supported directed fisheries. Given public and scientific interest, and the quality of available data, the species chosen were Atlantic menhaden, bluefish, striped bass, and weakfish. As such, the model is spatially centered in the Mid-Atlantic where much of the interaction among these species occurs.

The Commission began developing a Multispecies Virtual Population Assessment model (MSVPA) in 2001. The MSVPA model initially focused on the effects of predation by bluefish, striped bass, and

weakfish on the Atlantic menhaden population, and has since been extended to adjust the population estimates of the predators and other prey species. The Commission also hosted several workshops to verify the data used in the model and obtain feedback on features to include in the model. Early versions of the MSVPA model have been used by the Atlantic Menhaden Technical Committee to explore some basic questions about age 0 abundance. Also, an age-varying natural mortality as derived in some part by the MSVPA, was used in the latest peer reviewed assessment for Atlantic menhaden.

Further development of the model has progressed and a new version (MSVPA-X) was reviewed through an internal ASMFC peer review. Currently the model is undergoing sensitivity analysis by a sub committee of ASMFC's Stock Assessment Committee; in preparation for full review by the SARC in the autumn of 2005. While the model only explicitly models Menhaden, Bluefish, Weakfish, and Striped Bass interactions and population dynamics, other prey items have been included to produce a more realistic ecosystem picture across the predator's size and spatial ranges. These include:

- Sciaenids (spot, croaker)
- Small Forage Fish (anchovy, silversides, and sand lance)
- Medium Forage Fish (butterfish, squid, mullets)
- Clupeids (Atlantic herring, thread herring, and others)
- *Alosa* spp. (shads and river herrings, and others)
- Benthic invertebrates (worms)
- Benthic crustaceans (lobsters, blue crabs, jonah crabs, calico crabs)
- Macrozooplankton (shrimps, mysids, amphipods)

Once peer reviewed and incorporated into the management process, it is envisioned that a second, but linked, MSVPA-X model may be developed for the Gulf of Maine/Georges Bank Ecosystem.

The Large Pelagics Research Program at the University of New Hampshire (UNH) has been involved in research related to the food habits and preferences of bluefin tuna for many years. In 2004, with the cooperation of key co-op managers, buyers and fishermen, the UNH Large Pelagics Research Lab collected biological samples from commercially landed bluefin tuna captured within the Gulf of Maine. Stomach samples are being processed at this time, but analyses suggest the dominant prey item in both volume and number are Atlantic herring. Diet studies are being carried out to see if shifts in prey have occurred over the last decade. Additional work is being conducted on the historical and present distribution and association of bluefin tuna and their prey. A website (www.largepelagicslab.unh.edu) has been created to highlight the program and latest bluefin tuna research (NEFMC, DRAFT SEIS, 2005).

Bait: Atlantic herring also serve as important bait for many commercial and recreational fisheries including lobster and tuna. Increased fishing effort in the lobster fishery has been observed over the past three decades and lobster landings have continued to markedly increase throughout the 1980s and early 1990s, both of which place increased pressure on the herring resource.

While bait herring for the tuna fishery can be purchased from dealers or other boats, some tuna vessels are known to catch herring for use as live bait in this fishery. The use of small pelagic gillnets to catch herring for this purpose is authorized under the Northeast Multispecies Plan. There are no statistics on the extent of this practice or the amount of herring that is taken for this purpose. Some industry participants have estimated that 50-90% of the vessels fishing for tuna in New England waters may be catching herring as bait.

1.4 HABITAT CONSIDERATIONS

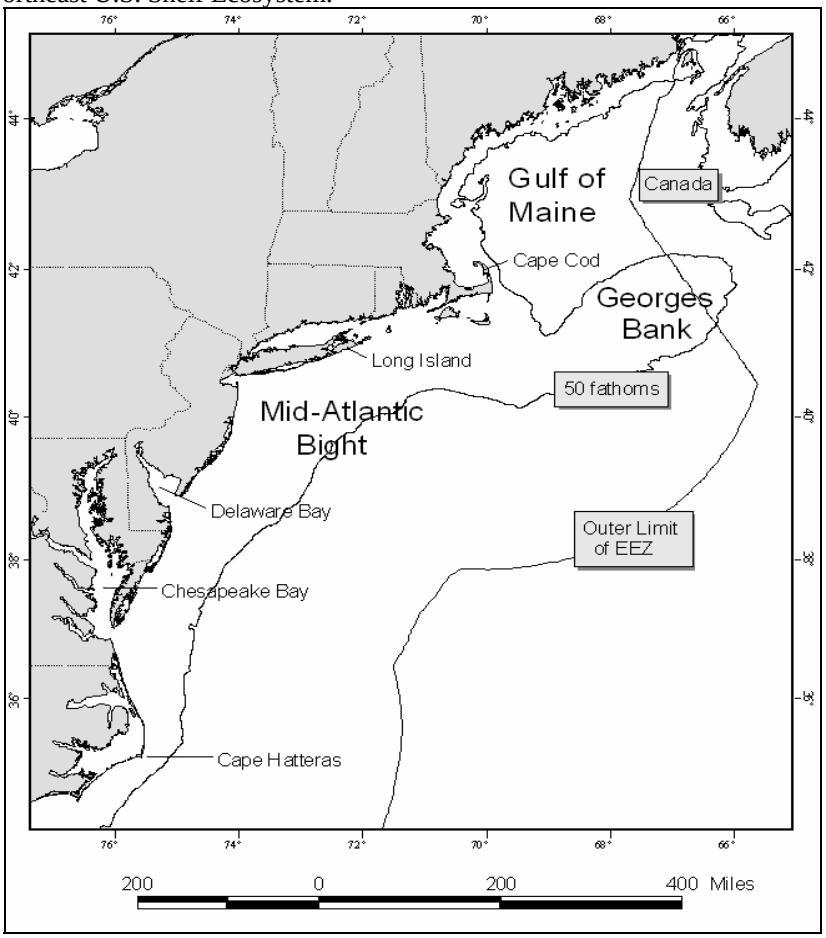
The New England Council has identified the Essential Fish Habitat (EFH) for herring and other species it manages. EFH provisions were submitted for all Council plans in one document that amends existing Council management plans and describes the EFH for Atlantic herring. The applicable provisions of this document that relate to Atlantic herring are incorporated into this FMP by reference. This includes the description and identification of herring EFH, the threats to EFH from fishing and non-fishing activities, and the conservation and enhancement measures to protect EFH for Atlantic herring.

1.4.1 Habitat Important to the Stocks

1.4.1.1 Description of the Habitat

The Northeast U.S. Shelf Ecosystem (Figure 4) has been described as including the area from the Gulf of Maine south to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream (Sherman et al., 1996; NEFMC, DRAFT SEIS, 2005). The continental slope includes the area east of the shelf, out to a depth of 2000 m. Four distinct subregions comprise the NOAA Fisheries Northeast Region: the Gulf of Maine, Georges Bank, the Mid-Atlantic Bight and the continental slope. Occasionally another subregion, southern New England, is described; however, discussions of any distinctive features of this area have been incorporated into the sections describing Georges Bank and the Mid-Atlantic Bight (NEFMC, DRAFT SEIS, 2005).

Figure 4. Map of Northeast U.S. Shelf Ecosystem.



The Gulf of Maine is an enclosed coastal sea, characterized by relatively cold waters and deep basins, with a patchwork of various sediment types. Georges Bank is a relatively shallow coastal plateau that slopes gently from north to south and has steep submarine canyons on its eastern and southeastern edge. It is characterized by highly productive, well-mixed waters and strong currents. The Mid-Atlantic Bight is comprised of the sandy, relatively flat, gently sloping continental shelf from southern New England to Cape Hatteras, North Carolina. The continental slope begins at the continental shelf break and continues eastward with increasing depth until it becomes the continental rise. Atlantic herring do not commonly occur over the continental slope (NEFMC, DRAFT SEIS, 2005). A more detailed description of habitat important to herring can be found in the Source Document for Amendment 1.

1.4.1.2 Identification and Distribution of Habitat and Habitat Areas of Particular Concern (Essential Fish Habitat)

The Atlantic States Marine Fisheries Commission does not have the authority to designate Essential Fish Habitat (EFH) as required by the Magnuson Stevens Fishery Conservation and Management Act (MSFCMA). The New England Fishery Management Council has identified EFH for a range of species, including Atlantic herring, in order to meet the requirements of MSFCMA as amended by the Sustainable Fisheries Act. The ISFMP Policy Board approved a recommendation in June 1998 to include Council EFH designation for FMPs or Amendments that are developed jointly or in association with a Council. Essential Fish Habitat (EFH) for Atlantic herring is described in NEFMC (1998a) as those areas of the coastal and offshore water (out to the offshore boundary of the EEZ) that are designated in Figure 5 through Figure 8.

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 5. Eggs adhere to the bottom, forming extensive egg beds that may be many layers deep. Generally, the following conditions exist where Atlantic herring eggs are found: water temperature below 15^{o} C, depths from 20-80 meters and a salinity ranges from 32-33$^{o}/_{oo}$. Herring eggs are most often found in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots. 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 6. Generally, the following conditions exist where Atlantic herring larvae are found: sea surface temperatures below 16^{o} C, water depths from 50-90 meters, and salinities around $32^{o}/_{oo}$. 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 7. Generally, the following conditions exist where Atlantic herring juveniles are found: water temperatures below 10^{o} C, water depths from 15-135 meters and a salinity range from 26-32$^{o}/_{oo}$.

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 8. Generally, the following conditions exist where Atlantic herring juveniles are found: water temperatures below 10^{o} C, water depths from 20-130 meters and salinities above $28^{o}/_{oo}$.

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 8. Generally, the following conditions exist where spawning Atlantic herring adults are found: water temperatures below 15^{o} C, depths from 20-80 meters and a salinity range from 32-33$^{o}/_{oo}$. Herring eggs are spawned in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots. Herring are most often observed spawning during the months from July through November.

Figure 5. NEFMC EFH designation for Atlantic herring eggs.

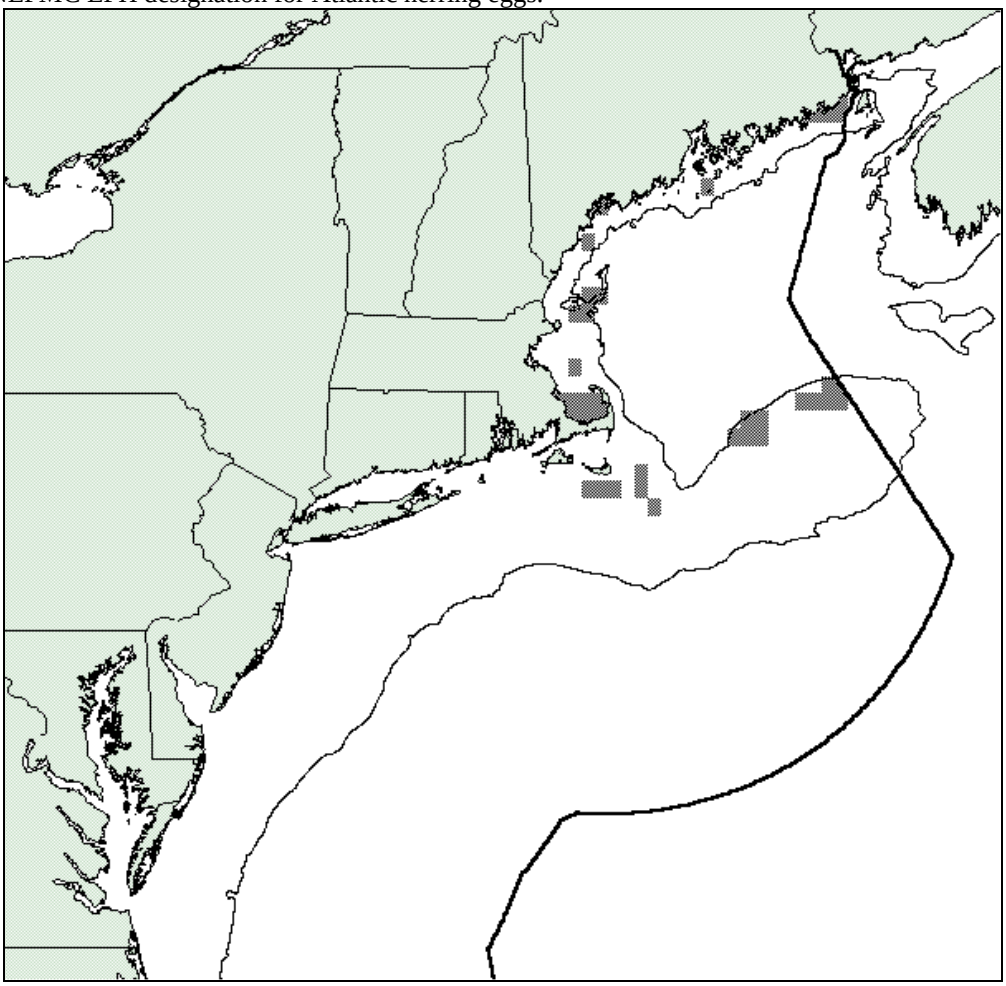


Figure 6. NEFMC EFH designations for Atlantic herring larvae.

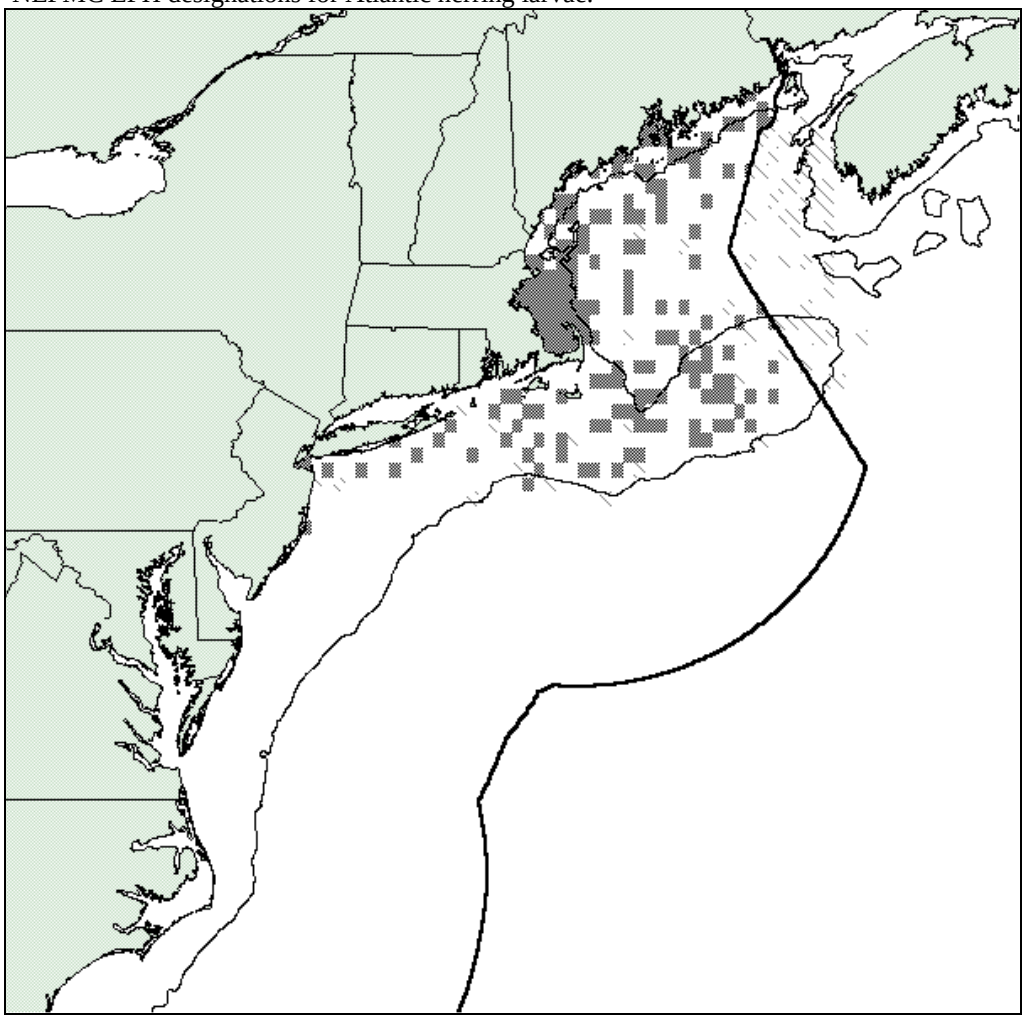


Figure 7. NEFMC EFH designations for Atlantic herring juveniles.

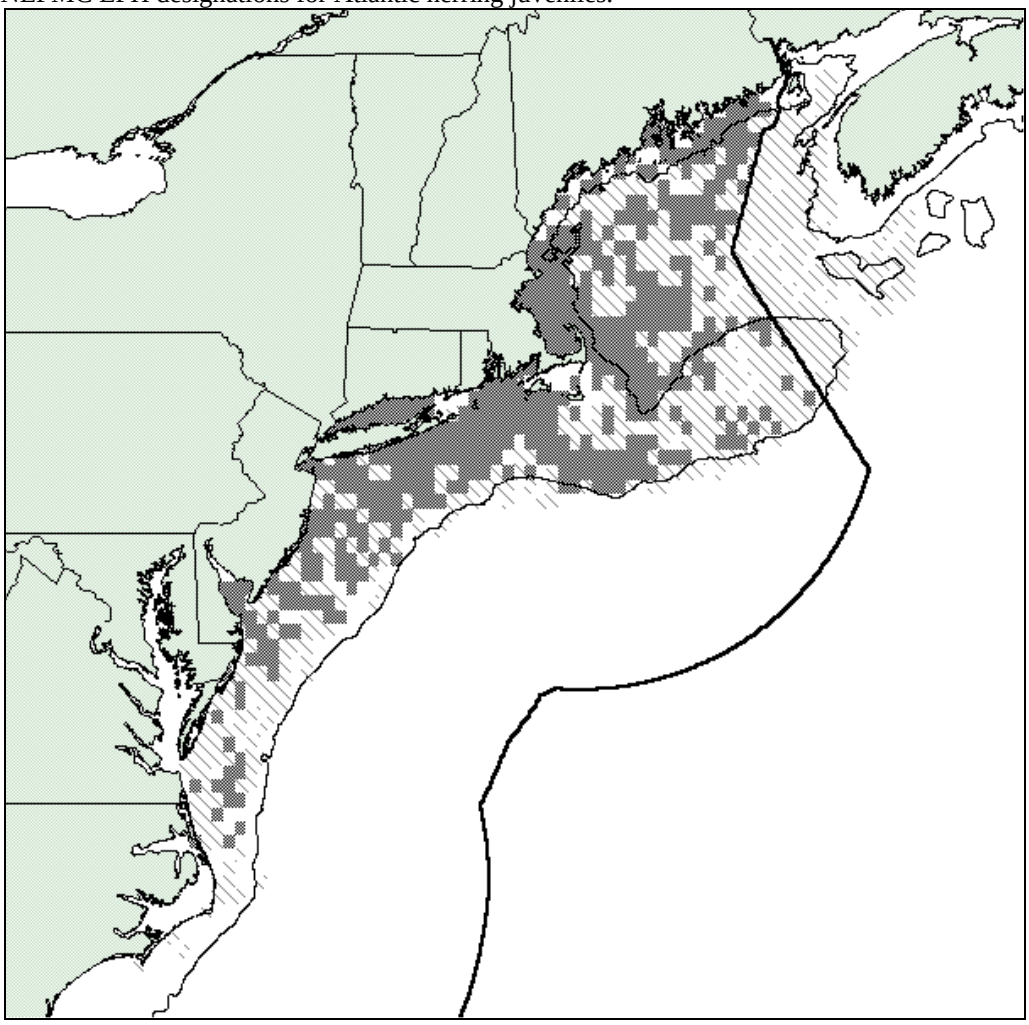
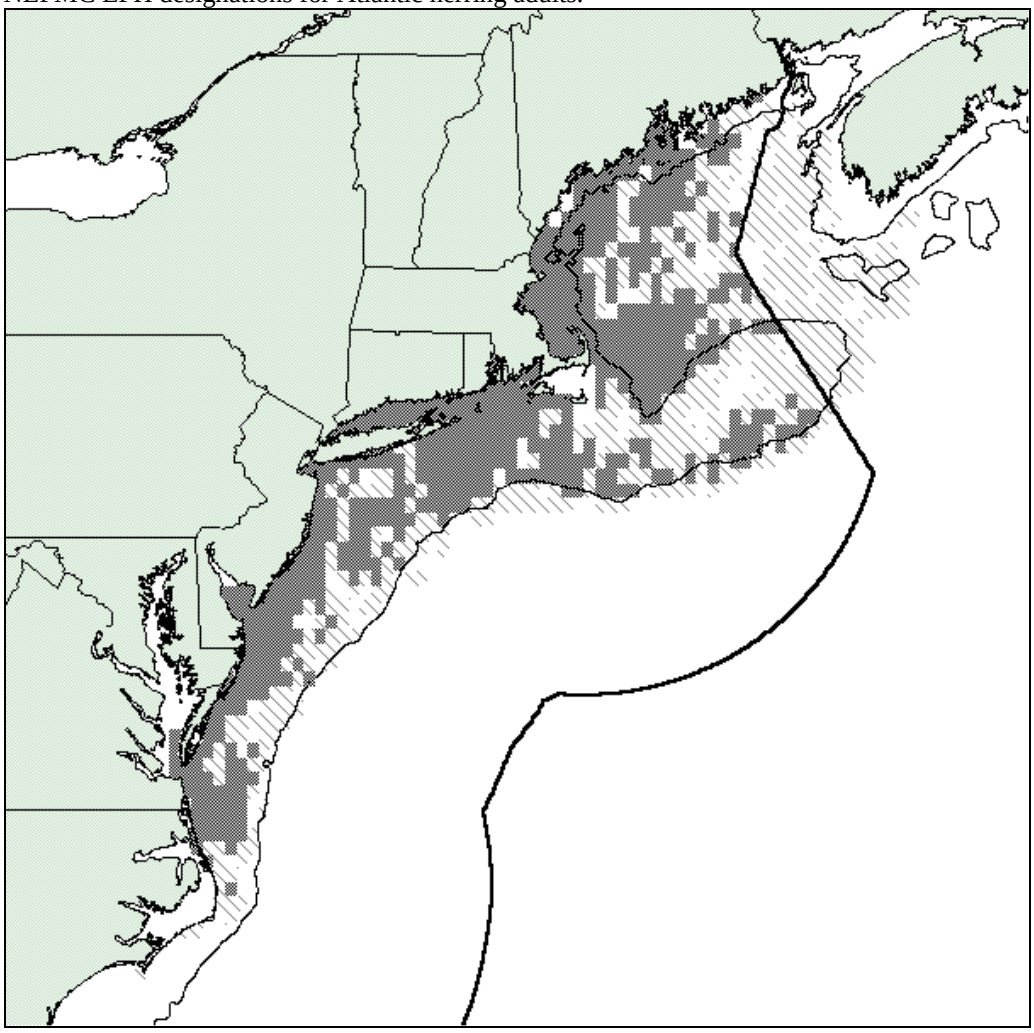


Figure 8. NEFMC EFH designations for Atlantic herring adults.



1.4.1.3 Present Condition of Habitats and Habitat Areas of Particular Concern

A detailed description of habitat quality and habitat areas of particular concern can be found in the Source Document for Amendment 1.

1.4.1.4 Ecosystem Considerations

Forage: Atlantic herring's role as forage in the northwest Atlantic ecosystem has recently become a concern to many stakeholders. *Sections 1.2.1.1* and *7.5* discuss this issue in more detail.

Other Northeast Region Species: The area where the Atlantic herring fishery takes place has been identified as EFH for species managed under the following Federal Fishery Management Plans: Northeast Multispecies; Atlantic Sea Scallop; Atlantic Monkfish; Summer Flounder, Scup and Black Seabass; Squid, Atlantic Mackerel and Butterfish; Atlantic Surf Clam and Ocean Quahog; Atlantic Bluefish; Atlantic Billfish; and Atlantic Tuna, Swordfish and Shark. All EFH descriptions and maps can be viewed on the NMFS Northeast Regional Office website (NEFMC, DRAFT SEIS, 2005).

Anthropogenic Impacts on Atlantic Herring and their Habitat: Habitat alteration and disturbance can occur through natural processes and human activities. Natural disturbances to habitat can result from summer droughts, winter freezes, heavy precipitation, and strong winds, waves, currents and tides associated with major storms (i.e. hurricanes and northeasters) and global climatic events such as El Nino. Biotic factors, including bioturbation and predation, may also disturb habitat (Auster and Langton MS, 1998 and in press). These natural events may have detrimental effects on habitat, including disrupting and altering biological, chemical and physical processes, and may impact fish and invertebrate populations. Potential adverse effects to habitat from fishing and non-fishing activities may include direct (e.g. contamination or physical disruption), indirect (e.g. loss of prey or reduction of species diversity), site-specific or habitat wide impacts, including individual, cumulative or synergistic consequences of the actions. Non-fishing threats to habitat may include the intentional or accidental discharge of contaminants (i.e. heavy metals, oil, nutrients, pesticides, etc.)from non-point and point sources, and direct habitat degradation from human activities (i.e. channel dredging, marina/dock construction, etc.).

Riverine, inshore and offshore habitats are subject to numerous chemical, biological and physical threats. Riparian habitat is being degraded and altered by many human activities. Inshore regions are variable environments that are threatened by many sources of degradation. Deep-sea habitats are stable and contain less resilient communities than habitats found within inshore waters (Radosh et al., 1978) that are altered by unnatural stress. Pelagic environments in coastal and offshore areas are potentially essential habitat for many marine organisms throughout substantial stages of ontogenetic development. These areas can also be disrupted. Chemical, biological, and physical threats can potentially limit survivorship, growth and reproductive capacity of fish and shellfish species and populations

The major threats to marine and aquatic habitats are a result of increasing human population, which is contributing to an increase of human generated pollutant loadings. These pollutants are being discharged directly into riverine and inshore habitats by way of point and non-point sources. The development of coastal regions to accommodate more people leads to an increase in unwanted runoff, such as toxicants, nutrients and pesticides. Humans attempt to control and alter natural processes of aquatic and marine environments for an array of reasons, including industrial uses, coastal development, port and harbor development, erosion control, water diversion, agriculture, and silviculture. Environmental conditions of fish and shellfish habitat are altered by human activities (see Wilk and Barr, 1994 for review) and threatened by non-point and point sources of pollution.

Environmental Contaminants: The effects of copper on eggs and larvae of Atlantic herring were reported by Blaxter (1977). Mortality of newly hatched larvae was high at copper concentrations of 1,000 micrograms per liter (mcrg/l). Eggs incubated in 30 mcrg/l had relatively high mortality and premature hatching; 70% of the larvae hatched were deformed. Larvae were more resistant to copper than eggs; survival of larvae was impaired only at concentrations $\geq$ 1,000 mcrg/l. The vertical migration of larvae was impaired at copper concentrations of $\geq$ 300 mcrg/l.

Tests on the effects of sulfuric pollutants such as iron sulfate and hydrogen sulfate, showed that a dilution of 1:8,000 significantly reduced egg fertilization and hatching success, decreased egg diameter, retarded embryonic growth, shortened the incubation period, and increased the rate of structural abnormalities in newly hatched larvae (Kinne and Rosenthal 1967). Larval prey-catching ability was impaired in 1:32,000 and 1:24,000 dilutions; locomotory performance was seriously affected at a 1:16,000 dilution. Permanent deformities and death occurred within a few days at a 1:8,000 dilution.

Studies of dinitrophenol effects on herring embryonic development indicated that low concentrations (0.01 to 0.05 micromole/l) increased embryo activity and altered heart rates significantly (Rosenthal and Stelzer 1970). Various embryonic malformations were also observed. A dinitrophenol concentration of

0.1 micromole/l caused up to a 400% increase in the normal embryonic respiration rate (Stelzer et al. 1971).

Blaxter and Hunter (1982) reported that eggs and larvae held under films of crude oil in concentrations of 1 to 20 ml/l, or in emulsions, experienced toxicities that varied with the origin of the oil. For oil from a particular source, the fractions with the lower boiling points seemed more harmful (Kuhnhold 1969; cited in Kelly and Moring, 1986). In tests on oil dispersants, larvae did not avoid horizontal gradients, but swam into surface dispersant layers and were narcotized (Wilson, 1974). The survival of herring eggs and larvae was highest in water with low biological oxygen demand and low nitrate levels (Baxter and Steele, 1973).

1.4.2 Description of Programs to Protect, Restore, Preserve and Enhance Atlantic Herring Habitat

Federal marine pollution research and monitoring activities are coordinated by NOAA's National Ocean Pollution Program Office. Short and long-term anthropogenic effects on the marine environment are also assessed. NOAA's Ocean Pollution Program Office coordinates interagency responsibilities while the Ocean Assessments Division (OAD) of the Office of Oceanography and Marine Assessments, National Ocean Service, manages assessments.

1.5 IMPACTS OF THE FISHERY MANAGEMENT PROGRAM

In general, the proposed management actions (see *Sections 2.0, 3.0* and *4.0* below) should have a positive impact on the biological, economic, and social components of the herring fishery. Spawning stock biomass is projected to continue to increase at the same time that landings of herring could double. In the long-term, the establishment of a total allowable catch and effort controls should develop a sustainable herring fishery.

The social impacts of the proposed actions are not expected to be large in scale, long-term or far reaching. Fishermen in the Gulf of Maine may be the most affected by the proposed actions, primarily by forcing a redistribution of fishing effort from the inshore area. Some fishermen in other fisheries will have the opportunity to enter the herring fishery, which may alleviate problems caused by increasing restrictions in those fisheries.

1.5.1 Biological and Environmental Impacts

Amendment 2 implements biological reference points and management measures that are designed to ensure that Atlantic herring populations do not become overfished. The reference points are intended to prevent overfishing, prevent adverse effects on the age structure and provide adequate spawning protection. The reference points will also provide adequate biomass to support the predatory consumption of herring.

1.5.2 Social and Economic Impacts

1.5.2.1 Recreational Fishery

Herring management affects the recreational fishery indirectly by controlling the availability of herring for bait and for forage (drawing the target species closer to shore where they are then accessible to the recreational industry). As long as management measures work to ensure that herring is not overfished, the recreational fishery will benefit. Although biomass estimates and research indicates that herring as forage is plentiful, to the extent that the measures slow the rate of catch, spreading the TAC over the year,

the perception of recreational fishermen is likely to be that herring would be available as forage for a longer period.

1.5.2.2 Commercial Fishery

Impacts on the commercial fishery are best considered individually according to the specific measures and options proposed in the Amendment. The following are not a comprehensive list of all potential impacts, but rather a suggestion of what some of the major impacts are likely to be.

Key social factors that should be considered in analyzing potential impacts on individuals, households and communities of management changes include:

- Social factors (individual, household and communities)
  - Safety and health
  - Distribution of resources (equity, justice)
  - Access to resources
  - Quality of life and/or life style
  - Cultural traditions (and values, attitudes, perceptions)
  - Community dynamics
  - Governance
- Economic factors
  - Impacts on individual and business income
  - Employment
- Other
  - Regulatory discarding

The factors most likely to be affected by the changes in herring regulations are the distribution of resources, access to resources, cultural values and perceptions and community dynamics.

Management Area Boundaries (*Section 2.4.1*) – Redefine Area 3

This measure significantly increases Management Area 3, taking over portions of Area 1 and Area 2. This will benefit some vessels that did not qualify to fish in Area 1 by opening the larger area. If this results in additional effort in what was Area 1B, the vessels that have been fishing in Area 1A and 1B may be faced with more competition. To the extent that this change brings purse seiners and additional midwater trawlers closer together, gear conflict may increase.

Biological Reference Points (*Section 2.5*) – 220,000 metric tons

With the conflicting scientific advice on MSY, accepting this precautionary level may limit the potential for major conflicts of interest among commercial fishing interests and those concerned about the level of forage available to recreational species and other interests (e.g., whale watch industry).

Although the TAC is not being reached in any of the areas that would see a reduction (specifically Area 2 where reducing the MSY would correspond with a 30,000 mt reduction in the TAC) this reduction may affect future business opportunities for participants in this fishery.

Bycatch Information and Monitoring (*Section 3.5*) – Recommended Complementary Measures

Increased observer coverage may result in additional restrictions on the herring fishery if observers find unacceptable levels of bycatch and/or discards. At the same time, more accurate/consistent information

could protect the industry from unnecessary regulation. The average size of the midwater and pair trawl vessels ensures that this would be an unlikely burden (carrying an additional person); however, should this be extended to cover purse seine vessels as well, some smaller boats may have difficulties.

Determining the Distribution of Area-Specific TACs (*Section 4.2.1*) – Consideration of Other Analytical Approaches

Given the historic volatility of the herring stocks, a measure that allows TAC decisions to be based on the most appropriate analytical approach is justifiable. Any approach that keeps the industry stable is valuable; however, the increased time for the specification process (unless the decision is made to accept specifications for multiple years) may be unacceptable to business owners who need information early in order to be able to plan for their year.

Specification Process: Planning Horizon (*Section 4.2.2*) – Tri-annual Process

The longer the planning horizon, the better for business planning decisions. The management measure retains the flexibility to revise specifications if necessary. No major impacts are anticipated for as a result of a longer planning horizon.

Research Set-Asides (*Section 4.2.3*) – TAC Research Set-Aside

Research set-asides of 0-3% will have limited negative impacts on fishery participants as a result of this measure. In fact, improved information generated by the research should have positive outcomes for participants, as management based on scientific information is considered more reliable. Industry participation in Atlantic herring research to date has helped improve the industry's confidence in the stock assessments and has led to discussion of managing herring based on the precautionary principle.

Effort Control Measures: Days Out (*Section 4.3.1*) – Days Out of the Fishery and Fixed Gear Exemption

Measures that facilitate a steady supply of herring to the market will likely benefit commercial fishermen (both herring fishermen and lobstermen), dealers, and other purchasers. In addition, all support industries benefit when commercial fishing is consistently pursued; therefore, associated communities benefit as well. These measures are intended to slow the landing of herring so there will be a steady supply over a longer period, thereby preventing derby fishing (safety benefits) and maintaining access to herring as bait for both lobster and tuna fishermen.

Other Spawning Area Considerations (*Section 4.3.4.4*)

***Option 1*. Exemption for the East Cutler Fixed Gear Fisheries**
***Option 2*. Exemption for all fixed gear fisheries**

Equity considerations motivate these management measures.

Internal Water Processing (*Section 4.3.5*) – Prohibition of IWPs in State Waters

Recent additions to shore-based processing in Massachusetts suggest that the domestic capacity to handle herring is sufficient for the available TAC; therefore, no negative impacts are anticipated from prohibiting IWP operations in state waters.

Downeast Maine Fixed Gear Fisheries (*Section 4.3.6*) – Include Downeast ME Fixed Gear Catch in New Brunswick Weir Catch and Establish TAC Set-Aside for All Fixed Gear Fisheries in Area 1A

Both management measures have reporting requirements that will lead to better information about fixed gear herring catch. These reporting requirements may be considered to have negative impact to those not previously required to report in real time. Nevertheless, as a general guideline, improved information benefits all. This measure may positively impact fixed gear participants in that these measures provide increased flexibility.

The set-aside as an allocation to fixed gear fisheries may not be considered equitable, particularly since this gear type is exempt from several of the other management measures (e.g., spawning restrictions). Because Downeast Maine fixed gear fisheries are the last opportunity for U.S. fisheries to catch herring as they move into the New Brunswick weir fishery area, the benefit of having herring caught and sold by U.S. fisheries participants may be sufficient to overcome any equity issues.

1.5.2.3 Subsistence Fishery

Insufficient data has been collected to comment in detail. It is uncertain to what extent herring may support subsistence fishing in the Mid-Atlantic or South and there does not appear to be subsistence fishing for herring in the Northeast. Because the amendment is attempting to control fishing on herring to smooth out the year's landings, it is anticipated that the measures here will help maintain access to herring for subsistence needs.

1.5.2.4 Non-consumptive Factors

Herring is considered a primary forage fish for tuna, whales and various other species targeted by recreational fishermen. Consequently, as the commercial herring industry has rebuilt in the last few years, considerable anxiety has developed in other sectors about whether or not too many herring are being caught. There is no reason to conclude that herring is overfished (according to the biomass estimates), but perception and anxiety can affect community dynamics and governance. This is an issue that will continue to be discussed and debated; therefore, the ASMFC will monitor the debate as it develops.

1.6 LOCATION OF TECHNICAL DOCUMENTATION FOR FMP (citations only)

1.6.1 Review of Resource Life History and Biological Relationships

ASMFC. 1999. Amendment 1 to the Interstate Fishery Management Plan for Atlantic Sea Herring. ASMFC. Washington, D.C.

NEFMC (New England Fishery Management Council). 2005 (in prep). Draft Amendment 1 to the Fishery Management Plan for Atlantic Herring. Draft Supplemental Environmental Impact Statement.

1.6.2 Stock Assessment Document

Overholtz, W.J., Jacobson, L.D., Melvin, G.D., Cieri, M., Power, M., Libby, D. and Clark, K. February 2004. Stock Assessment of the Gulf of Maine – Georges Bank Atlantic Herring Complex, 2003. Northeast Fisheries Science Center Reference Document 04-06.

1.6.3 Social Assessment Document

The Affected Human Environment (AHE) section of the NEFMC's Herring Plan describes the background on fishing communities and companies that are significant in herring in the Northeast.

Research Paper: *The Role of Atlantic Herring, Clupea Harengus, in the Northwest Atlantic Ecosystem* (NEFMC Staff, September 2003)

1.6.4 Economic Assessment Document

The Fishery-Related Businesses and Communities section of the NEFMC's Herring Plan provides additional background on the economic aspects of the herring fishery.

1.6.5 Law Enforcement Assessment Document

The Law Enforcement Committee (LEC) will review this document during the public comment period. All LEC findings will be forward to the Atlantic Herring Section prior to final approval of Amendment 2.

2.0 GOALS AND OBJECTIVES

2.1 HISTORY AND PURPOSE OF THE PLAN

2.1.1 History of Prior Management Actions

Management of USA Northwest Atlantic herring stocks beyond territorial waters was commenced in 1972 through the International Commission for the Northwest Atlantic Fisheries (ICNAF). The international fishery was regulated by ICNAF until USA withdrawal from the organization in 1976 with Congressional passage of the Magnuson Fishery Conservation and Management Act (MFCMA). Under the aegis of the MFCMA, the New England Fishery Management Council (Council) developed a Fishery Management Plan (FMP) for herring, which was approved by the Secretary of Commerce and was implemented on December 28, 1978. Over the interim period (1976-1978), foreign fishing for herring in USA waters was regulated through a Preliminary Management Plan (PMP) prepared by the National Marine Fisheries Service (NMFS 1995). In 1982, this plan was withdrawn by NMFS and herring was placed on the prohibited species list, eliminating directed fisheries for herring by foreign nationals within the US EEZ and requiring that any herring bycatch by such vessels be discarded. In 1983, an Interstate Herring Management Plan was adopted by the states of Maine, Massachusetts, New Hampshire and Rhode Island, which implemented a series of spawning closures. The states from Maine to New Jersey, acting through the ASMFC, adopted a new FMP in 1994 to address the growth of the herring resource and interest in Internal Waters Processing (IWP) operations.

Amendment 1 to the ASMFC's Interstate Fishery Management Plan for Atlantic Herring was developed in close coordination with the New England Fishery Management Council as a more comprehensive Federal FMP was drafted during 1997 and 1998. The complementary FMPs are designed to minimize the chance of a population collapse due to overfishing, reduce the risk of recruitment failure, promote orderly development of the offshore fishery, reduce impacts to species that are ecologically dependent upon Atlantic herring and minimize adverse effects on participants in the fishery.

In order to maintain consistency between Amendment 1 and the Council's FMP, the Commission's Atlantic Herring Section adopted the same overfishing definition and biological reference points as the

Council, which were created under guidelines stipulated in the revised Magnuson-Stevens Fishery Conservation and Management Act. Both FMPs provide a process for determining the annual specifications for the fishery and by management area. Both plans also contain institutional frameworks for developing and implementing future management action.

ASMFC Amendment 1 delineates the areas with spawning restrictions and describes criteria for determining the start and duration of the closure period. In July 2000, the Section approved Addendum I to readdress the protection of spawning areas and change the due date for annual State compliance reports. The Commission approved Technical Addendum #1a in 2001 to change the delineation of the Eastern Maine spawning boundary because the spawning aggregations were not adequately protected in 2000. Addendum II was developed in conjunction with the Council's Framework Adjustment 1 to allocate the Total Allowable Catch (TAC) for the inshore Gulf of Maine on a seasonal basis. Addendum II also specifies the procedures for allocating the annual IWP quota.

Pursuant to Amendment I for Atlantic herring, states are required to implement the days out provision (landing prohibition) for an area where the TAC is consistently fully harvested. The provision was designed to slow the herring catch rate primarily to ensure supply to the lobster bait market. With landings prohibited two days of the week earlier in the fishing year, a greater portion of the quota remains during the time of peak demand. Additionally, the days out provision was designed to move effort out of the areas where catches are approaching the TAC and into areas where the TAC goes largely unused.

Today, Atlantic herring continues to be managed by the ASMFC in state waters and the NEFMC in federal waters. Currently, the NEFMC is drafting Amendment 1 to the Fishery Management Plan for Atlantic Herring. The two primary differences between the Council's FMP and the ASMFC FMP are the spawning restrictions and the days out provisions included in the ASMFC FMP; however, the ASMFC Atlantic Herring Section and the Council still work closely to establish annual total allowable landings (TACs) in four management areas and sub-areas through a joint specification process.

2.1.2 Purpose and Need for Action

The Commission and New England Council have reviewed the status of the Atlantic herring resource and the condition of the industry that utilizes this resource. The Commission and the Council have determined that sufficient management problems exist to warrant the development and implementation of a complementary interstate and Federal program for conservation and management.

Some of the specific concerns covered by this amendment, include:

- Management area boundaries
- Biological reference points
- Bycatch
- Effort control measures
- Spawning restrictions

To address these concerns, the Council's Amendment 1 will continue its management program for Atlantic herring resources within the EEZ of the U.S. The Commission's Amendment 2 to its FMP continues the implementation of the existing interstate program for herring within state waters. Each plan has been developed in close coordination with both bodies and its member states/constituents in order to ensure consistency throughout the range of the fishery.

2.2 GOALS

The goals of Amendment 2 to the Interstate Fishery Management Plan for Atlantic Herring are:

- To achieve, on a continuing basis, optimum yield (OY) for the United States fishing industry and to prevent overfishing of the Atlantic herring resource. Optimum yield is the amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, taking into account the protection of marine ecosystems, including maintenance of a biomass that supports the ocean ecosystem, predator consumption of herring, and biologically sustainable human harvest. Optimum yield is based on the maximum sustainable yield (MSY) as reduced by any relevant economic, social, or ecological factor, and, in the case of an overfished fishery, provides for rebuilding to a level consistent with producing MSY.
- To provide for the orderly development of the offshore and inshore fisheries, taking into account the viability of current participants in the fishery.

2.3 OBJECTIVES

To meet the goals of Amendment 2, the following objectives shall guide the development of the interstate management program for Atlantic herring:

- To harvest the U.S. Northwest Atlantic herring resource consistent with the definition of overfishing contained in Amendment 2.
- To prevent the overfishing of discrete spawning units consistent with the national standards.
- To avoid patterns of fishing mortality by age which adversely affect age structure of the stock.
- To provide adequate protection for spawning herring and prevent damage to herring egg beds.
- To promote U.S. and Canadian cooperation in order to establish complementary and real-time management practices.
- To implement management measures in close coordination with other Federal and State FMPs.
- To promote research and improve the collection of information in order to better understand herring population dynamics, biology, and ecology, improve science in order to move to real-time management and to improve assessment procedures and cooperation with Canada.
- To achieve full utilization from the catch of herring, including minimizing waste from discards in the fishery.
- To maximize domestic use, such as lobster bait, sardines, and other products for human consumption, and encourage value-added product utilization.
- To promote the utilization of the resource in a manner, which maximizes social and economic benefits to the nation and taking into account the protection of marine ecosystems and its value as a forage species.

2.4 SPECIFICATION OF MANAGEMENT UNIT

The management unit for this amendment is defined as the Atlantic herring (*Clupea harengus harengus* L.) resource throughout the range of the species within U.S. waters of the northwest Atlantic Ocean from the shoreline to the seaward boundary of the Exclusive Economic Zone (EEZ). Because the management unit is limited to U.S. waters, it does not include the entire range of the Atlantic herring stock complex.

Various components of the stock complex migrate through Canadian waters, beyond the Atlantic States Marine Fisheries Commission's range of management. The Atlantic herring stock complex is interstate, state-federal and transboundary in nature; therefore, effective assessment and management can be enhanced through cooperative efforts with state, federal, and Canadian scientists and fisheries managers.

The states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, and New Jersey, and the National Marine Fisheries Service have declared an interest in Atlantic herring.

2.4.1 Management Area Boundaries

The definition of the management area boundaries is based on knowledge of the seasonal distribution and availability of juvenile and adult fish within the area of the management unit, regional differences in the nature and degree of harvesting (different gear types) and processing activity (differences in size and age of fish processed), differences between the inshore and offshore fishing grounds and habitat and the location of known spawning grounds. One of the most important reasons for distinguishing management areas is to avoid over-exploitation of individual spawning populations that are included within the stock complex. Despite the fact that the management unit extends throughout the range of the species in U.S. waters, there is evidence that the U.S. Atlantic herring resource is comprised of separate spawning populations that occupy identifiable areas prior to and during spawning. For the reasons given above, it is appropriate to establish an overall management program that is consistent with unique conditions of the resource and the fishery within separate management areas and that allows for the cooperative management of the resource by different regulatory jurisdictions (the states, the ASMFC and the New England Fishery Management Council).

Amendment 2 redefines areas 1B, 2 and 3, resulting in a larger area covered by Management Area 3 (Figure 10). This change from Amendment 1 is based on two recommendations from the 2003 TRAC Meeting: 1) moving the boundary between Areas 1B and 3 to better reflect spawning distributions and minimize reporting errors and 2) moving the Area 2/3 boundary from its previous position (69°) west to 70° to better reflect the distribution and movement of spawning concentrations. These changes are intended to better reflect the distribution of the spawning components of the stock and have been supported by hydroacoustic sampling of the offshore component of the resource (Figures 10 and 11).

Area 3 is redefined as originating south of Cape Cod at 4139.00 and 7000.00, northeast to a point on the EEZ at 4253.14 and 6744.35. Continuing south along the EEZ to a point at 3754.00 and 7000.00, then north along 7000.00 longitude to the Cape Cod shoreline.

Management Area 1 (Gulf of Maine):
All US waters of the Gulf of Maine north of a line extending from the eastern shore of Monomoy Island at 41^{o} 35' N. latitude eastward to a point at 41^{o} 35' N. latitude, 69^{o} 00' W. longitude, thence northeasterly to a point along the Hague Line at 42^{o} 53'14" N. latitude, 67^{o} 44'35" W. longitude, thence northerly along the Hague Line to the US-Canadian border, to include State and Federal waters adjacent to the states of Maine, New Hampshire, and Massachusetts.

Management Area 1 is further divided into two sub-areas. The following points describe the line subdividing this area:

(1)	70^{o} 00' W	(Cape Cod shoreline at 70^{o} 00'W)
42^{o} 38.4' N	70^{o} 00' W	
42^{o} 53' N	69^{o} 40' W	
43^{o} 12' N	69^{o} 00' W	
43^{o} 40' N	68^{o} 00' W	
43^{o} 58' N	67^{o} 22' W;	(the US-Canada maritime Boundary).

Northward along the irregular US-Canada maritime boundary to the shoreline.

The area inshore of the line is Area 1A, which includes the inshore fishing grounds that have supported most of the catch to date; the area offshore of the line is Area 1B.

Management Area 2 (South Coastal Area):
All waters west and south of the Cape Cod shoreline at 70^{o} 00' W. longitude, to include state and Federal waters adjacent to the states of Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia and North Carolina.

Management Area 3 (Georges Bank):
All U.S. waters east of 70^{o} 00' W. longitude and southeast of the line that runs from a point at 70^{o} 00' W. longitude and 41^{o} 35' N. latitude, northeasterly to the Hague Line at 67^{o} 44' 35" W. longitude and 42^{o} 53' 14" N. latitude.

Figure 9. New Atlantic herring Management Areas with Area 3 Redefined (shaded area).

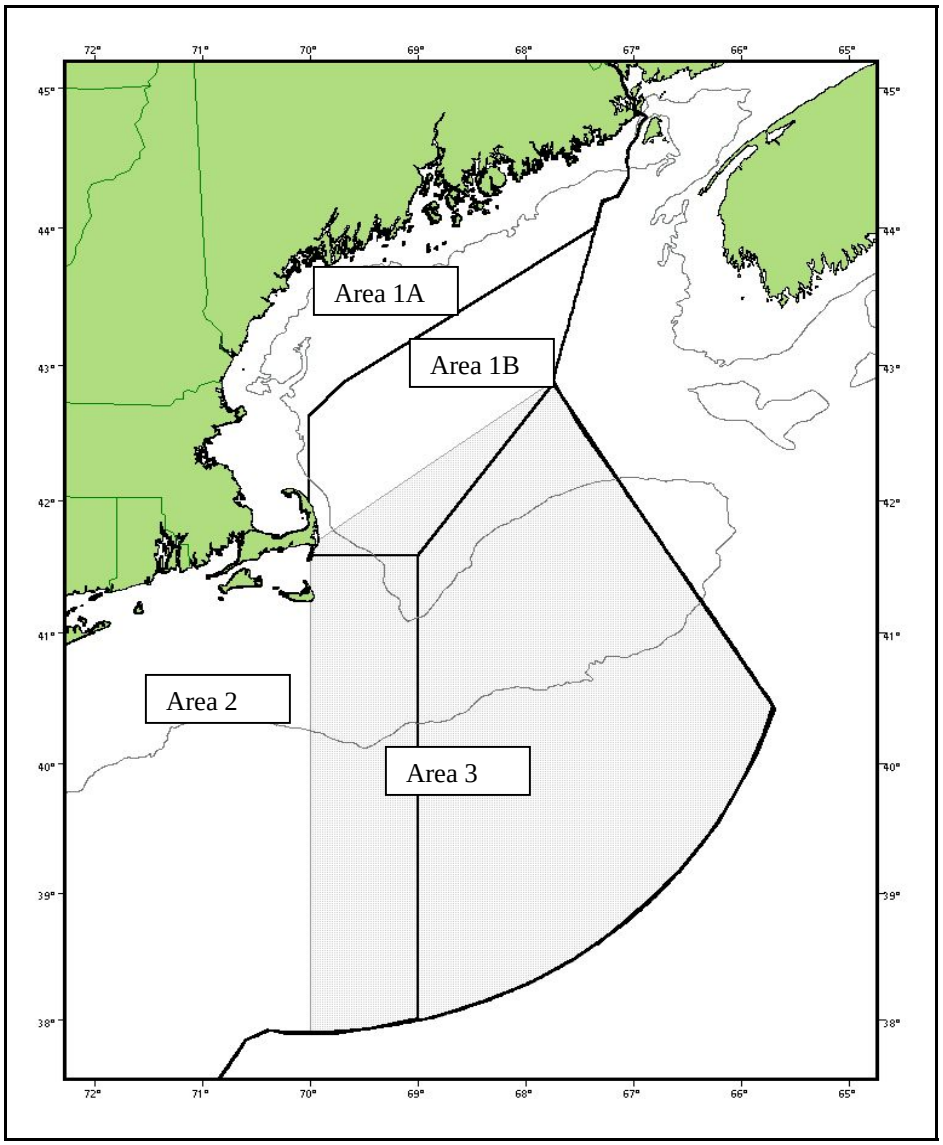


Figure 10 Results of 2000 NMFS Hydroacoustic Survey Superimposed on Current Management Area Boundaries and Proposed Revisions to Area 3

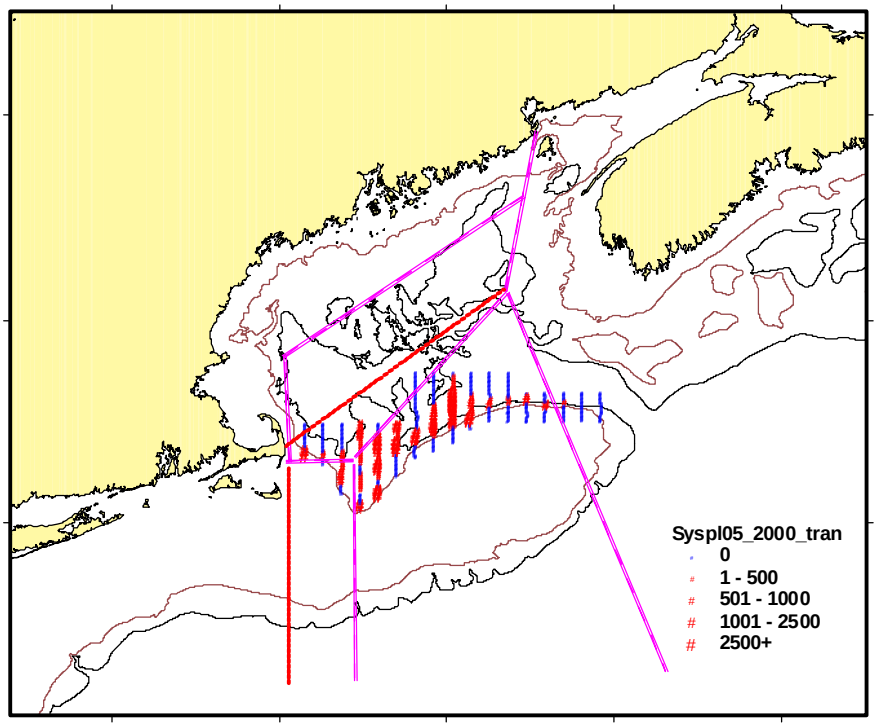
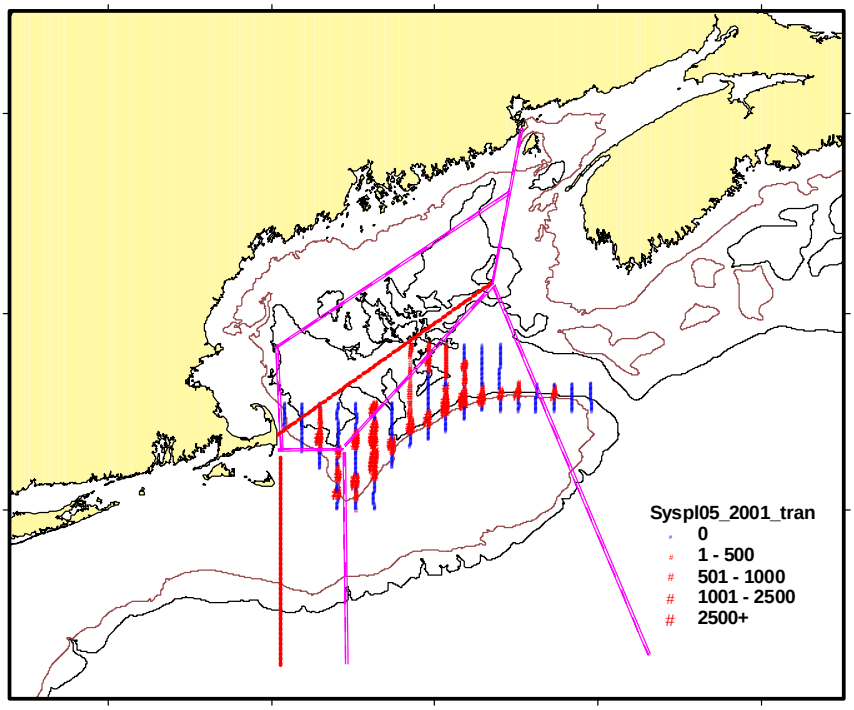


Figure 11 Results of 2001 NMFS Hydroacoustic Survey Superimposed on Current Management Area Boundaries and Proposed Revisions to Area 3.



2.5 BIOLOGICAL REFERENCE POINTS

The term "overfishing" or "overfished" means a level or rate of fishing mortality that jeopardizes the capacity of a fishery to produce maximum sustainable yield on a continuing basis. Absent a statement that defines an appropriate level of fishing mortality, it is problematic to determine whether a fishery is overfished and a rebuilding effort is necessary. The lack of an overfishing definition would hinder attainment of this amendment's goal to prevent overfishing of the herring resource. Measurable criteria are required to achieve this goal.

Amendment 2 sets the maximum sustainable yield for the Atlantic herring fishery at 220,000 mt. This measure establishes a proxy for maximum sustainable yield for the Atlantic herring complex. Establishing a proxy for MSY recognizes the scientific uncertainty associated with the last stock assessment for Atlantic herring (TRAC, February 2003). No consensus was reached at the Transboundary Resource Assessment Committee (TRAC) meeting in February 2003, and the NEFMC's Scientific and Statistical Committee (SSC) did not fully endorse the reference points from the forward projection model (FPM) that was presented at the TRAC meeting. Reference points from the ADAPT

virtual population analysis (ADAPT VPA) were not presented at the TRAC, but reference points were later estimated and not accepted by the SSC. This proxy is intended to be a temporary and precautionary placeholder for MSY until the next stock assessment for the Atlantic herring complex is completed, which is anticipated for May/June 2006. If a new stock assessment results in one estimate of MSY that is supported by a scientific peer-review, the proxy will be modified through the adaptive management process described in *Section 4.7.*

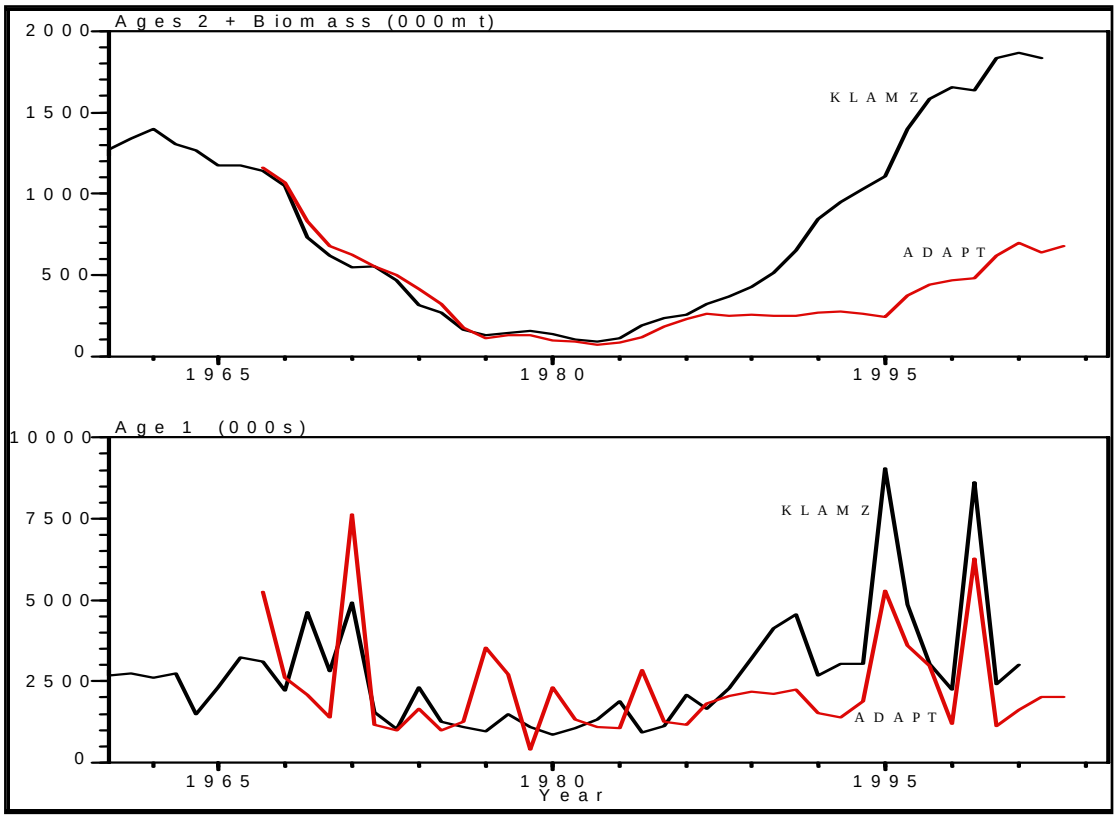
Both the FPM and the ADAPT VPA estimate the same trends in historical biomass until about the mid-1980s, then the models diverge from about 1985 onward (Figure 14). The average biomass between 1960-1970, 1,130,000 mt, provides the basis of the proposed MSY proxy. The historical average biomass was rounded down to 1.1 million mt because the actual value (1,130,000 mt) produces a proxy that is higher than the MSY estimated by the FPM (222,000 mt). The SSC agreed estimates of F_{MSY} from 0.2-0.25 are reasonable and do not appear to be as sensitive to the differences between the FPM and VPA models. Applying the lower estimate of F_{MSY} to the 1,100,000 mt proxy for B_{MSY} results in the following MSY proxy:

1,100,000 mt x 0.2 = 220,000 mt

Under this management measure, the reference points in the overfishing definition for Atlantic herring will be as follows:

MSY = 220,000 mt
B_{MSY} (B_{Target}) = 1,100,000 mt
F_{MSY} ($F_{Threshold}$ when stock is at B_{MSY})= 0.2 – 0.25, based on TRAC assessment results and SSC recommendations
$B_{Threshold}$ = 550,000 mt
F_{Target} = F that produces OY, <= F_{MSY}
$F_{Threshold}$ when stock is below B_{MSY} = F with 50% probability of rebuilding in 5 years (currently equal to F_{MSY})
Rebuilding Period = five years

Figure 12. Herring Biomass Estimates Resulting from the FPM (KLAMZ) and ADAPT VPA Assessment Models.



2.6 STOCK REBUILDING PROGRAM

A rebuilding program is not applicable for the Atlantic herring complex at the present time; however, if it is determined that the herring resource is experiencing overfishing or has become overfished, the Atlantic herring Section will initiate and develop a rebuilding schedule at that time.

2.7 RESOURCE COMMUNITY ASPECTS

Due to the unique and important role that Atlantic herring play in the ecosystem, management considerations should be broader than just traditional fisheries management. Atlantic herring support a valuable commercial fishery for human consumption and provide bait for other fisheries. Herring also serve as an important prey species for fish, birds and marine mammals. *Section 1.3.5* describes the importance of herring as a forage species.

2.8 IMPLEMENTATION SCHEDULE

Amendment 2 to the Interstate Fishery Management Plan for Atlantic Herring was approved and adopted by the Commission January 2006. States are required to submit implementation proposals by April 1, 2006. State proposals will be reviewed for approval during the May 2006 ASMFC meeting week.

3.0 MONITORING PROGRAM SPECIFICATIONS/ELEMENTS

The Atlantic Herring Technical Committee will meet at least once each year to review the stock assessment and all other relevant and current data pertaining to stock status. The Technical Committee will report on all required monitoring elements outlined in *Section 3* and forward any recommendations to the Atlantic Herring Section. The Technical Committee shall also report to the Management Board the results of any other monitoring efforts or assessment activities not included in *Section 3* that may be relavant to the stock status of Atlantic Herring or indicative of ecosystem health and interactions.

The Atlantic Herring Advisory Panel will meet at least once each year to review the stock assessment and all other relevant data pertaining to stock status. The Advisory Panel will forward its report and any recommendations to the Management Board.

The Atlantic Herring Plan Review Team will annually review implementation of the management plan and any subsequent adjustments (addenda), and report to the Management Board on any compliance issues that may arise. The PRT will also prepare the annual Atlantic Herring FMP Review and coordinate the annual update and prioritization of research needs (see *Section 6.0*).

The Section encourages all state fishery management agencies to pursue full implementation of the Atlantic Coastal Cooperative Statistics Program (ACCSP), which will meet the monitoring and reporting requirements of this FMP. The Section recommends a transition or phased-in approach be adopted to allow for full implementation of the ACCSP. Until such time as the ACCSP is implemented, the Section encourages state fishery management agencies to initiate implementation of specific ACCSP modules, and/or pursue pilot and evaluation studies to assist in development of reporting programs to meet the ACCSP standards (please refer to the ACCSP Program Design document for specific reporting requirements and standards). The ACCSP partners are the 15 Atlantic coastal states (Maine - Florida), the District of Columbia, the Potomac River Fisheries Commission, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the three Fishery Management Councils, and the Atlantic States Marine Fisheries Commission. Participation by program partners in the ACCSP does not relieve states from their responsibilities in collating and submitting harvest/monitoring reports to the Commission as may be required under this FMP [Amendment].

3.1 ASSESSMENT OF ANNUAL RECRUITMENT

The Technical Committee and Stock Assessment Subcommittee will review annually the status of Atlantic herring recruitment to the coastal stock complex and “other specific groups of herring” as directed by the Section.

3.2 ASSESSMENT OF SPAWNING STOCK BIOMASS

The Technical Committee and Stock Assessment Subcommittee will review annually the spawning stock biomass of the Atlantic herring coastal stock complex and “other specific groups of herring” as directed by the Section.

3.3 ASSESSMENT OF FISHING MORTALITY TARGET AND MEASUREMENT

The Technical Committee and Stock Assessment Subcommittee will review annually the fishing mortality rate of the Atlantic herring coastal stock complex and "other specific groups of herring" as directed by the Section.

3.4 SUMMARY OF MONITORING PROGRAMS

3.4.1 Catch and Landings Information

Prior to 1994, U.S. landings were collected by a combination of canning industry reports and reports by NMFS port agents. After 1994, harvesters using Vessel Trip Reports (VTR) directly reported U.S. landings data. With implementation of the FMP in 1999, harvesters have been required to use both VTR and Interactive Voice Reports (IVR). Federally licensed dealers are also required to submit monthly reports (NEFMC, DRAFT SEIS, 2005 1999).

Harvesters report VTR data on a monthly basis. Because harvesters give location data (coordinates or Loran) on a per trip basis, this reporting system allows for summarizing catch information from specific areas. VTR data are useful for stock assessment and effort evaluation, but because they are reported on a monthly basis, the data are not useful for quota monitoring (NEFMC, DRAFT SEIS, 2005 2001).

Using the IVR call-in system, harvesters report catches by management area on a weekly schedule. Although trip level information and location data are not reported, this system is useful for near real time quota monitoring. IVR data are not generally useful for stock assessments, or to address management questions that require information by area or gear.

Any marine fishery products landed in any state must be reported by a dealer or a marine resource harvester acting as a dealer in that state. Any marine resource harvester or aquaculturist who sells, consigns, transfers, or barters marine fishery products to anyone other than a dealer would themselves be acting as a dealer and would therefore be responsible for reporting as a dealer.

Dealer reports include detailed information on amounts landed, price paid and utilization of landings, usually on a per trip basis. The dealer reports do not contain information on area of catch.

Both IVR and VTR data include landings to foreign vessels by domestic harvesters. Dealer data only include landings made to domestic dealers. NMFS and state observers collect data on landings to foreign processing or fishing vessels. At the end of a fishing year, all reporting systems are analyzed to detect and reconcile discrepancies.

The ACCSP commercial data collection program will be a mandatory, trip-based system with all fishermen and dealers required to report a minimum set of standard data elements (refer to the ACCSP Program Design document for details). Submission of commercial fishermen and dealer reports will be required by the 10^{th} of each month.

3.4.2 Biological Information

The ACCSP program design calls for the collection of baseline biological data on commercial, for-hire, and recreational fisheries. Biological data for commercial fisheries will be collected through port sampling programs and at-sea observers. Biological data for recreational fisheries will be collected in conjunction with the access-intercept survey. Biological data for for-hire fisheries will be collected

through existing surveys and at-sea observer programs. A minimum set of standard data elements will be collected in all biological sampling programs (refer to the ACCSP Program Design document for details). Priorities and target sampling levels will be determined by the ACCSP Biological Review Panel, in coordination with the Discard/Release Prioritization Committee.

3.4.3 Social Information

No ongoing data collection or monitoring is planned; however, the herring industry has very active representation and participates on the advisory panel, so will certainly provide information about any serious social impacts of regulatory change. The ACCSP is currently developing a comprehensive coastwide data collection program that will include social data.

3.4.4 Economic Information

Federal Atlantic herring dealers will continue to submit trip-level landings reports on a monthly basis. These data include the vessel name, gear type, general catch area and amount purchased and can be used for future economic assessments. The ACCSP is currently developing a comprehensive coastwide data collection program that will include economic data.

3.4.5 Observer Programs

The NMFS at-sea observer program is a mandatory program. As a condition of state and/or federal permitting, vessels shall be required to carry at-sea observers when requested. Once states have fully implemented the ACCSP bycatch/observer module, they are then required to have mandatory observer coverage (~5%). A minimum set of standard data elements will be collected through the ACCSP at-sea observer program (refer to the ACCSP Program Design document for details). Specific fisheries priorities and sampling levels will be determined by the Discard/Release Prioritization Committee.

Recent developments in the herring fishery and increased demand for more observer coverage may lead to a more comprehensive observer program for the herring fishery implemented by NMFS in the near future.

3.5 BYCATCH REDUCTION PROGRAM

Under this management measure, Amendment 2 recommends each state develop a bycatch monitoring program for state permitted vessels participating in the directed herring fishery that mirrors the federal requirements. As such, no action would be taken to implement more specific requirements for observer coverage in the Atlantic herring fishery in state waters. Vessels engaged in the herring fishery and which hold a federal permit would continue to take observers on their vessels as requested by the National Marine Fisheries Service (NMFS). Observer coverage would continue at the discretion of the NMFS. The information collected from independent fisheries observers helps to improve the collection of bycatch information and improve the monitoring of bycatch in the fishery. With better information, more effective management measures are able to be implemented to discourage bycatch and discards.

If the NEFMC implements bycatch caps, the ASMFC Atlantic Herring Section may initiate an addendum via adaptive management (*Section 4.7*) to modify the Interstate Management Program so that it is complementary to the Federal regulations.

3.6 TAGGING STUDIES/PROGRAM

Tagging of fish and shellfish with individually-numbered tags is a proven technique for determining movement and migration routes and rates, growth rates and patterns, estimation of mortality/survival, estimation of population size (if assumptions are met), stock identification and determination of movement/migration corridors and habitat use. The use of more sophisticated electronic tags can provide additional habitat information such as temperature (of both water and fish body), depth and specific location. The Atlantic herring Advisory Panel, Stock Assessment Subcommittee, Technical Committee and/or Management Board (for ASMFC), Advisory Panel or Committee (for Fishery Management Councils) and working groups for International Fisheries Commissions may decide to recommend that tagging studies be performed. Alternatively, one or more of the partners in the fishery management process may initiate such studies independently.

Fish and shellfish tagging is a technical activity usually conducted by scientific personnel; however a number of other entities have become involved in or conducted their own tagging studies. Should a tagging study be proposed for Atlantic herring, a number of considerations should be addressed. Any proposed study must have stated objectives that directly relate to scientific or management purposes. A second important consideration is whether a species can be tagged with minimal mortality, as the utility of study data will be highly questionable if handling/tagging mortality is high. Should a species prove tag-able, an appropriate tag should be selected for use. The species technical committee will review tag retention studies and suggest most appropriate tags for this species, if a tagging program is initiated for Atlantic herring. The ideal tag should be one which has a unique alpha-numeric identifier and organization contact information, is easily emplaced, has a high rate of retention, is readily visible to potential recoverers without increasing an animal's susceptibility to predation, and remains permanently legible, or in the case of internally-embedded coded wire (CWT) or passive integrated transponder (PIT) tags, is easily and consistently detectable. The implantation location and type of CWT or PIT tags should be fully coordinated with other investigators tagging the same species. Tag number sequences and colors of externally visible tags should be coordinated with other investigators conducting similar studies, via the Interstate Tagging Committee, to ensure that duplication does not occur, and contact information for recoveries and returns should be clearly imprinted on the tag. Personnel who have been properly trained should conduct tagging in a consistent manner. Consideration should be given to requiring certification of both professional staff and volunteer angler taggers by the sponsoring organization, in order to increase both the efficiency of tagging and the survival of tagged fish or shellfish through minimization of handling/tagging mortality. The ASMFC Interstate Tagging Committee is in the process of developing a certification for tagging programs, for which sponsoring organizations may wish to apply.

Tagging studies should be highly publicized among the fishing public to maximize the rate of return from both commercial and recreational sectors. In most cases, efforts should be undertaken to accurately measure the rate of tag encounter and return reporting. Each study conducted should ideally assess short-term tagging (handling) mortality; short and long-term tag loss; and reporting rates for each fishery sector. Advertised/promised rewards should be provided promptly upon receipt of data. Study managers should insist on complete and accurate return information. Numbers of animals tagged should be sufficiently high to ensure that the desired information will be produced by the study. Careful and appropriate study design (i.e., purpose, location, sample size, duration, recapture procedures, analysis) is vital to ensure success. Prior to study implementation, a repository for any resultant data should be specified, and long-term commitments made by the sponsoring program, and resources made available to analyze and publish the results. Funds should be provided/reserved to process recaptured tagged animals reported after the program has ended. In angler programs, participants with tagging kits should be notified when the program has ended. All incoming tagging data should be added to the existing database until no additional data are received. Failure to respond to reports of recaptured fish will be detrimental to

surrounding tagging programs. Tag reporting apathy develops in anglers when they do not receive replies from the tagging entity.

Investigators may wish to consider collaboration with existing tag database managers (e.g., National Marine Fisheries Service, Southeast Fishery Science Center, Miami, FL, 305-361-4248; NMFS Northeast Fishery Science Center, Woods Hole, MA, 02543; or US Fish and Wildlife Service, Fishery Resources Office, Annapolis, MD, 410-263-2604) for data entry and analysis. Studies should not be undertaken without adequate consideration of all of these issues. The Interstate Tagging Committee strongly encourages programs which are implemented with: 1) connection to an agency or scientific entity for study design and data analyses; 2) an established constituent base to promote the program; 3) training for individuals on proper fish handling and tagging techniques; and 4) identified research needs and objectives.

Any public or private entity which is proposing new tagging studies for Atlantic herring should seek guidelines from and provide a proposal to the Interstate Tagging Committee for review and coordination prior to initiation of any study. The proposal should use the ASMFC's Protocols for Tagging Programs as guidance in developing the proposed study. If the proposed study is an integral component of the FMP, study design should ideally be reviewed and approved by the Stock Assessment Subcommittee and/or Technical Committee as well, during the FMP review process. Tagging studies outside the ASMFC jurisdiction may choose not to participate in the ASMFC review process.

The ASMFC's Interstate Tagging Committee was developed to serve as a technical resource for jurisdictions other than the ASMFC, as well as for private, non-profit tagging groups, who may plan to tag Atlantic herring. Protocols have been developed by the Committee as a source of information, advice and coordination for all Atlantic coast tagging programs. A copy of the protocol is available on the ASMFC web site. Copies of proposals for review and coordination should be provided to the Interstate Tagging Coordinator at the ASMFC.

3.7 HABITAT PROGRAM

Currently there is no habitat program designed specifically for Atlantic herring. The NEFMC has identified the Essential Fish Habitat (EFH) for herring and other species it manages. The EFH provisions (*Section 1.4.1.2*) were submitted for all Council plans in one document that amends existing Council management plans and lists the EFH for Atlantic herring.

4.0 MANAGEMENT PROGRAM IMPLEMENTATION

4.1 FISHING YEAR

The fishing year for Atlantic herring will be from January 1-December 31; under this measure, revisions developed under the specification process will be implemented with the beginning of the fishing year, January 1.

4.2 SPECIFICATION PROCESS

4.2.1 Specification Process: Determining the Distribution of Area-Specific TACs

The specification process for the entire Atlantic herring fishery, both state and federal waters, has been a joint process. The Section annually meets with the Atlantic Herring Oversight Committee to establish

area TACs that apply throughout the management area despite the border between state and federal waters. Amendment 2 expands upon the specification process outlined in Amendment 1 (see below) by allowing for the use of other analytical approaches when determining the distribution of area TACs. As such, the current process is still used but provides a specific approach to establishing the area-specific TACs. The ASMFC's Technical Committee (TC) and NEFMC's Plan Development Team (PDT) can modify the methodology to employ the best available scientific information for the Atlantic herring stock complex and its components.

The specification approach outlined in Amendment 1 was adopted, in part, to prevent the overfishing of individual stock components by establishing area-specific TACs based on current fishing patterns and estimates of stock mixing. Using this approach, the process for determining area-specific TACs would continue as follows:

1. Estimate the relative abundance of herring in each of three areas during spawning season.
2. Consider existing information on stock distribution and adjust the distribution of spawning components by area (Table 8) as necessary.
3. Examine seasonal patterns in the fishery to identify changes in the exploitation of various spawning components over time.
4. Based on ABC, estimate the allowable U.S. harvest from the components of herring that spawn in the Gulf of Maine, Georges Bank, and Nantucket Shoals.
5. Estimate the expected harvest of Gulf of Maine herring in the winter fishery in Management Area 2.
6. Estimate the expected harvest of Georges Bank and Nantucket Shoals herring in Management Area 1.
7. Establish the TACs for Areas 1A, 1B, 2, and 3.
8. Determine the amount, if any, of the TAC that will be assigned to a TAC reserve.

The mixing regime currently included in the Herring FMP, which is applied to this approach, is described in Table 8.

Table 8. Stock Component Mixing Regime Currently Included in Herring FMP.

Time of Year	Component	Percent of Component in Management Area		
		1	2	3
Dec-March	GOM	100	20	0
	GB/NS	0	80	0
Apr-July	GOM	50	0	0
	GB/NS	50	100	100
Aug-Nov	GOM	100	0	0
	GB/NS	0	100	100

By allowing for the consideration of other analytical approaches, Amendment 2 authorizes the NEFMC's PDT and ASMFC's TC, in consultation with the Herring Committee, Section, Advisory Panels and other interested parties, to utilize the most appropriate analytical approach for determining the distribution of area-specific TACs during the fishery specification process, as long as the justification is provided. Depending on stock/fishery conditions as well as on the quality and resolution of available scientific information, the most appropriate approach for calculating the distribution of area-specific TACs may be: the approach currently outlined in the Herring FMP, a "risk assessment" approach (described generally below), an approach that utilizes assessment information specific to individual stock components

(currently not available, but may be in the future), or another analytical approach. This measure allows the NEFMC PDT and ASMFC TC to utilize all available information to determine the most appropriate analytical approach as part of the fishery specification process.

It is important to note that adopting this management measure may extend the specification process and require additional meetings of the NEFMC PDT/ASMFC TC, Herring Committee/Advisory Panels/Section, and/or Council to address the herring fishery specifications. Instead of addressing the specifications over the course of about two months (June/July), the process will likely begin earlier and occur over the course of about four months (April – July). Utilizing this approach, the fishery specification process will generally occur as follows:

1. NEFMC Herring PDT and ASMFC Herring TC meet to update and evaluate available stock and fishery information, prepare SAFE Report and FMP Review, select analytical approach for calculating area-specific TACs, and develop supporting rationale (likely to occur during April based on a January – December fishing year);
2. Herring Committee/Advisory Panel and ASMFC Section meet to review information provided by the Herring PDT and TC and recommend a range of TAC options for analysis (likely to occur during May based on a January – December fishing year);
3. Herring PDT and TC conduct an analysis of the proposed TAC options relative to status quo (likely to occur during May/June based on a January – December fishing year);
4. Herring Committee/Advisory Panel and ASMFC Section meet to review PDT analysis and recommend a preferred TAC option (likely to occur during June based on a January – December fishing year). The Section will make a final decision on the upcoming fishing year specifications;
5. Council meets to consider Committee/Advisory Panel recommendations and select final area-specific TACs for upcoming fishing year(s) (likely to occur during July based on a January – December fishing year).

Some of the increased costs (administrative, analytical, manpower) associated with extending the specification process under this measure may be mitigated by adjusting the timing of the specification process to allow fishery specifications to remain effective for multiple fishing years (see *Section 4.2.2.*).

Example of an Alternative Analytical Approach – "Risk Assessment"

One new approach to calculate area-specific TACs and analyze the impacts associated with a range of TAC options may be a risk assessment approach. This approach was developed by the NEFMC's Herring PDT during the Amendment 1 process, primarily in response to advice from the Council's SSC to conduct a relative risk assessment when determining the aerial distribution of catches in the herring fishery (see SSC Recommendations, Appendix V, Volume II).

While there is flexibility in the methodology for conducting a risk assessment, the approach can be generally summarized as follows:

1. Estimate the biomass of the inshore (GOM) spawning component of the herring resource using the most recent information from hydroacoustic surveys and/or other sources of relevant information.
2. Calculate average historical removals of the inshore component. The time period for estimating historical removals of the inshore component could be determined by the PDT and TC, provided the selection is justified. Fishery-independent indices (trawl surveys, acoustic surveys) in addition to landings data would be used to determine an appropriate historical reference time frame.

3. Evaluate a reasonable range of options for TAC distributions (including the status quo) using a relative risk assessment.
    - The risk assessment should apply the current biomass estimate for the inshore component and a range of possible mixing scenarios across all management areas to account for uncertainties associated with the mixing scenarios.
    - The assumption about how much of the inshore component of the resource will be taken by the New Brunswick weir fishery would be re-evaluated periodically and adjusted as necessary, especially if landings from the NB weir fishery increase or decrease significantly in the future. (The current assumption of catch from this fishery is 20,000 mt.) If the option is selected to include the Downeast Maine fixed gear fishery catch in the assumption about the NB weir fishery catch, then it will be even more important to re-evaluate this assumption and possibly adjust it based not only on the NB weir fishery catch, but also on the Downeast ME fixed gear fishery catch.
    - The assessment would evaluate relative risk associated with the TAC options by producing estimates of removals from the inshore component under a range of mixing scenarios, which would be compared to average historic removals under the same range of mixing scenarios.
4. The Council and Section would select TACs for Areas 1A, 1B, 2, and 3 based on choices regarding both the risk of overfishing the inshore component (relative to historical removals) and issues/tradeoffs associated with allocating the catch of the inshore component of the resource between Areas 1 (primarily 1A) and 2.

One benefit of a risk assessment approach may be that it accounts for uncertainties related to stock mixing by not relying on one specific mixing scenario. Instead, this approach estimates potential removals from the inshore component of the resource based on a range of possible mixing scenarios. Consequently, a range of projected removals under each TAC option that is evaluated would result from the risk assessment. The inshore component of the resource has been identified by the Herring PDT as the limiting factor when allocating catches by management area. The intent of this approach would be to minimize the relative risk of overfishing the inshore component of the resource under a total MSY and OY that are not expected to compromise the health of the resource as a whole.

4.2.2 Specification Process – Tri-annual Planning Horizon

Under this measure, the NEFMC's PDT and the ASMFC's TC will meet tri-annually to review the most recent stock status information. The PDT and TC will recommend necessary changes to the next three fishing year's specifications by July. With this type of multi-year management measure, the NEFMC and ASMFC will have the ability to modify the specifications during the interim years. This measure is summarized below:

- The Herring PDT will meet with the Commission's TC to review the status of the stock and the fishery and prepare a SAFE Report every three years. While a SAFE Report will only be prepared every three years, the Herring PDT will meet at least once on alternate years to review the status of the stock relative to the overfishing definition if information is available to do so.

- When conducting a three-year review and preparing a SAFE Report, the PDT/TC will report to the Council/Commission no later than July with any necessary adjustments to the specifications.
- Specifications and TACs will be implemented by the Regional Administrator once approved by the Council. Specifications are implemented for the state waters fishery upon the Atlantic Herring Section's approval. Specifications will be set for three fishing years.
- **This measure maintains flexibility to adjust the fishery specifications in the interim years.** If the Council and Section determine that the specifications should be adjusted during the three-year time period, it can do so through the same process during one or both of the interim years.
- If the specifications will not be changed for the upcoming three fishing years, this will be announced through a notice action in the *Federal Register*.

4.2.3 Research Set Asides

In the past, industry members have put forth collaborative efforts outside of a costly public regulatory and administrative process for best utilization of resources to address research needs for the resource. For example, in 2003, the ECPA dedicated approximately 30% of its annual budget to acoustic and tagging research efforts in collaboration with industry, the Gulf of Maine Research Institute, and the Maine Department of Marine Resources. In addition to this support, individual vessels (ECPA members and others) have made significant (cash and in-kind) donations to maintain and further these efforts. Perhaps most important, the herring industry's role as an essential partner in the Gulf of Maine herring spawning stock survey results in the industry having confidence in the resulting stock abundance estimates and the industry's leadership in exploring how Gulf of Maine herring should be managed on a precautionary basis. Independent of the Commission or Council process, states, industry, and other interested parties have supported successful research that was conducted in the last few years with herring vessels in two ways:

1. Chartering vessels for a daily rate on mandatory days out of the fishery, and
2. Providing a special permit for landing herring on mandatory days out

Table 9. Atlantic Herring Research Projects and Funding Source

Current Research Projects	Project Coordinator	Current Funding source	Need to seek long-term funding?
Herring migration and movement	Maine DMR	Industry	Needed
Commercial catch sampling	Maine DMR	Maine DMR/ ACCSP	Needed
Inshore acoustic survey	Gulf of Maine Research Institute	Industry/Northeast Consortium	Needed
NMFS offshore acoustic survey	NEFSC	Federal	Not needed at current funding levels
Morphometric study	NEFSC	Federal	Unlikely

In addition to the above industry-oriented process, the Atlantic Herring Section and the Council may establish a mechanism to set aside a percentage of one or more management area TACs to help support research on the herring stock complex and fishery. A TAC set-aside for research in the herring fishery could help to eliminate the constant pursuit of soft money to fund industry-based research programs (i.e. herring tagging and inshore hydroacoustic surveys). A TAC set-aside for research in the herring fishery could help secure reliable funding for long-term resource monitoring programs such as migration and movement studies and the inshore acoustics project. This measure authorizes NEFMC and ASMFC to

set-aside **0 - 3%** of the TAC from any management area(s) or the total TAC for the herring fishery to support herring-related research. The Council and Section will determine the specific percentages for the research set-asides and the management area(s) to which they apply during the fishery specification process.

Currently, the herring fishery closes in a particular management area when it is projected that 95% of the area TAC has been/will be caught. The remaining 5% of the TAC is set-aside for incidental catch in other fisheries (under a 2,000-pound trip limit) after the directed fishery is closed. **The research set-aside is intended to be in addition to the current 5% set-aside for incidental catch once the directed fishery in a management area closes.**

4.2.3.1 Administration of Research Set Asides

The research set-aside could be administered in a number of ways, and the Council and Commission are seeking public comment on how to administer the research set-asides. Below are two possibilities for administering the research set-asides.

NMFS or ASMFC Administered Research Set Aside: NMFS or the ASMFC could manage the research set-aside allocation by allowing vessels to fish on days out, in spawning areas without a tolerance, or after the TAC has been reached in an area. Interested parties could submit proposals to the managing entity for approval, outlining the research to be conducted, the participating vessels, and the compensation arrangement. Monitoring of the research set-aside would be through the IVR call-in system, marine patrol inspections, and/or observer coverage. Consider the following example: ME DMR submits a proposal to tag herring in cooperation with the F/V Nameless. In exchange for 10 days of charter work in the Gulf of Maine during July and August, the F/V Nameless would be allowed to harvest 1,000,000 pounds of herring (100,000 lbs/trip) after the Area 1A TAC is reached. These fish would be harvested from the TAC set-aside for Area 1A. It is important to note that a vessel, which has entered into such a research contract will not be compensated for their research activity if a management area is not closed. The appropriate entity to manage the set-aside would depend on the incentives available for fishermen. Such incentives include fishing during days out, exemptions from the spawning restrictions, and fishing after an area TAC is reached and the area is closed.

Annual Specification & Governmental Selection Process: This set-aside could be administered through a mechanism similar to the process used by the Mid-Atlantic Council for its Squid, Mackerel and Butterfish, Summer Flounder, Scup and Black Sea Bass, Bluefish and Tilefish FMPs. During the specification process, the Council, in consultation with ASMFC, would designate between 0% and 3% of the TAC for one or more management areas to be set aside for research. Proposals may then be submitted that respond to the Council's research priorities, and revenues generated from the set-aside would be awarded to projects that are selected through the designated governmental process. Currently, set-aside awards are processed through NOAA's Grants Management Division. Proceeds from the sale of set-aside quota constitute the only source of revenue available to support research under this program. The major elements of this approach as it may relate to the Herring FMP are summarized below:

- The research set-aside amount may vary between 0 and 3% of each area-specific TAC.
- Specification of research set-aside amounts (percentages) for the coming year(s) shall be incorporated into the Council's fishery specification package submitted to NMFS and the Commission final approval of the fishing year specifications.
- For each proposal cycle, the Council will publish a Request for Proposals (RFP) that specifies research priorities and application procedures. Each RFP will include:
    - Dates of Submission
    - Eligibility Criteria

  - Proposal Requirements and Format
  - Research Priorities
  - General Project Administration Requirements
  - Evaluation Criteria
  - Selection Procedures
  - Interim and/or Final Report Requirements.

- It is the Council's intent that, whenever possible, research proposals be reviewed and approved prior to the publication of final quota specifications for the upcoming year. In the event that the approved proposals do not make use of any or all of the set-aside, NMFS would be authorized to release the un-utilized portion back to its respective management area when the final specifications are published.
- Proposals may request that the quota set-aside be collected separately from the research trip or other related research trip. The separate research compensation trips do not necessarily have to be conducted by the same vessel.
- There would be a lag time of one year associated with this approach, as TAC set-asides during the first year would not be available for auction until the area TACs are caught. The money from the auction would therefore not be available to support research until the following year.

4.3 COMMERCIAL FISHERIES MANAGEMENT MEASURES

4.3.1 Effort Control Measures: Days Out[1]

This measure is designed to control the catch rate of herring as an area's TAC approaches full utilization. The days out are also designed to allow a vessel to fish in an open area when another area is closed, moving effort out of the areas where catches are approaching the TAC. The restrictions on transfers at sea ease the enforcement of this provision by preventing the transfer of large illegal catches to a boat that may have legally caught herring onboard (see section on Transfers at Sea below).

All vessels will take the same days out (that is, days out will be "no fishing" days) for a particular area. Fishing will be allowed in other areas, and catch may be landed in an area that is closed to fishing. Any vessel transiting an area closed to fishing with legally caught herring on board must have its fishing gear stowed.

During a closure, vessels participating in other fisheries may retain an incidental catch of herring that does not exceed 2,000 pounds per trip. Vessels may be allowed to possess no more than 2,000 pounds of herring per trip that they caught in an area closed to directed herring fishing. Vessels may not land more than 2,000 pounds of herring per day caught in an area closed to directed herring fishing. Vessels transiting a closed area with more than 2,000 pounds of legally caught herring on board must have all seine and mid-water trawl gear stowed.

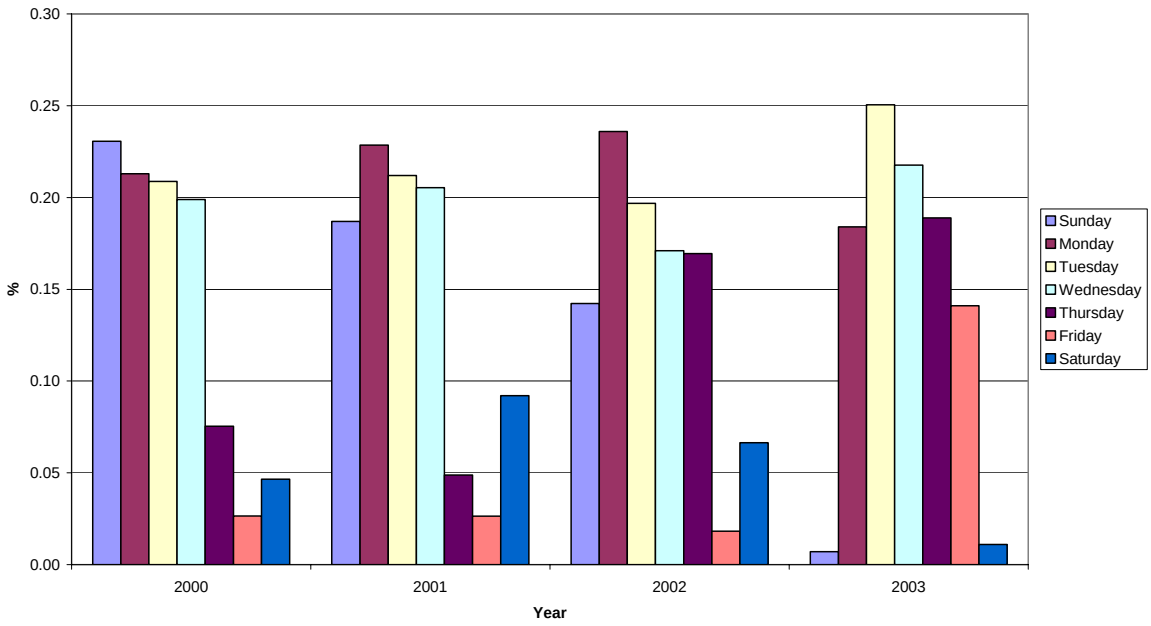
By April of each fishing year, if the catch in a particular area or sub-area is projected to be harvested projections are based on historical catch rates using Atlantic herring landings for a given management area reported through the NOAA Fisheries Interactive Voice Reporting (IVR) system) before the end of a given period, states within the management area will meet to discuss implementation of the "days out" measures. To prevent an early closure of a management area or sub-area, the states will annually agree to the start date, number of days out of the fishery, as well as which consecutive days of the week will have landing restrictions. While the start time for the landing restriction may vary by state, the states must

[1] If the NEFMC develops sector allocations, the ASMFC Atlantic Herring Section will initiate an addendum via adaptive management to address modification to the effort control program in order to account for sector allocation.

implement the landing restriction for the same consecutive days each week. Projections indicate the specific days taken out of the fishery do not influence the catch rate or closure date. Off-loading herring caught from an area with the days out provision in effect will be permitted while the landing restriction is in place.

Fixed gear fishermen may remove and land herring from the gear (weirs and stop seines) on the days designated as a "day out" of the fishery. In addition, vessels with an Atlantic herring permit are not prohibited from participating in other fisheries for other species in restricted areas during days out of the Atlantic herring fishery.

Figure 13. Percentage of Area 1A landings by day of the week.



4.3.1.1 Transfer At Sea

A vessel may not transfer at sea to other U.S. vessels more than 2,000 pounds of herring per day in an area subject to spawning closures or effort controls. A vessel that catches herring in an area subject to a spawning closure or effort controls may not transfer any herring to an IWP or JVP vessel.

4.3.2 Spawning Restrictions

Landing restrictions on spawn herring are designed to conserve the stock by ensuring recruitment to the stock. Much of the management program is designed to move effort into the offshore areas where the TAC has not been fully harvested and the spawning component is thought to be strong. The inshore component is the most vulnerable component of the stock complex; therefore, management measures are focused on providing the greatest protection to the component that is thought to be most susceptible to overfishing. Protection to the offshore spawning component would come at the expense of putting more pressure on the inshore component of the stock complex.

Atlantic herring schools are especially susceptible to fishing when they aggregate for spawning. While vulnerable, they are also most valuable during spawning because their fat content is at its peak. The economic incentives to harvest spawn herring are countered by conservation concerns for the status of the stock. Fishing on spawning herring not only results in high catch rates, but may also interfere with the spawning behavior of uncaught herring. There is a peak point at which spawn herring is acceptable to the market; spawn herring in the latter stages may not be fit for some markets. Therefore, the amendment defines specific measures designed to reduce the exploitation and disruption of spawning aggregations, while providing a limited opportunity to harvest herring during that time of the year.

4.3.2.1 Inshore Gulf of Maine Spawning Areas (Area 1A)

Figure 14 displays the areas defined in this measure.

Eastern Maine Spawning Area
All waters bounded by the following coordinates:

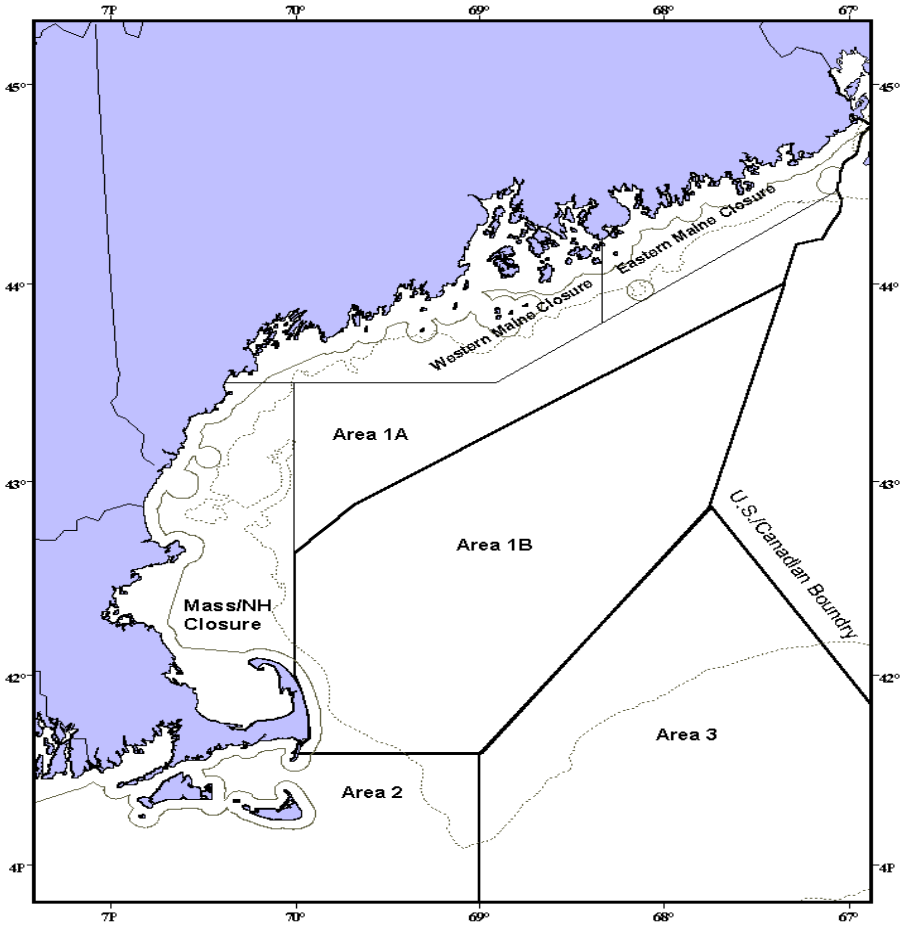
Maine coast	68° 20' W
43° 48' N	68° 20' W
44° 25' N	67° 03' W
North along US/Canada border	

Western Maine Spawning Area
All waters bounded by the following coordinates:

43° 30' N	Maine coast
43° 30' N	68° 54.5' W
43° 48' N	68° 20' W
North to Maine coast at 68° 20' W	

Massachusetts/New Hampshire Spawning Area
All waters bounded by the Massachusetts, New Hampshire and Maine coasts, and
43° 30' N and 70° 00' W

Figure 14. Spawning Areas for Atlantic Herring in State Waters



4.3.2.2 Spawning Closures & Default Dates

Spawning closures are based on commercial catch samples that are collected by at least August 1 for the Eastern and Western Maine areas, and by at least September 1 for the Massachusetts/New Hampshire area. If sufficient samples are not available, closures will begin on the default dates listed below and extend for at least four (4) weeks. Area 1A inshore spawning area closures will begin on the following dates, unless commercial catch samples show earlier spawning than the default date or continuing two weeks after the four-week closure.

Eastern Maine:	August 15
Western Maine:	September 1
Massachusetts/New Hampshire:	September 21

By default, closures will last four (4) weeks. Catch sampling of the fishery will resume at the end of the initial four-week closure period. If catch sampling indicates significant numbers of spawn herring still are being harvested, closures will resume for an additional two weeks. Significant numbers of spawn herring is defined as 25% or more mature herring, by number in a catch sample, have yet to spawn. Mature or "spawn" herring shall be identified as Atlantic herring in ICNAF gonadal stages V and VI.

Table 10 shows the start and end dates of the area spawning closures for the past four years, as well as the default closure dates from Addendum I (*Section 4.2.1.3* Default Closure Dates). Reviewing the closure information from the past four years, the three spawning areas have closed right around the default closure dates and have lasted for about four weeks. Using the commercial catch samples, Maine had the flexibility to delay the closure date to allow the fishery to continue while providing protection to the stock at the appropriate time. The viability of the spawning closures can be attributed to the collection of commercial catch samples to modify the closure periods providing greater protection to the spawning component of the stock.

Table 11 shows the number of Area 1A commercial catch samples that contained greater than 20% spawning females outside of a spawning closure. Since implementation of Amendment 1 in January 2000, a total of 12 commercial samples collected from Area 1A during August to October have had >20% spawning fish, representing a small fraction of the total samples collected during the time period (~5%). Most of these samples were collected just before the start of the spawning closure between issuing the closure notice and actual start date (Table 12). In many states, it can take 3-5 business days between notice and implementation of a spawning closure because of public notification requirements.

Table 10. Historical and default dates for the spawning area closures (EGOM is Eastern Gulf of Maine; WGOM is Western Gulf of Maine; and MA/NH is Massachusetts/ New Hampshire; see Figure 14)

	AREA					
	EGOM		**WGOM**		**MA/NH**	
YEAR	**Start**	**End**	**Start**	**End**	**Start**	**End**
2000	15-Aug	11-Sept	1-Sept	21-Sept	21-Sept	18-Oct
2001	26-Aug	23-Sept	2-Sept	30-Sept	21-Sept	18-Oct
2002	15-Aug	12-Sept	13-Sept	11-Oct	4-Oct	1-Nov
2003	1-Sept	29-Sept	1-Sept	29-Sept	21-Sept	19-Oct
Default Date	**15-Aug**	**13-Sept**	**1-Sept**	**30-Sept**	**21-Sept**	**19-Oct**

Table 11. Number of samples containing > 20% spawning females (ICNAF stages 5&6). Note total samples are the numbers of samples taken from Area 1A August - October of each year.

Year	**# Samples > 20%**	**Total samples**
2000	3	76
2001	0	49
2002	8	70
2003	1	62

Table 12. Year, Spawning Area, and timing of 12 samples containing >20% spawning females

Year	Sample ID	Area	Before or After Closure	Comments
2000	107	EGOM	Before	Within 5 days of start
	109	EGOM	Before	Within 2 days of start
	115	WGOM	Before	Within 3 days of start
2001	N/A	N/A	N/A	N/A
2002	160	MA/NH	Before	Within 10 days of start
	174	MA/NH	Before	Within 5 days of start
	176	MA/NH	Before	Within 2 days of start
	177	MA/NH	Before	Within 5 days of start
	179	MA/NH	After	Within 2 days of end
	180	MA/NH	Before	Within 3 days of start
	193	MA/NH	Before	Within 3 days of start
	207	MA/NH	After	Within 3 days of end
2003	116	EGOM	After	Within 4 days of end

4.3.2.3 Tolerance Provision – Zero Tolerance

Any vessel is prohibited to fish for, take, land, or possess "spawn" herring, as identified below, from or within a restricted spawning area. "Spawn" herring shall be identified as Atlantic herring in ICNAF gonadal stages V and VI.

Any vessel may fish for, take, land, or possess "spawn" herring from a management area outside of those identified in the Delineation of Spawning Areas. Any herring vessel having onboard spawn herring, which were caught outside of a management area that is under a herring spawning closure, may transit the closed area only if all of its fishing gear has been stowed.

An incidental bycatch allowance of up to 2,000 pounds of herring per trip for non-directed fisheries shall be in place during the spawning closures. This bycatch allowance will not be subject to the tolerance provision, i.e. vessels may land "spawn" herring as long as said vessel lands no more than 2,000 pounds. The amount of herring landed by one vessel in a day, as a bycatch allowance, shall not exceed 2,000 pounds (this prohibits a vessel from making multiple trips in one day to land more than the bycatch allowance). A trip shall be based on a calendar day basis.

4.3.2.4 Other Spawning Area Considerations – Exemption for East of Cutler Fixed Gear Fisheries

Under Amendment 1, all vessels fishing with fixed gear in state waters were required to obtain a permit from the appropriate state agency. While Amendment 1 does not specify an exemption for the fixed gear fisheries in the East Cutler area, these fisheries did have an exemption from the spawning restrictions prior to the amendment. The exemption was granted by the State of Maine and was later removed to comply with Amendment 1 to the Interstate FMP. The East Cutler area is defined in Figure 17 below. With implementation of Amendment 2, East of Cutler fixed gear fisheries are granted an exemption from

spawning area considerations and are not limited on the amount of spawn herring that can be landed during a spawning closure.

4.3.3 Internal Water Processing – Prohibition of IWPs in All State Waters

Due to the uncertainty in the inshore stock status, overcapacity in Area 1 and sufficient access to the domestic shoreside processing plants in Area 1, Internal Water Processing operations will be prohibited from processing herring caught in all state waters.

4.3.4 Downeast Maine Fixed Gear Fisheries

A vast majority, if not all, of fixed gear fishermen operate in state waters and obtain state permits to fish for Atlantic herring. It is difficult to get an estimate of the number of fixed gear fishermen targeting Atlantic herring in each state because permitting requirements vary by state. Several of the states do not have species-specific permits; rather, permitting is tied to gear type or individual.

The catch from the Downeast Maine fixed gear fishery will be included as part of the assumed catch from the New Brunswick (NB) weir fishery when determining area-specific TACs and herring fishery specifications (currently 20,000 mt). During the fishing season, catch from the Downeast Maine fixed gear fishery will not be counted against the TAC for Area 1A, and the fixed gear fishery will be allowed to continue to operate once the Area 1A TAC has been reached. This equates to an exemption for the Downeast Maine fixed gear fishery from the Area 1A TAC. Total catch in the Downeast Maine fixed gear fishery would essentially be unrestricted (with the notable exception of inshore spawning restrictions that affect catch in this fishery).

Fixed gear fishermen that qualify for the exemption must report landings through the interactive voice reporting (IVR) system to monitor total landings (New Brunswick plus Downeast Maine) relative to the currently specified TAC of 20,000 mt. If the exempted landings increase significantly, modifications to the exemption may be necessary.

The rationale for this measure is based on the proximity between the Downeast Maine fixed gear fishery and the fixed gear fishery occurring in New Brunswick. Both fisheries operate very close to each other and catch the same fish if/when they move inshore. If the Area 1A TAC is reached by the time the fish move inshore, then the Downeast Maine fixed gear fishermen lose access to the fishery, but the New Brunswick weir fishermen (only about 20 miles away) continue to catch the fish.

From 1993-2002, the New Brunswick weir fishery catch averaged 19,605 mt, consistent with the current 20,000 mt assumption used when calculating area-specific TACs. The New Brunswick weir fishery is not restricted by TACs in Canada, and landings from this fishery could increase in the future. With implementation of this measure, an adaptive approach may be necessary in the future so that the previous year's catch in these two fisheries could be accounted for when calculating TACs for the following year, especially if average catch in either the New Brunswick weir fishery or the Downeast Maine fixed gear fishery increases.

In addition to including catch from the Downeast Maine fixed gear fishery east of Cutler as part of the assumed catch from the New Brunswick (NB) weir fishery, 500 mt of the Area 1A TAC will be set aside for fixed gear fisheries operating in Area 1A (weirs and stop seines) west of Cutler (area west of the shaded area below). This set-aside will be available to fixed gear fishermen in Area 1A until November 1. If the set-aside has not been utilized by the fixed gear fisheries west of Cutler by November 1, it will then be made available to the remainder of the herring fleet fishing in Area 1A until the directed fishery in 1A closes. If 95% of the Area 1A TAC has already been reached by November 1 (and the directed

herring fishery in 1A is therefore closed), the set-aside will be released as part of the 5% set-aside for incidental catch in 1A (at a 2,000 lb trip limit).

Again, fixed gear fishermen in Area 1A will be required to report their herring catches through the Interactive Voice Response (IVR) reporting system. Currently, fixed gear fishermen are not required to report on a real-time basis through IVR reporting. However, this measure relies on real-time monitoring of fixed gear catches in Area 1A, so IVR reporting is necessary.

Under the combination of these two measures, the TAC set-aside applies to the fixed gear fisheries occurring in Area 1A west of Cutler. The fixed gear fishery occurring east of Cutler will be exempt from the Area 1A TAC.

The definition of the Downeast Maine fixed gear fishery to which the above management measures apply is based on the definition used by the State of Maine in 1999 to establish an exemption for the Downeast Maine fixed gear fishery to spawning area restrictions:

Fixed gear (stop seine and weir) catches in waters north of a line drawn from Spruce Point (44 36.2' and 67 16.8'), Cross Island, Cutler, due east magnetic to the international boundary with Canada (see Figures 17 and 18).

Figure 15. Downeast ME Fixed Gear Area Exemption (shaded area).

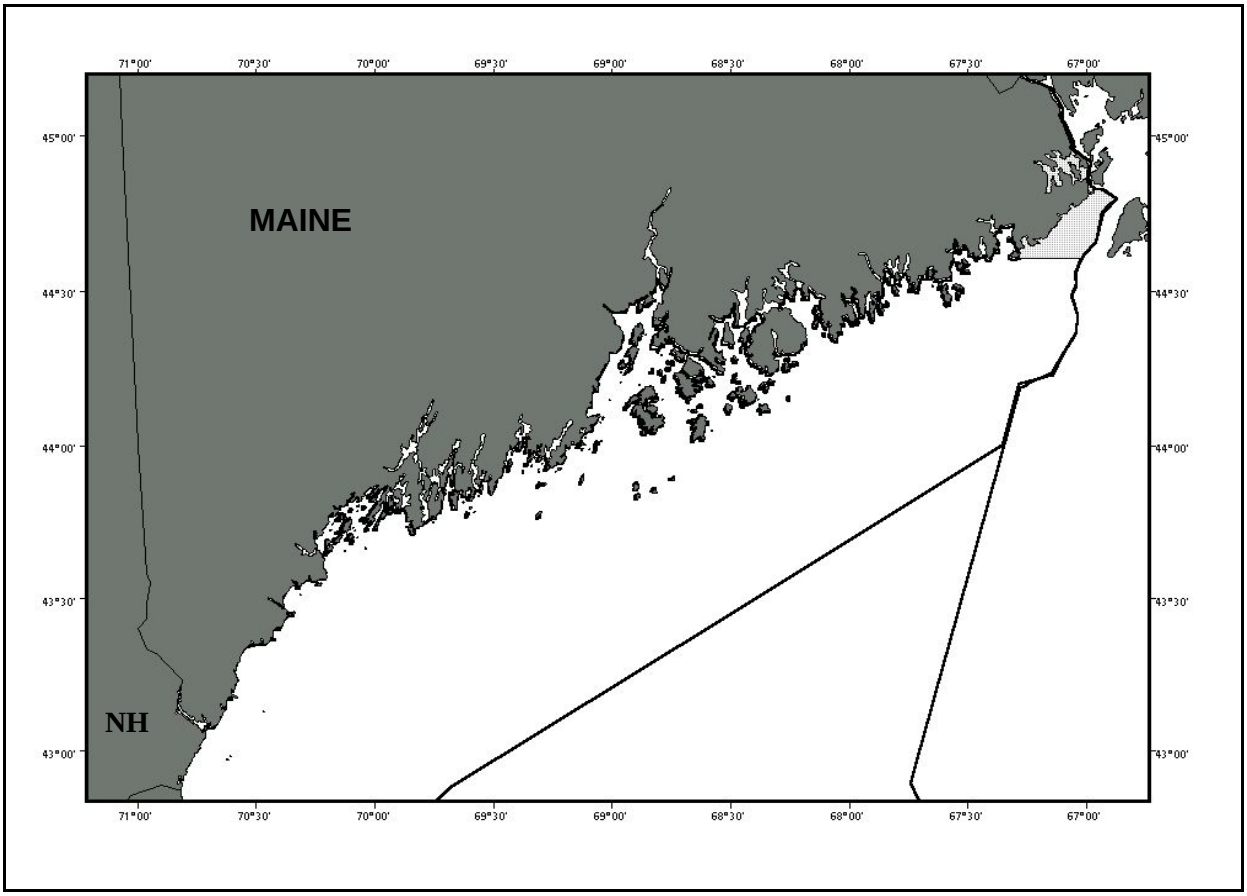
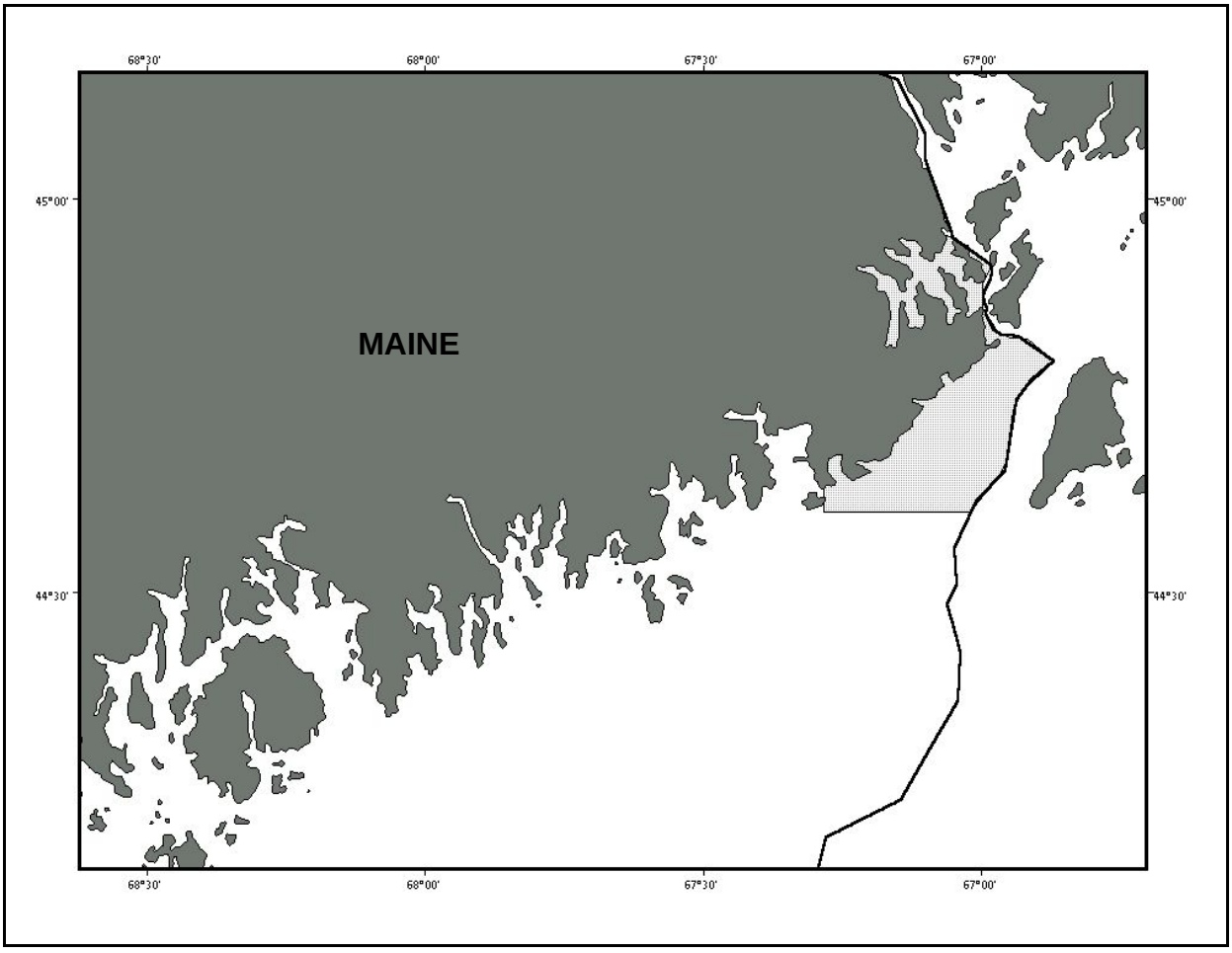


Figure 16. Downeast ME Fixed Gear Exemption Area (shaded), same area defined in Figure 15 at a closer resolution.



4.3.4.1 Small Scale Fixed Gear Fisheries

The Commission received public comments on fixed gear fisheries taking place in areas such as New Jersey and Massachusetts. These comments expressed concern regarding their ability to continue harvesting herring if a limited access program is implemented in state waters. The comments also emphasized a need for a consistent small supply of fresh herring throughout the year for various bait

markets (lobster and striped bass) and ethnic markets for human consumption. These small-scale fixed gear fishermen need access to about 300-400 pounds of herring per day. As long as Amendment 2 continues the 2,000 pound bycatch provision during closures, these smaller scale fixed gear fishermen should continue to have access to the resource and have the ability to harvest enough herring to supply these markets.

4.3.5 Use restrictions – Prohibition of Directed Mealing

The harvest of herring for the primary purpose of reduction to meal or meal-like product is prohibited. The processing, transfer, or sale of herring cuttings, by-products, and whole herring condemned for human consumption, or waste is permitted.
The harvest of herring for the primary purpose of reduction to fishmeal or oil is a concern because of the large volume of fish necessary to support such an operation. The rapid harvest may make it difficult to track landings and implement effort controls at the appropriate time. This may lead to the TAC being exceeded. Even if effort controls can be implemented in a timely fashion, a rapid harvest could lead to an early closure of the fishery, disrupting the supply of herring to other markets.

4.4 RECREATIONAL FISHERIES MANAGEMENT MEASURES

No recreational fisheries management measures are proposed in this amendment. Recreational landings of Atlantic herring are currently so small, regulation of this fishery is unnecessary at this time.

4.5 HABITAT CONSERVATION AND RESTORATION

4.5.1 Preservation of Existing Habitat

Protection of habitat essential for herring spawning is vital to ensure the continued recovery and health of this species. States should identify any locations where herring consistently return to spawn in order to provide some protective measures to egg beds when and if necessary. Monitoring of these locations may also provide an indication of relative spawning component size.

4.5.2 Habitat Restoration, Improvement, and Enhancement

1. State marine fisheries agencies should identify state permitting and planning agencies, which regulate those activities likely to adversely affect Essential Fish Habitat (EFH) and habitats, either by destruction of habitat or degradation of quality. The marine fisheries agency should work with the relevant permitting or planning agency in each state to develop permit conditions and planning considerations to avoid or mitigate adverse impacts on EFH. Standard permit conditions and model policies that contain mitigation techniques should be developed. The development of Memoranda of Understanding (MOU's) with other state agencies are recommended for joint review of projects and planning activities to ensure that habitat protections are adequately incorporated.

For example, dredging windows should be established to avoid impacts to Atlantic herring egg EFH and spawning activity. Dredging windows should be coordinated to ensure practical opportunities for permitted dredging to take place.

2. When it is expected that impacts will occur from an anthropogenic activity, but probably not above some de minimis level, prohibition of the activity may not be warranted, but the marine fisheries agency should request that the appropriate agency consider requiring application of Best Management Practices for the activity.

3. State marine fisheries agencies should coordinate with state water quality agencies and state coastal zone management agencies to ensure that Clean Water Act Section 319 non-point source control plans and Coastal Zone Act Reauthorization Amendment Section 6217 coastal non-point source control plans are developed and implemented so as to minimize adverse impacts of non-point source pollution on herring and herring EFH. In particular, marine fisheries agencies should consider whether areas such as EFH for eggs merit designation as critical coastal areas under state 6217 programs (non-point source pollution control under the Coastal Zone Management Act amendments of 1990) due to water quality impacts to fish habitat, and should provide input to the 6217 lead agencies (identified in the Source Document).

4. State marine fisheries agencies should coordinate with appropriate state agencies to strengthen compliance with National Pollutant Discharge Elimination System (NPDES) or State Pollutant Discharge Elimination System (SPDES) permits.

5. State marine fisheries agencies should work with state coastal zone management agencies to determine whether: 1) additional state policies for habitat protection should be adopted under the state coastal management program; 2) additional federal activities should be added to the state coastal management programs list of activities subject to state consistency review; and 3) the state is fully utilizing the Coastal Zone Management Act federal consistency process for protection of fish habitats.

6. When states have identified habitat restoration as a need, state marine fisheries agencies should coordinate with other agencies to ensure that habitat restoration plans are developed, and funding is actively sought for plan implementation and monitoring.

7. State marine fisheries agencies should coordinate with and provide input to the state water quality agency in development and updating of the Clean Water Act section 303(d) list (priority list of water not meeting state water quality standards). In addition, state marine fisheries agencies should review the adequacy of water quality standards to protect herring and should participate in the triennial review of the state water quality standards.

8. State marine fisheries agencies should review oil spill prevention and response plans for preventing accidental release and recommending prioritized response in EFH.

9. State marine fisheries agencies should work closely with the appropriate Coast Guard District Office in the development, amendment, and implementation of area wide oil spill contingency plans.

10. State marine fisheries agencies should work closely with water quality agencies in the development or revision of river basin plans to identify degraded or threatened resources and recommend preventative, remedial or mitigation measures.

11. State marine fisheries agencies should work with the appropriate agencies to develop contaminated sediment remediation plans or active sediment pollution prevention programs for areas with or susceptible to sediment contamination.

12.State marine fisheries agencies should coordinate with appropriate National Estuary Program (NEP) committees to ensure that NEP Comprehensive Coastal Management Plans (CCMPs) identify and implement habitat protection and restoration needs.

State marine fisheries agencies should assist industrial siting councils in siting new power plants so that impingement and entrainment of Atlantic herring are minimized.

State marine fisheries agencies should work with the appropriate agencies to establish and enforce "no discharge" zones, and promote education of recreational boaters to reduce contamination of nearshore waters from chronic fuel spills and waste disposal.

4.5.3 Avoidance of Incompatible Activities

Federal and state fishery management agencies should take steps to limit the introduction of compounds that are known or suspected to accumulate in Atlantic herring tissue and which pose a threat to human health or Atlantic herring health. Each state should establish windows of compatibility for activities known or suspected to adversely affect herring life stages and their habitats (such as navigational dredging, bridge construction, and dredged material disposal) and notify the appropriate construction or regulatory agencies in writing. Projects involving water withdrawal from spawning or nursery habitats (e.g. power plants, irrigation, water supply projects) should be scrutinized to ensure that adverse impacts resulting from larval/ juvenile impingement, entrainment, and/or modification of flow, temperature and salinity regimes due to water removal will not adversely impact Atlantic sturgeon spawning stocks, including early life stages. Each state which contains spawning and nursery areas within its jurisdiction should develop water use and flow regime guidelines which are protective of Atlantic sturgeon spawning and nursery areas and which will ensure to the extent possible the long-term health and sustainability of the stock. States should endeavor to ensure that proposed water diversions/withdrawals from rivers tributary to spawning and nursery habitats will not reduce or eliminate conditions favorable to Atlantic herring use of these habitats.

4.5.4 Fisheries Practices

The use of any fishing gear or practice which is documented by management agencies to have an unacceptable impact on Atlantic herring (e.g. habitat damage or bycatch mortality) should be prohibited within the effected essential habitats (e.g. trawling in spawning areas or primary nursery areas should be prohibited).

4.6 ALTERNATIVE STATE MANAGEMENT REGIMES

Once approved by the Atlantic Herring Management Board, states are required to obtain prior approval from the Board of any changes to their management program for which a compliance requirement is in effect. Other non-compliance measures must be reported to the Board but may be implemented without prior approval from the Section. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Section's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (*Section 4.6*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Section and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

4.6.1 General Procedures

A state may submit a proposal for a change to its regulatory program or any mandatory compliance measure under this amendment to the Commission, including a proposal for *de minimis* status. Such changes shall be submitted to the Chair of the Plan Review Team, who shall distribute the proposal to the Management Board, the Plan Review Team, the Technical Committee, the Stock Assessment Committee and the Advisory Panel.

The Plan Review Team is responsible for gathering the comments of the Technical Committee, the Stock Assessment Committee and the Advisory Panel, and presenting these comments as soon as possible to the Board for decision.

The Atlantic Herring Section will decide to approve the state proposal for an alternative management program if it is consistent with the applicable target fishing mortality rate and the goals and objectives of this amendment.

4.6.2 Management Program Equivalency

The Atlantic Herring Technical Committee, under the direction of the Plan Review Team, will review any alternative state proposals under this section and provide to the Atlantic Herring Management Board its evaluation of the adequacy of such proposals.

4.6.3 *De minimis* Fishery Guidelines

The ASMFC Interstate Fisheries Management Program Charter defines *de minimis* as "a situation in which, under the existing condition of the stock and scope of the fishery, conservation and enforcement actions taken by an individual state would be expected to contribute insignificantly to a coastwide conservation program required by a Fishery Management Plan or amendment" (ASMFC, 2000).

States may apply for *de minimis* status if, for the last *three* years, the combined average commercial landings (by weight) constitute less than one percent (1%) of the coastwide commercial landings for the same *three*-year period. States may petition the Atlantic Herring Section at any time for *de minimis* status, if their fishery falls below the threshold level. Once *de minimis* status is granted, designated states must submit annual reports to the Board justifying the continuance of *de minimis* status. States are encouraged to include *de minimis* requests as part of their annual compliance reports.

4.7 ADAPTIVE MANAGEMENT

The Atlantic Herring Section may vary the requirements specified in this amendment as a part of adaptive management in order to conserve the Atlantic herring resource. Specifically, the Board may change target fishing mortality rates and harvest specifications, other measures designed to prevent overfishing of the stock complex or any spawning component. Such changes will be instituted to be effective on the first fishing day of the following year, but may be put in place at an alternative time when deemed necessary by the Section. These changes should be discussed with the appropriate federal representatives and Councils prior to implementation in order to be complementary to the regulations for the EEZ.

4.7.1 General Procedures

The Plan Review Team will monitor the status of the fishery and the resource and report on that status to the Atlantic Herring Management Board annually, or when directed to do so by the Board. The Plan Review Team will consult with the Technical Committee, the Stock Assessment Committee and the Advisory Panel, if any, in making such review and report. The report will contain recommendations concerning proposed adaptive management revisions to the management program.

The Atlantic Herring Management Board will review the report of the Plan Review Team and may consult further with Technical Committee, the Stock Assessment Committee or the Advisory Panel. The Board may direct the PRT to prepare an addendum to make any changes it deems necessary. The

addendum shall contain a schedule for the states to implement its provisions.

The Plan Review Team will prepare a draft addendum as directed by the Board and shall distribute it to all states for review and comment. A public hearing will be held in any state that requests one. The Plan Review Team will also request comment from federal agencies and the public at large. After a 30-day review period, the Plan Review Team will summarize the comments and prepare a final version of the addendum for the Management Board.

The Management Board shall review the final version of the addendum prepared by the Plan Review Team and shall also consider the public comments received and the recommendations of the Technical Committee, the Stock Assessment Committee and the Advisory Panel. The Board shall then decide whether to adopt, or revise and then adopt, the addendum.

Upon adoption of an addendum implementing adaptive management by the Board, states shall prepare plans to carry out the addendum, and submit them to the Section for approval according to the schedule contained in the addendum.

4.7.2 Measures Subject to Change

The following measures are subject to change under adaptive management upon approval by the Atlantic Herring Section:

(1) MSY or MSY proxy;
(2) Management area boundaries or additional management areas;
(3) Size, timing, or location of a new or existing spawning area closure;
(4) Closed area other than a spawning closure;
(5) Restrictions in the amount of fishing time;
(6) Days at sea system, including options transferability or leasing of DAS;
(7) Adjustments to OY, TACs, DAP, DAH, JVP, IWP, or the Reserve;
(8) Adjustments to the amount of Canadian catch deducted when determining specifications;
(9) Distribution of the TAC to an area or time period;
(10) Gear restrictions (such as *gear type*, mesh size, etc.) or requirements (such as bycatch reduction devices, etc.);
(11) Measures to address bycatch and bycatch monitoring (such as seasonal, and temporal closures, bycatch caps, gear restriction, and closed fishing seasons);
(12) Vessel size/horsepower restrictions; vessel size limits/upgrade restrictions
(13) Closed seasons;
(14) Minimum fish size;
(15) Trip limits;
(16) Seasonal or area quotas; seasonal allocation of area TACs
(17) In-season adjustments;
(18) Changes to the overfishing definition;
(19) Vessel tracking system;
(20) Restrictions for prohibitions on mealing or a roe fishery;
(21) Quota monitoring tools, such as vessel operator or dealer reporting requirements;
(22) Permit upgrading or splitting limitations, and vessel upgrading restrictions;
(23) Measures to reduce gear conflicts, such as;
    a) Mandatory monitoring of a radio channel by fishing vessels;
    b) Gear location reporting by fixed gear fishermen and mandatory plotting by mobile gear fishermen;
    c) Standards of operation when gear conflicts occur;

d) Fixed gear marking or setting practices;
e) Gear restrictions for certain areas and/or at certain times of the year;
f) Vessel monitoring systems;
g) Restrictions on the maximum number of fishing vessels;
h) Special permitting conditions;

(24) Measures to address information from multispecies stock assessments;
(25) Management of the roe fishery
(26) Herring Processor Survey
(27) Sector allocation/effort control
(28) Any other management measures currently included in Amendment 2.

This list will be modified to include the same measures listed as the frameworkable measures listed in the NEFMC's Amendment 1 to the federal FMP for Atlantic Herring.

4.8 EMERGENCY PROCEDURES

Emergency procedures may be used by the Atlantic Herring Section to require any emergency action that is not covered by or is an exception or change to any provision in Amendment 2. Procedures for implementation are addressed in the ASMFC Interstate Fisheries Management Program Charter, Section Six (c)(10) (ASMFC, 2000).

4.9 MANAGEMENT INSTITUTIONS

The management institutions for Atlantic herring shall be subject to the provisions of the ISFMP Charter (ASMFC, 2000). The following is not intended to replace any or all of the provisions of the ISFMP Charter. All committee roles and responsibilities are included in detail in the ISFMP Charter and are only summarized here.

4.9.1 ASMFC and the ISFMP Policy Board

The ASMFC (Commission) and the ISFMP Policy Board are generally responsible for the oversight and management of the Commission's fisheries management activities. The Commission must approve all fishery management plans, and amendments, including this Amendment 2, and must also make all final determinations concerning state compliance or noncompliance. The ISFMP Policy Board reviews any non-compliance recommendations of the various Management Boards and Sections and, if it concurs, forwards them on to the Commission for action.

4.9.2 Atlantic Herring Section

The Atlantic Herring Section is established by Amendment 1 to the Compact creating the Commission (Public Law 539, as amended) and is generally responsible for carrying out all activities under this Amendment. It establishes and oversees the activities of the Plan Development or Plan Review Team, the Technical Committee and the Stock Assessment Subcommittee and requests the establishment of the Commission's Atlantic Herring Advisory Panel. Among other things, the Board makes changes to the management program under adaptive management and approves state programs implementing the amendment and alternative state programs under *Sections 4.6* and *4.7*. The Section reviews the status of state compliance with the FMP or amendment at least annually. If it determines that a state is out of compliance, the Board reports its determination to the ISFMP Policy Board under the terms of the ISFMP Charter.

4.9.3 Atlantic Herring Plan Development / Plan Review Team

The Atlantic Herring Plan Development Team (PDT) and the Atlantic Herring Plan Review Team (PRT) will be composed of a small group of scientists and/or managers whose responsibility is to provide all of the technical support necessary to carry out and document the decisions of the Atlantic Herring Management Board. The ASMFC FMP Coordinator chairs both. The Atlantic Herring PDT/PRT is directly responsible to the Board for providing information and documentation concerning the implementation, review, monitoring and enforcement of Amendment 2. The Atlantic Herring PDT/PRT shall be comprised of personnel from state and federal agencies who have scientific and management ability and knowledge of Atlantic herring. The PDT will be responsible for preparing all documentation necessary for the development of Amendment 2, using the best scientific information available and the most current stock assessment information. The PDT will either disband or assume inactive status upon completion of Amendment 2. Alternatively, the Board may elect to retain PDT members as members of the PRT or appoint new members. The PRT will provide annual advice concerning the implementation, review, monitoring, and enforcement of Amendment 2 once the Commission has adopted it.

4.9.4 Atlantic Herring Technical Committee

The Atlantic Herring Technical Committee will consist of representatives from state or federal agencies, Regional Fishery Management Councils, Commission, university or other specialized personnel with scientific and technical expertise and knowledge of the Atlantic herring fishery. The Board will appoint the members of the Technical Committee and may authorize additional seats as it sees fit. Its role is to act as a liaison to the individual state and federal agencies, provide information to the management process, and review and develop options concerning the management program. The Technical Committee will provide scientific and technical advice to the Management Board, PDT and PRT in the development and monitoring of a fishery management plan or amendment.

4.9.5 Atlantic Herring Stock Assessment Subcommittee

The Atlantic Herring Stock Assessment Subcommittee shall be appointed by the Technical Committee at the request of the Section and will consist of scientists with expertise in the assessment of the Atlantic herring population. Its role is to assess the Atlantic herring population and provide scientific advice concerning the implications of proposed or potential management alternatives, or to respond to other scientific questions from the Board, Technical Committee, PDT or PRT. The Stock Assessment Subcommittee will report to the Technical Committee.

4.9.6 Atlantic Herring Advisory Panel

The Atlantic Herring Advisory Panel was established according to the Commission's Advisory Committee Charter. Members of the Advisory Panel are citizens who represent a cross-section of commercial fishing interests and others who are concerned about Atlantic herring conservation and management. The Advisory Panel provides the Board with advice directly concerning the Commission's Atlantic herring management program.

4.9.7 Federal Agencies

4.9.7.1 Management in the Exclusive Economic Zone (EEZ)

Management of Atlantic herring in the EEZ is currently under the jurisdiction of the New England Fishery Management Council under the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.). In the absence of a Council Fishery Management Plan, management is the responsibility of the NMFS as mandated by

the Atlantic Coastal Fishery Conservation and Management Act (16 U.S.C. 5105 et seq.) and the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.). The NEFMC is currently developing an amendment to the federal FMP for Atlantic herring, scheduled for implementation by the 2006 fishing year.

4.9.7.2 Federal Agency Participation in the Management Process

The Commission has accorded the United States Fish and Wildlife Service (USFWS) and the NMFS voting status on the ISFMP Policy Board in accordance with the Commission's ISFMP Charter. Due to the makeup of Sections under the ISFMP Charter, no federal agencies are accorded voting status on the Atlantic Herring Management Board; however, the NMFS participates on the Atlantic Herring Plan Development Team, Plan Review Team, Technical Committee and Stock Assessment Subcommittee.

4.9.7.3 Consultation with Fishery Management Councils

In carrying out the provisions of Amendment 2, the states, as members of the Atlantic Herring Section, shall closely coordinate with the New England Fishery Management Council in order to cooperatively manage the Atlantic herring population. In accordance with the Commission's ISFMP Charter, a representative of the New England Fishery Management Council may be invited to participate as a full member of the Atlantic Herring Section.

4.10 RECOMMENDATIONS TO THE SECRETARIES FOR COMPLEMENTARY ACTION IN FEDERAL WATERS

The Atlantic States Marine Fisheries Commission believes that the measures contained in Amendment 2 are necessary to prevent overfishing of the Atlantic herring resource and to allow growth in the fishery. The Atlantic States Marine Fisheries Commission recommends that the federal government promulgate all necessary regulations to implement complementary measures in federal waters that are contained in *Section 4.0*. In addition, Amendment 2 calls for the Atlantic Herring Section to make additional changes to Amendment 2 via adaptive management. As such changes are made, the Management Board will recommend additional measures to the Secretary. The Commission recognizes that such action may be taken under the Atlantic Coastal Fisheries Cooperative Management Act or the Magnuson-Stevens Fishery Conservation and Management Act. In addition, the Commission urges adoption and implementation of NEFMC's Amendment 1 to the Fishery Management Plan for Atlantic herring when complete.

4.11 COOPERATION WITH OTHER MANAGEMENT INSTITUTIONS

The Atlantic Herring Plan Review Team, Technical Committee and Management Board shall regularly communicate with fishery managers in Canadian agencies to help ensure the sustainability of the Atlantic herring resource. Canadian fishery managers and their officials shall be invited to ASMFC discussions on Atlantic herring conservation as needed, especially when discussing transshipment issues and cross-border trade.

5.0 COMPLIANCE

Full implementation of the provisions of this amendment is necessary for the management program to be equitable, efficient and effective. States are expected to implement these measures faithfully under state laws. The Atlantic States Marine Fisheries Commission will continually monitor the effectiveness of state implementation and determine whether states are in compliance with the provisions of this fishery management plan. This section sets forth the specific elements states must implement in order to be in

compliance with this fishery management plan, and the procedures that will govern the evaluation of compliance. Additional details of the procedures are found in the ASMFC Interstate Fisheries Management Program Charter (ASMFC, 2000).

5.1 MANDATORY COMPLIANCE ELEMENTS FOR STATES

A state will be determined to be out of compliance with the provisions of this fishery management plan, according to the terms of Section Seven of the ISFMP Charter if:

- its regulatory and management programs to implement *Section 4* have not been approved by the Atlantic Herring Section; or
- it fails to meet any schedule required by *Section 5.1.2*, or any addendum prepared under adaptive management (*Section 4.7*); or
- it has failed to implement a change to its program when determined necessary by the Atlantic Herring Section; or
- it makes a change to its regulations required under *Section 4* or any addendum prepared under adaptive management (*Section 4.7*) without prior approval of the Atlantic Herring Section.

5.1.1 Mandatory Elements of State Programs

To be considered in compliance with this fishery management plan, all state programs must include harvest controls/a regime of restrictions for Atlantic herring fisheries consistent with the requirements of *Sections 4.1, 4.2* and *4.3*; except that a state may propose an alternative management program under *Section 4.6*, which, if approved by the Section, may be implemented as an alternative regulatory requirement for compliance.

In addition, the Atlantic Herring Section will monitor bycatch of Atlantic herring in other fisheries and report excessive bycatch problems to the management authority for the fishery causing the bycatch.

5.1.1.1 Regulatory Requirements

States may begin to implement Amendment 2 after final approval by the Commission. Each state must submit its required Atlantic herring regulatory program to the Commission through the ASMFC staff for approval by the Atlantic Herring Section. During the period from submission, until the Management Board makes a decision on a state's program, a state may not adopt a less protective management program than contained in this management plan or contained in current state law. The following lists the specific compliance criteria that a state/jurisdiction must implement in order to be in compliance with Amendment 2:

7. Each jurisdiction must enact spawning area restrictions that are at least as restrictive or more than those in (*Section 4.3)*;
8. Each jurisdiction shall prohibit the landing of herring from a management area or sub-area when the TAC has been attained in that area or sub-area (*Section 4.3*);
9. Each jurisdiction shall prohibit directed fishing for herring in state waters when the TAC has been attained in that area or sub-area (*Section 4.3*);
10. Each jurisdiction shall prohibit the landing of herring to an Internal Waters Processing (IWP) operation that were harvested from an area or sub-area closed to directed herring fishing (*Section 4.3*);
11. Each jurisdiction shall require that (daily) herring landings from fixed gear fisheries be reported on a weekly basis in order to monitor progress toward attaining the TAC (*Section 4.3)*; and

12. Each jurisdiction shall annually provide a report on any mealing activity of herring occurring in their state, specifically, the amount in weight of herring processed into meal or like product, biological sampling results and location of catch by NMFS statistical area or Management Area.

Once approved by the Atlantic Herring Management Board, states are required to obtain prior approval from the Board of any changes to their management program for which a compliance requirement is in effect. Other measures must be reported to the Board but may be implemented without prior Board approval. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (*Section 4.7*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

5.1.1.2 Monitoring Requirements

The PDT and Technical Committee will work to develop appropriate protocols for designing fishery-independent surveys for Atlantic herring. Such surveys may be implemented under *Section 4.7* (Adaptive Management) through the Commission's addendum process including the opportunity for public comment.

5.1.1.3 Research Requirements

The PDT and Technical Committee will prioritize the research needs for Atlantic herring. Appropriate programs for meeting these needs may be implemented under *Section 4.7* (Adaptive Management) through the Commission's addendum process including the opportunity for public comment.

5.1.1.4 Law Enforcement Requirements

All state programs must include law enforcement capabilities adequate for successfully implementing that state's Atlantic herring regulations. The adequacy of a state's enforcement activity will be monitored annually by reports of the ASMFC Law Enforcement Committee to the Atlantic Herring Plan Review Team. The first reporting period will cover the period from January 1 – December 31.

5.1.1.5 Habitat Requirements

There are no mandatory habitat requirements for Atlantic herring. See *Section 4.4* for Habitat Recommendations.

5.1.2 Compliance Schedule

States must implement Amendment 2 according to the following schedule:

April 1, 2006 States must submit programs to implement Amendment 2 for approval by the Atlantic Herring Section. Programs must be implemented upon approval by the Section.[2]

[2] Amendment 2 recognizes the need of some states to go through the state legislative process to fully implement compliance requirements. States should identify these legislative needs and approximate timeline in their implementation proposals.

January 1, 2007 States with approved management programs must implement Amendment 2. States may begin implementing management programs prior to this deadline if approved by the Section.[3]

Reports on compliance must be submitted to the Commission by each jurisdiction annually, no later than *February 1, beginning in 2008.*

5.1.3 Compliance Report Content

Each state must submit an annual report concerning its Atlantic herring fisheries and management program for the previous calendar year. A standard compliance report format has been prepared and adopted by the ISFMP Policy Board. States should follow this format in completing the annual compliance report.

5.2 PROCEDURES FOR DETERMINING COMPLIANCE

Detailed procedures regarding compliance determinations are contained in the ISFMP Charter, Section Seven (ASMFC, 2000). The following summary is not meant in any way to replace the language found in the ISFMP Charter.

In brief, all states are responsible for the full and effective implementation and enforcement of fishery management plans in areas subject to their jurisdiction. Written compliance reports as specified in the Plan or Amendment must be submitted annually by each state with a declared interest. Compliance with Amendment 2 will be reviewed at least annually. The Atlantic Herring Management Board, ISFMP Policy Board or the Commission, may request the Atlantic Herring Plan Review Team to conduct a review of plan implementation and compliance at any time.

The Atlantic Herring Section will review the written findings of the PRT within 60 days of receipt of a State's compliance report. Should the Section recommend to the Policy Board that a state be determined out of compliance, a rationale for the recommended non-compliance finding will be included addressing specifically the required measures of Amendment 2 that the state has not implemented or enforced, a statement of how failure to implement or enforce the required measures jeopardizes Atlantic herring conservation, and the actions a state must take in order to comply with Amendment 2 requirements.

The ISFMP Policy Board shall, within thirty days of receiving a recommendation of non-compliance from the Atlantic Herring Section, review that recommendation of non-compliance. If it concurs in the recommendation, it shall recommend at that time to the Commission that a state be found out of compliance.

The Commission shall consider any Amendment 2 non-compliance recommendation from the Policy Board within 30 days. Any state, which is the subject of a recommendation for a non-compliance finding is given an opportunity to present written and/or oral testimony concerning whether it should be found out of compliance. If the Commission agrees with the recommendation of the Policy Board, it may determine that a state is not in compliance with Amendment 2 and specify the actions the state must take to come into compliance.

Any state that has been determined to be out of compliance may request that the Commission rescind its non-compliance findings, provided the state has revised its Atlantic herring conservation measures or

[3] See footnote above.

shown to the Board and/or Commission's satisfaction that actions taken by the state provide for conservation equivalency.

5.3 ANALYSIS OF ENFORCEABILITY OF PROPOSED MEASURES

The ASMFC Law Enforcement Committee will, during the implementation of this amendment, analyze the enforceability of new conservation and management measures as they are proposed.

6.0 MANAGEMENT AND RESEARCH NEEDS

During the development of this amendment, the Council, in conjunction with ASMFC as well as the Herring PDT and Advisory Panel, identified the following data and research needs. Addressing current data deficiencies will improve the long-term management of the Atlantic herring fishery.

6.1 STOCK ASSESSMENT AND POPULATION DYNAMICS

- Continue commercial catch sampling of Atlantic herring fishery (risk of losing funding after the 2004-2005 season) according to ACCSP protocols
- Continue to utilize the inshore and offshore hydroacoustic and trawl surveys to provide an independent means of estimating stock sizes. Collaborative work between NMFS, DFO, State agencies and the herring industry on acoustic surveys for herring should continue to be encouraged.
- Develop tagging and morphometric studies to explore uncertainties in stock structure and the impacts of harvest mortality on different components of the stock. Although tagging studies may be problematic for assessing survivorship for a species like herring, they may be helpful in identifying the stock components and the proportion of these components taken in the fishery on a seasonal basis.
- Examine the root causes of the discrepancy between Forward Projection and ADAPT assessments.
- Pursue the development of a dedicated pelagic survey technique utilizing hydroacoustic and trawling methods to provide another direct and independent means of estimating stock sizes. Collaborative work between NMFS, DFO, State agencies and the herring industry on acoustic surveys for herring should be encouraged.
- Potential changes in catchability within spring bottom trawl survey indices should be investigated.
- Organize annual U.S.-Canada workshops to coordinate stock assessment activities and optimize cooperation in management approaches between the two countries.

6.1.1 Biology/Community Ecology

- Reinvestigate the estimation of age-3 herring, the natural mortality rate assumed for all ages, the use of catch-per-unit-effort tuning indices and the use of NEFSC fall bottom trawl survey tuning indices in the analytical assessment of herring.
- Evaluate the concept of a minimum biologically-acceptable level biomass (MBAL) for the herring coastal stock complex. Determine the adequacy of present methods and data to determine MBAL if appropriate.
- Possible effects of density-dependence (e.g. reduced growth rates at high population size) on parameter estimates used in assessments should be examined.

- Synthesize predator/prey information and conduct investigations to address information gaps; investigate the role of herring in the Northwest Atlantic ecosystem and the importance of herring as a forage species for other commercial fish stocks; assess the importance of herring as forage relative to other forage species in the region.

6.2 RESEARCH AND DATA NEEDS

6.2.1 Biological

- Identify known herring spawning areas. Establish critical spawning habitat areas or special management zones to protect spawning aggregations of herring and/or demersal egg masses.
- Investigate bycatch and discards in the directed herring fishery.
- Develop a long-term strategy for assessing individual spawning stocks as a basis for more effective management of any heavily exploited portion(s) of the stock complex. Evaluate the merit of acoustic surveys and other techniques to achieve sub-stock complex monitoring.
- Develop new approaches to estimating recruitment (i.e. juvenile abundance) from fishery-independent data.
- Consider using NEFSC fall survey mean weights at age as the spawning stock mean weight at age in the estimation of biological reference points. Evaluate alternative catch weights at age.
- Investigate alternative methods of estimating mean weight at age used to determine the age composition of U.S. and Canadian landings from the coastal stock complex.
- Conduct a retrospective analysis of herring larval and assessment data to determine the role larval data plays in anticipating stock collapse and as a tuning index in the age-structured assessment.
- Continue resource monitoring activities, especially larval surveys to indicate the relative importance of individual spawning areas and stocks and the degree of spawning stock recovery on Georges Bank and Nantucket Shoals.
- Evaluate the concept of a fixed spawning stock size or spawning target for the herring coastal stock complex. Determine the adequacy of present methods and data to set a target if more appropriate.
- Investigate the effects of averaging maturity rates over blocks of years to help smooth some of the inter-annual variability in the calculation of spawning stock biomass.
- Consider potential discards if fishing mortality increases in the future.
- Investigate the validity extremely high recruitment in recent years.
- Investigate bycatch/discards in the directed herring fishery through both at-sea and portside sampling.
- Develop and test gear modifications to minimize interactions with non-target species in the herring fishery.

6.2.2 Social and Economic

- Develop economic analyses necessary to evaluate the costs and benefits associated with different segments of the industry.
- Develop socio-economic analyses appropriate to the determination of optimum yield.
- Organize annual US-Canada workshops to coordinate stock assessment activities and optimize cooperation in management approaches between the two countries.

7.0 PROTECTED SPECIES

In the fall of 1995, Commission member states, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) began discussing ways to improve implementation and enforcement of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) in state waters. In November 1995, the Commission, through its Interstate Fisheries Management Program (ISFMP) Policy Board, approved an amendment of its ISFMP Charter (section 6(b)(2)) so that protected species and their interactions with ASMFC managed fisheries are addressed in the Commission's fisheries management planning process. Specifically, the Commission's fishery management plans (FMP) will describe impacts of state fisheries on certain marine mammals and endangered species (collectively termed "protected species"), and recommend ways to minimize these impacts. The following section outlines: (1) the federal legislation that guides protection of marine mammals and sea turtles, (2) the protected species with potential fishery interactions; (3) the specific type(s) of fishery interaction; (4) population status of the affected protected species; and (5) potential impacts to Atlantic coastal state and interstate fisheries.

7.1 MARINE MAMMAL PROTECTION ACT (MMPA) REQUIREMENTS

The 1994 amendments to the MMPA established both short- and long-term goals for reducing mortality and serious injury, or bycatch, of marine mammals incidental to commercial fisheries. The amendments also established take reduction plans (TRPs) and stakeholder-based take reduction teams (TRTs) as the mechanisms for achieving these goals. The MMPA requires NMFS to convene TRTs to develop TRPs for each strategic stock that interacts with a Category I or II fishery, fisheries with "frequent" or "occasional" marine mammal bycatch, respectively. (Fisheries that have a remote likelihood of or no known bycatch of marine mammals are classified in Category III.) A strategic stock is defined as a stock: (1) for which the level of direct human-caused mortality exceeds the potential biological removal (PBR)[4] level; (2) which is declining and is likely to be listed under the ESA in the foreseeable future; or (3) which is listed as a threatened or endangered species under the ESA or as a depleted species under the MMPA. In the short-term (within six months of implementation), TRPs must reduce marine mammal bycatch to levels below a marine mammals stock's potential biological removal level. In the long-term (within five years of implementation), TRPs must reduce marine mammal bycatch to insignificant levels approaching a zero mortality and serious injury rate taking into account the economics of the fishery, the availability of existing technology, and existing state or regional fishery management plans.

The 1994 amendments also required fishermen in Category I and II fisheries to register under the Marine Mammal Authorization Program (MMAP), the purpose of which is to provide an exception for commercial fishermen from the general taking prohibitions of the MMPA; to take on board an observer if requested to do so by the Secretary of Commerce; and to comply with any applicable TRP or emergency regulations. All commercial fishermen, regardless of the category of the fishery in which they participate, must report all marine mammal bycatch.

Section 101(a)(5)(E) of the MMPA requires the authorization of the incidental taking of individuals from marine mammal stocks listed as threatened or endangered under the ESA in the course of commercial fishing operations if it is determined that (1) incidental mortality and serious injury will have a negligible impact on the affected species or stock; (2) a recovery plan has been developed or is being developed for such species or stock under the ESA; and (3) where required under section 118 of the MMPA, a

[4] PBR is the number of human-caused deaths per year each stock can withstand and still reach an optimum population level. This is calculated by multiplying "the minimum population estimate" by "½ stock's net productivity rate" by "a recovery factor ranging from 0.1 for endangered species to 1.0 for healthy stocks."

monitoring program has been established, vessels engaged in such fisheries are registered in accordance with section 118 of the MMPA, and a take reduction plan has been developed or is being developed for such species or stock. Permits are not required for Category III fisheries; however, any serious injury or mortality of a marine mammal must be reported.

7.2 ENDANGERED SPECIES ACT REQUIREMENTS

The taking of endangered sea turtles and marine mammals is prohibited under section 9 of the ESA. NMFS may issue section 4(d) protective regulations necessary and advisable to provide for the conservation of threatened species. There are several mechanisms established in the ESA to avoid the takings prohibition in section 9. First, a 4(d) regulation may include less stringent requirements intended to reduce incidental take and thus allow for the exemption from the taking prohibition. Section 10(a)(1)(B) of the ESA authorizes NMFS to permit, under prescribed terms and conditions, any taking otherwise prohibited by section 9 of the ESA, if the taking is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Finally, section 7(a) requires NMFS to consult with each federal agency to ensure that any action that is authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species. Section 7(b) authorizes incidental take of listed species after full consultation and identification of reasonable and prudent alternatives or measure to monitor and minimize such take.

7.3 PROTECTED SPECIES WITH POTENTIAL FISHERY INTERACTIONS

There are numerous species that inhabit the range of the Atlantic herring management unit covered under this FMP that are protected under the MMPA and ESA. Twelve species are classified as endangered or threatened under the ESA, while the remainder are protected by the provisions of the MMPA.

<u>Cetaceans</u>	
Northern right whale (*Eubalaena glacialis*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Blue whale (*Balaenoptera musculus*)	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Sperm whale (*Physeter macrocephalus*)	Endangered
Minke whale (*Balaenoptera acutorostrata*)	Protected
Harbor porpoise (*Phocoena phocoena*)	Protected
Risso's dolphin (*Grampus griseus*)	Protected
Pilot whale (*Globicephala* spp.)	Protected
White-sided dolphin (*Lagenorhynchus acutus*)	Protected
Common dolphin (*Delphinus delphis*)	Protected
Spotted and striped dolphins (*Stenella* spp.)	Protected
Bottlenose dolphin (*Tursiops truncatus*)	Protected
<u>Seals</u>	
Harbor seal (*Phoca vitulina*)	Protected
Gray seal (*Halichoerus grypus*)	Protected
Harp seal (*Phoca groenlandica*)	Protected
<u>Sea Turtles</u>	

Leatherback turtle (*Dermochelys coriacea*)	Endangered
Kemp's ridley turtle (*Lepidochelys kempii*)	Endangered
Green turtle (*Chelonia mydas*)[5]	Endangered
Hawksbill turtle (*Eretmochelys imbricata*)	Endangered
Loggerhead turtle (*Caretta caretta*)	Threatened

Fish

Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered
Atlantic salmon (*Salmo salar*)[6]	Endangered

NOAA Fisheries has developed a list of species of concern that include: 1) species for which there are concerns regarding danger of extinction or risk of becoming endangered but for which insufficient information is available to indicate a need to list; 2) species for which an ESA biological status review has determined that listing is not warranted but for which significant concerns or uncertainties remain; 3) species that are undergoing formal status reviews. The objectives of the Species of Concern designation are to:

- Identify species potentially at risk;
- Increase public awareness about those species;
- Identify data deficiencies and uncertainties in species' status and threats;
- Stimulate cooperative research efforts to obtain the information necessary to evaluate species status and threats; and
- Foster voluntary efforts to conserve the species before listing becomes warranted.

Species of concern in New England include:
Dusky shark (*Carcharhinus obscurus)*
Sand tiger shark (*Odontaspis Taurus)*
Barndoor skate *(Raja laevis)*
Thorny skate *(Raja radiata)*
Atlantic sturgeon *(Acipenser oyxrinchus oxyrinchus)*
Atlantic salmon *(Salmo salar)*
Rainbow smelt *(Osmerus mordax)*
Cusk *(Brosme brosme)*
Atlantic wolfish *(Anarhichas lupus)*
Atlantic halibut *(Higgoglossus hippoglossus)*
Atlantic white marlin *(Tetrapturus albidus)*

7.4 PROTECTED SPECIES INTERACTIONS WITH EXISTING FISHERIES

Although all of the protected species listed above may be found in the general geographical area covered by the Herring FMP not all are affected by the fishery. Some species may inhabit areas other than those in which the fishery is prosecuted, prefer a different depth or temperature zone, or may migrate through the area at times when the fishery is not in operation. In addition, certain protected species may not be vulnerable to capture or entanglement with the gear used in the fishery.

[5] The breeding populations of green turtles in Florida and on the Pacific coast of Mexico are listed as endangered, the remainder of the population is listed as threatened.
[6] The Gulf of Maine distinct population segment (DPS) of Atlantic salmon is endangered, all other Atlantic salmon is considered a species of concern.

Atlantic herring occur in large schools, inhabiting coastal and continental shelf waters from Virginia to Labrador, Canada, and support a commercial fishery. Landings exceeded 150 million pounds throughout the late 1880s and early 1900s, and again in the late 1940s and 1950s. Today, landings are lower, ranging from 80 to 100 million pounds; the majority of which is taken from the Gulf of Maine. Otter trawls, both single and pair, and purse seines are used in the majority of catches in the Atlantic herring fishery.

7.4.1 Marine Mammals

Marine mammal interactions have been recorded in the primary fisheries (utilizing otter trawls and purse seines) that target Atlantic herring, including the Northeast mid-water trawl (including pair trawl) fishery and the Gulf of Maine Atlantic herring purse seine fishery. Marine mammal stocks of greatest concern that interact with this fishery are the western North Atlantic long-finned and short-finned pilot whales, western North Atlantic white-sided dolphin, and Gulf of Maine/Bay of Fundy harbor porpoise. The MMPA 2004 List of Fisheries (LOF) (69 FR 48408) classifies fisheries by the level of serious injury and mortality of marine mammals incidental to each fishery. Table 1 lists the predominant fisheries that target Atlantic herring and the marine mammals known to interact with those fisheries.

Subsequent sections discuss documented interactions with the primary species of concern, e.g., pilot whales, white-sided dolphins, and harbor porpoises. These bycatch reports do not represent a complete list, but rather available records. It should be noted that without adequate observer programs for these fisheries; actual numbers of interactions are difficult to obtain. Until very recently, the level of observer coverage has been minimal despite the 1999 re-categorization of the herring mid-water trawl fishery to Category II on the Marine Mammal Protection Act's (MMPA's) List of Fisheries. This change was to have permitted observers to collect data to more accurately document interactions. Category II fisheries have an occasional likelihood of causing incidental mortality and/or serious injury to marine mammals. The recent 2004 ramping up of observer coverage could provide additional information on protected species interactions in herring mid-water gear, whether vessels are engaged in domestic or foreign fishing.

Table 13. Commercial Fisheries Taking Atlantic Herring in the Atlantic Ocean (source: LOF 2004).[7]

Fishery Description	Marine Mammal Species Incidentally Killed/Injured
CATEGORY II	
Northeast mid-water trawl (including pair trawl)	Harbor seal, Long-finned pilot whale, Short-finned pilot whale, White-sided dolphin
CATEGORY III	
Gulf of Maine Atlantic herring purse seine	Harbor porpoise, Harbor seal, Gray seal

7.4.1.1 Mid-Water Trawl

Pilot Whale

Interactions between both short-finned and long-finned pilot whales and the Northeast mid-water trawl (including pair trawl) fishery have been documented. These two species are difficult to distinguish at sea as separate species and, therefore, abundance estimates, PBR, and bycatch estimates are combined into one listing for pilot whales There were no domestic mid-water trawl trips observed in 1997-1998, 3 trips observed in 1999 (1 single; 2 paired), 13 trips in 2000 (12 single; 1 paired), and no trips in 2001. There were no marine mammal takes observed from the domestic mid-water trawl fishing trips during 1997-

[7] Excerpt for List of Fisheries for 2004, Federal Register 69 (153 August 2004): 48407-48423.

2001. A USA joint venture (JV) mid-water (pelagic) trawl fishery was conducted on Georges Bank from August - December 2001. A Total Allowable Level of Foreign Fishing (TALFF) was also granted during the same time period. Ten vessels (3 foreign and 7 American), fishing both single and paired mid-water trawls, participated in the 2001 Atlantic herring JV fishery. Two out of the three foreign vessels also participated in the 2001 TALFF and fished with paired mid-water trawls. NMFS maintained 74% observer coverage (243 hauls) of the JV transfers and 100% observer coverage (114 hauls) of the foreign vessels granted a TALFF. Eight pilot whales were incidentally captured in a single mid-water trawl during JV fishing operations. Three pilot whales were incidentally captured in a single mid-water trawl during foreign fishing operations (TALFF). The total mortality attributed to the Atlantic herring mid-water trawl fishery in 2001 was 11 animals.

White-sided Dolphin

There were no domestic mid-water trawl trips observed in 1997-1998, 3 trips in 1999 (1 single; 2 paired), 13 trips in 2000 (12 single; 1 paired), and no trips in 2001. There were no marine mammal takes observed from the domestic mid-water trawl fishing trips during the period 1997-2001. A USA joint venture (JV) mid-water (pelagic) trawl fishery was conducted on Georges Bank from August -December 2001. A total allowable landings of foreign fishery (TALFF) was also granted during the same time period. Ten vessels (3 foreign and 7 American), fishing both single and paired mid-water trawls, participated in the 2001 Atlantic herring JV fishery. Two out of the three foreign vessels also participated in the 2001 TALFF and fished with paired mid-water trawls. The NMFS maintained 74% observer coverage (243 hauls) on the JV transfers and 100% observer coverage (114 hauls) on the foreign vessels granted a TALFF. No white-sided dolphins were incidentally captured in the mid-water trawl during JV fishing operations. Two white-sided dolphins were incidentally captured in a single mid-water trawl during foreign fishing operations (TALFF). The total mortality attributed to the Atlantic herring mid-water trawl fishery in 2001 was 2 animals.

7.4.1.2 Purse Seine

Harbor Porpoise

Harbor porpoises are listed on the MMPA 2004 List of Fisheries (LOF) as interacting with the Gulf of Maine Atlantic herring purse seine fishery. However, no interactions are documented in the most recent stock assessment report for the Gulf of Maine/Bay of Fundy harbor porpoise stock.

7.4.2 Sea Turtles

Interactions with sea turtles may occur when fishing effort overlaps with sea turtle distribution. Interactions could occur in the summer and fall, as turtles can be found in northeastern waters from June to November. Juvenile and immature Kemp's ridleys and loggerheads utilize nearshore and inshore waters north of Cape Hatteras during the warmer months and can be found as far north as the waters in and around Cape Cod Bay. Sea turtles are likely to be present off the Virginia, Maryland and New Jersey coasts by April or May, but do not arrive in great concentrations in New York and northwards until mid-June. Although uncommon north of Cape Hatteras, immature green sea turtles also use northern inshore waters during the summer and may be found as far north as Nantucket Sound. Leatherbacks migrate north in the spring to productive foraging grounds off Nova Scotia. With the decline of water temperatures in late fall, sea turtles migrate south to warmer waters. When water temperatures are greater than approximately 11˚C, sea turtles may be present in some areas where the Atlantic herring fishery occurs.

There are not data available that can be used to estimate the number of threatened or endangered sea turtles that might be taken in herring gear. Nevertheless, based on observed takes from sea sampling data from other fisheries for gear types that may be used in the herring fishery, NMFS believes that it would be reasonable to expect, as a precaution, six loggerhead sea turtles to be taken by the proposed fishery (three of these takes would be lethal) and one green sea turtle, Kemp's ridley sea turtle and leatherback sea turtle to be taken by the proposed fishery. Based on the information available on the distribution and abundance of these sea turtle species in the actions area, NMFS does not believe the death, capture or injury of these small numbers of sea turtles would appreciably diminish the viability of sea turtle populations in the action area. Further, NMFS does not believe it would be reasonable to expect that the death, capture, harm or harassment of these numbers of sea turtles would appreciably reduce the likelihood of survival and recovery of these species in the wild (excerpted from NMFS, 1999).

Based on information collected in similar fisheries, the major gear types used in the herring fishery appear to have little or no interactions with sea turtles, although it must be acknowledged there has been an extremely low level of observer coverage in this fishery to date. In addition, there appears to be little spatial/temporal overlap in the distribution of Atlantic herring and sea turtles.

7.4.3 Seabirds

Like marine mammals and sea turtles, seabirds are vulnerable to entanglement in commercial fishing gear. Along with commercial fishing, human activities such as coastal development, habitat degradation and destruction, and the presence of organochlorine contaminants are considered to be major threats to some seabird populations.

The otter trawl and the purse seine are the primary commercial gears used in the Atlantic herring fishery, accounting for the vast majority of the landings. These gears do not appear to be a significant source of incidental seabird takes.

7.5 HERRING AS A FORAGE SPECIES

Atlantic herring is one of many important forage species in the Northeast Atlantic Ocean ecosystem. While available information to quantify the importance of herring as a forage species is not available at this time, there is a substantial amount of literature that describes the role that herring plays in the ecosystem and estimates the amount of herring consumed by various fish, marine mammal, and seabird species.

Observational and empirical evidence suggests that there are four major groups of predators (marine mammals, large pelagic fishes, seabirds, and medium demersal) that feed on Atlantic herring in the Gulf of Maine-Georges Bank region. Many marine mammal populations in the region have increased dramatically in the last 20 years (NMFS 2002). Observations on the larger marine mammals such as humpback and fin whales suggest that these large predators have changed their diets to incorporate a larger proportion of herring during the 1990s and 2000s, instead of a diet that was dominated by sand lance in the 1980s (Read and Brownstein 2003). Smaller marine mammals such as harbor porpoise and harbor seals are also relying on Atlantic herring, based on diet studies from captured or stranded animals (Gannon et al. 1998; Williams 1999). Seabirds such as Northern gannets, shearwaters, and herring gulls are also likely preying routinely on herring (Powers and Backus 1987).

Read and Brownstein (2003) used survey-based estimates of abundance for eight species of marine mammals between 1991 and 1997 to estimate the total annual consumption of Atlantic herring by these species. Their estimates of marine mammal consumption ranged from about 94,000 to 190,000 mt of

herring per year. Their results show that minke whales, harbor porpoises, and white-sided dolphins are major predators on Atlantic herring because of high proportions of herring (34-51%) in their diets, whereas fin and humpback whales consume large quantities of herring to sustain their large body mass. Despite a three-fold increase in the harbor seal population in the Gulf of Maine between 1981 and 1997, herring only make up 13% of their diet. Consequently, the mean consumption estimate for harbor seals is below 5,000 mt a year.

Read and Brownstein's (2003) mean (or "best") estimate of Atlantic herring consumed annually by marine mammals during 1991-1997 was about 140,000 mt, with a range of 93,000-200,000 mt. Adding these estimates to the most current (1997) estimate of 100,000 mt of Atlantic herring consumed by fish and elasmobranch predators reported by Overholtz et al. (2000) produces a total mean estimate of 240,000 mt, with a range of 193,000-300,000 mt. During the 1990s, the total amount of herring consumed by all predators could have been as high as 400-450,000 mt.

Table 14. Annual Consumption Estimates (Metric Tons) of Atlantic Herring by Marine Mammal Predators (source: Read and Brownstein, 2003)

Marine Mammal Predators	
Species	**Estimated Annual Consumption, 1991-1997**
Fin Whale	16,081-62,362
Minke Whale	11,648-22,108
Humpback Whale	31,046-35,507
Pilot Whale	149-512
Harbor Porpoise	20,863-27,655
White-sided Dolphin	7,852-35,591
Harbor Seal	4,853
Gray Seal	1,310

7.6 POPULATION STATUS REVIEW OF RELEVANT PROTECTED SPECIES

7.6.1 Marine Mammals

Five marine mammal species are known to become entangled in gear used by the Atlantic herring fishery, namely, harbor porpoise, pilot whale, white-sided dolphin, harbor seal and gray seal. Both short and long-finned pilot whales are classified as strategic stocks under the MMPA. The status of these and other marine mammal populations inhabiting the northwest Atlantic Ocean has been discussed in great detail in the annual U.S. Atlantic Marine Mammal Stock Assessment Report. The reports present information on stock definition, geographic range, population size, productivity rates, potential biological removal levels (PBR – the number of human-caused deaths the stock can withstand annually and still reach and maintain an optimum population level), and fishery-specific mortality estimates and also compares the PBR to estimated human-caused mortality for each stock. To access the stock assessment report, see the NMFS website at http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/sars.html.

7.6.1.1 Harbor Porpoise

The Gulf of Maine harbor porpoise was proposed to be listed as threatened under the ESA on January 7, 1993 (NMFS, 1993), but NMFS determined this listing was not warranted (NMFS, 1999). NMFS

removed this stock from the ESA candidate species list in 2001. The PBR for the harbor porpoise is 747 animals (NMFS, 2002). The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR level, which means the human-induced mortality is not approaching a zero mortality and serious injury rate. This is not a strategic stock because average annual fishery-related mortality and serious injury has not exceeded the PBR level in recent years.

Harbor porpoises range from Labrador to North Carolina. The southern-most stock of harbor porpoise is referred to as the Gulf of Maine/Bay of Fundy stock and generally spends its winters in the Mid-Atlantic region. Harbor porpoises are generally found in coastal and inshore waters, but will also travel to deeper, offshore waters. The status of the harbor porpoise stock in U.S. waters relative to the optimum sustainable population is unknown. There are insufficient data to determine population trends for this species because harbor porpoises are widely dispersed in small groups, spend little time at the surface, and distribution varies unpredictably from year to year depending on environmental conditions (NMFS, 2002).

Shipboard line transect sighting surveys have been conducted to estimate population size of the harbor porpoise stock. The best estimate of abundance for the Gulf of Maine/Bay of Fundy harbor porpoise stock is 89,700. The minimum population estimate is 74,695 individuals (NMFS, 2002).

7.6.1.2 Pilot Whale

The two species of pilot whales in the Atlantic, long-finned and short-finned pilot whales, are difficult to distinguish to the species level at sea. The species tend to overlap from New Jersey to Cape Hatteras, North Carolina. Sightings north of this overlapping area are likely long-finned pilot whales, while sightings south of this area are more likely short-finned pilot whales.

Both long-finned and short-finned pilot whale abundance may have been affected by reduction in foreign fishing, curtailment of the Newfoundland drive fishery for pilot whales in 1971, and increased abundance of herring, mackerel, and squid stocks. The total number of long-finned and short-finned pilot whales off the eastern U.S. is unknown. Because long-finned and short-finned pilot whales are difficult to identify at sea, seasonal abundance estimates were reported for *Globicephala* species as a whole. The best abundance estimate for pilot whales (*Globicephala sp.*) is 14,524 and the minimum population estimate is 11,343 individuals.

Long-finned pilot whale

The status of long-finned pilot whales, *Globicephala melas*, relative to their optimum sustainable population is unknown, and there are insufficient data to determine a population trend for this species. Long-finned pilot whales are not listed under the ESA, but are considered a strategic stock because the 1996-2000 estimated average annual fishery-related mortality exceeds the PBR level (108) for this species.

Long-finned pilot whales range from North Carolina north to Iceland and Greenland and east to North Africa. Off the northeast U.S. coast, pilot whales are distributed principally along the continental shelf edge in the winter and early spring. In late spring, pilot whales move onto Georges Bank and into the Gulf of Maine and more northern waters until late autumn. Pilot whales generally prefer areas of high relief or submerged banks, and also areas associated with the Gulf Stream north wall and thermal fronts along the continental shelf edge. Stock structure of the long-finned pilot whale is uncertain, although it has been proposed that two populations exist (a warm-water population and a cold-water population) related to sea surface temperature (Fullard et al., 2000).

Short-finned pilot whale

The status of short-finned pilot whales, *Globicephala macrorynchus*, relative to their optimum sustainable population, is unknown, and there are insufficient data to determine a population trend for this species. Short-finned pilot whales are not listed under the ESA, but are considered a strategic stock because the 1996-2000 estimated average annual fishery-related mortality exceeds the PBR level (108) for this species.

Short-finned pilot whales range worldwide in tropical to warm temperate waters with North Carolina considered the northern extent of their range in U.S. waters. Sightings within U.S. waters are primarily within the Gulf Stream and along the continental shelf and continental slope in the northern Gulf of Mexico. No information is available on stock structure for this species.

7.6.2 Sea Turtles

All sea turtles that occur in U.S. waters are listed as either endangered or threatened under the ESA. The Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) are listed as endangered. The loggerhead (*Caretta caretta*) and green turtle (*Chelonia mydas*) are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific coast of Mexico, which are listed as endangered. All five of these species inhabit the waters of the U.S. Atlantic and Gulf of Mexico.

NOAA Fisheries recognizes five loggerhead subgroups within the western Atlantic including two primary subpopulations: 1) a northern nesting subpopulation that occurs from North Carolina to northeast Florida, about 29ºN (approximately 7,500 nests in 1998); 2) a south Florida nesting subpopulation, occurring from 29ºN on the east coast to Sarasota, Florida on the west coast (mean of 73,751 nests each year). The status of the northern population based on the number of loggerhead nests has been classified as stable or declining (TEWG, 2000). Data from all beaches within the south Florida subpopulation where nesting activity has been recorded indicate substantial increases when data are compared over the last 25 years. However, an analysis limited to nesting data from the statewide sea turtle Index Nesting Beach Survey program from 1989 to 2002, a period encompassing index surveys that are more consistent and more accurate than surveys in previous years, has shown no detectable trend (Blair Witherington, Florida Fish and Wildlife Conservation Commission (FFWCC, pers. comm., 2002).

The Kemp's ridley is one of the most endangered of the world's sea turtle species. The only major nesting site for Ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico. Estimates of the adult female nesting population reached a low of 300 in 1985. Conservation efforts by Mexican and U.S. agencies have aided this species by eliminating egg harvest, protecting eggs and hatchlings, and reducing at-sea mortality through fishing regulations. From 1985 to 1999, the number of nests observed at Rancho Nuevo, and nearby beaches increased at a mean rate of 11.3% per year (TEWG, 1998). Current totals exceed 8,000 nests per year, allowing cautious optimism that the population is on its way to recovery.

Recent population estimates for green sea turtle in the western Atlantic area are not available. However, the pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of index beaches in 1989.

Leatherback populations in the eastern Atlantic (*i.e.,* off Africa) and Caribbean appear to be stable, but there is conflicting information for some sites (Spotila, pers. comm.) and it is certain that some nesting populations (*e.g.,* St. John and St. Thomas, U.S. Virgin Islands) have been extirpated (NMFS and USFWS, 1995). Data collected in southeast Florida clearly indicate increasing numbers of nests for the

past twenty years (9.1-11.5% increase), although it is critical to note that there was also an increase in the survey area in Florida over time (NOAA Fisheries SEFSC, 2001).

7.7 EXISTING AND PROPOSED FEDERAL REGULATIONS/ACTIONS PERTAINING TO RELEVANT PROTECTED SPECIES

7.7.1 Marine Mammals

7.7.1.1 Harbor Porpoise

On December 1, 1998, NMFS published a final rule to implement the Harbor Porpoise Take Reduction Plan for the Gulf of Maine and the Mid-Atlantic coastal waters. The Northeast sink gillnet and Mid-Atlantic coastal gillnet fisheries are the two fisheries regulated by the HPTRP (63 FR 66464, December 2, 1998; also defines fishery boundaries). Among other measures, the HPTRP uses time/area closures in combination with acoustical devices (e.g., pingers) in Northeast waters, and time/area closures along with gear modifications for both small mesh (greater than 5 inches (12.7 cm) to less than 7 inches (17.78 cm)) and large mesh (greater than or equal to 7 inches (17.78 cm) to 18 inches (45.72 cm)) gillnets in Mid-Atlantic waters. Although the HPTRP predominately impacts spiny dogfish and monkfish fisheries due to high rates of porpoise bycatch, other gillnet fisheries are also managed under the HPTRP.

Copies of the final rule are available from the Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910-3226. Additional information regarding the rule and its changes can also be accessed via the Internet at http://www.nero.nmfs.gov/porptrp/.

7.7.1.2 Pilot Whale

There are no take reduction measures currently in place for pilot whales in the Atlantic Ocean. However, NMFS plans to convene two new take reduction teams in 2005 and 2006 to address incidental takes of pilot whales in Atlantic pelagic longline and trawl fisheries. The Pelagic Longline TRT will convene in June of 2005 and the Trawl TRT will follow in 2006.

7.7.2 Sea Turtles

Under the ESA, and its implementing regulations, taking sea turtles – even incidentally – is prohibited, with exceptions identified in 50 CFR 223.206. The incidental take of endangered species may only legally be authorized by an incidental take statement or an incidental take permit issued pursuant to section 7 or 10 of the ESA.

Existing NMFS regulations specify procedures that NMFS may use to determine that unauthorized takings of sea turtles are occurring during fishing activities, and to impose additional restrictions to conserve sea turtles and to prevent unauthorized takings (50 CFR 223.206(d)(4)). Restrictions may be effective for a period of up to 30 days and may be renewed for additional periods of up to 30 days each.

7.7.3 Seabirds

Under the Migratory Bird Treaty Act it is unlawful “by any means or in any manner, to pursue, hunt, take, capture, [or] kill” any migratory birds except as permitted by regulation (16 U.S.C. 703). The regulations at 50 CFR 21.11 prohibit the take of migratory birds except under a valid permit or as permitted in the implementing regulations. The US Fish and Wildlife Service’s Policy on Waterbird Bycatch states “It is the policy of the U.S. Fish and Wildlife Service that the Migratory Bird Treaty Act of 1918, as amended,

legally mandates the protection and conservation of migratory birds. Avian conservation is of significant concern to many in the United States. Substantial numbers of waterbirds (especially seabirds, but also waterfowl, shorebirds, and other related wading species) are killed annually in fisheries, making waterbird bycatch a serious conservation issue and a violation of the underlying tenets of the MBTA. The goal of the U.S. Fish and Wildlife Service is the elimination of waterbird bycatch in fisheries. The Service will actively expand partnerships with regional, national, and international organizations, States, tribes, industry, and environmental groups to meet this goal. The Service, in cooperation with interested parties, will aggressively promote public awareness of waterbird bycatch issues, and gather the scientific information to develop and provide guidelines for management, regulation, and compliance."

7.8 POTENTIAL IMPACTS TO ATLANTIC COASTAL STATE AND INTERSTATE FISHERIES

Regulations developed under the future trawl take reduction plan for pilot whales have the potential to impact trawl fisheries that target Atlantic herring.

7.9 IDENTIFICATION OF CURRENT DATA GAPS AND RESEARCH NEEDS

7.9.1 Marine Mammal Research Needs

- Abundance estimates capable of distinguishing short-finned from long-finned pilot whales are needed to achieve more accurate status assessments for this species and to improve the ability to monitor them.

7.9.2 Sea Turtle Research Needs

- In order to better understand sea turtle populations and the impacts of incidental take in Atlantic herring fisheries, in-water abundance estimates of sea turtles are needed to achieve more accurate status assessments for these species and improve our ability to monitor them.

7.9.3 Sea Bird Research Needs

- An analysis of existing bird bycatch data for this fishery should be conducted and summarized for the plan.

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