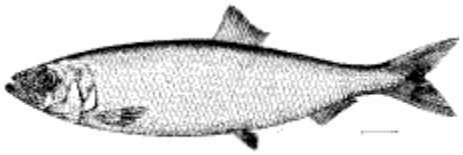
Proposed Atlantic Herring Specifications

for the 2007-2009 Fishing Years
(January 1, 2007 – December 31, 2009)

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



Prepared by the
New England Fishery Management Council

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

Date Submitted: November 3, 2006
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EXECUTIVE SUMMARY

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and the Atlantic Herring Fishery Management Plan (FMP) requires the New England Fisheries Management Council (Council) to develop specifications recommendations for each fishing year. The "Proposed Atlantic Herring Specifications and associated EA, RIR and IRFA" for the 2007-2009 fishing years includes proposed values for, and analysis of, the following alternatives for specifications:

SPECIFICATION	COUNCIL-PREFERRED	NMFS-Preferred * (the same as Council-Preferred in 2007, but as follows for 2008-2009)	NO ACTION
Allowable Biological Catch (ABC)	194,000	194,000	220,000
Optimum Yield (OY)	145,000	145,000	150,000
Domestic Annual Harvest (DAH)	145,000	145,000	150,000
Domestic Annual Processing (DAP)	141,000	141,000	146,000
Total Foreign Processing (JVPt)	0	0	0
Joint Venture Processing (JVP)	0	0	0
Internal Waters Processing (IWP)	0	0	0
U.S. At-sea Processing (USAP)	20,000 (Areas 2 and 3 only)	20,000 (Areas 2 and 3 only)	20,000 (Areas 2 and 3 only)
Border Transfer (BT)	4,000	4,000	4,000
Total Allowable Level of Foreign Fishing (TALFF)	0	0	0
Reserve	0	0	0
TAC Area 1A	50,000 (5,000 available Jan-May)	45,000 (5,000 available Jan-May)	60,000 (6,000 available Jan-May)
TAC Area 1B	10,000	10,000	10,000
TAC Area 2	30,000	30,000	30,000
TAC Area 3	55,000	60,000	50,000
Research Set-Aside	3% from each area TAC (2008 and 2009 FY only)	3% from each area TAC (2008 and 2009 FY only)	None

* **The NMFS-Preferred alternative is the proposed action**.

Note: These specifications will apply to the herring management areas, as modified in Amendment 1.

When the Council submitted its original specifications package/Environmental Assessment (EA), on November 3, 2006, it did not contain the NMFS-preferred alternative, but rather had the Council-preferred alternative as the proposed action. Upon reviewing the Council's submission, NMFS decided to select another alternative as the proposed action. The reasons for this decision are laid out below and in the body of the document.

It is also important to note that when the Council submitted its specifications package, Amendment 1 to the Atlantic Herring FMP was still under review by NMFS. One of the key issues in Amendment 1 was whether or not it would establish a purse seine/fixed gear (PS/FG) only area in Area 1A. Although referred to as a PS/FG measure, this measure is essentially a seasonal midwater trawl restricted gear area. Vessels using single and paired midwater trawls would be prohibited from fishing for Atlantic herring in Area 1A from June 1 – September 30 of each fishing year. Vessels using all other gear types and fishing for herring consistent with regulations in the FMP and other applicable FMPs would be allowed to fish for Atlantic herring in the restricted gear area (examples include vessels using a raised footrope trawl in Small Mesh Areas 1 and 2, and vessels participating in the northern shrimp fishery). All gear types would be allowed to harvest herring in Area 1A from October 1 – May 31. The Council supported this precautionary measure primarily because of concerns that trawlers were causing localized depletion of herring, which, in turn, the Council believes could have had a negative impact on the health of other fish, seabirds, and marine mammals that prey on herring. Because the PS/FG only area was still under review, the Council's specifications package included a discussion of the environmental impacts of the various specifications alternatives in the event that the PS/FG only area was approved or disapproved.

Since the Council's submission, NMFS has partially approved Amendment 1. The PS/FG only area was approved, and will be implemented in 2007. This meant that, in revising this specifications package, NMFS had to decide whether it would rewrite the sections of the document that had considered the two possible outcomes of the Amendment 1 approval process: that the PS/FG only area would be approved or disapproved. Because the document, as originally submitted, did a good job of discussing/analyzing the impacts of the approval and the disapproval of the PS/FG only area, NMFS decided that it was not necessary to rewrite those sections. The information presented, even though some of it no longer applies, is not confusing and is sufficient for the readers to consider for themselves the impacts of the implementation of the PS/FG only area.

The proposed specifications are consistent with the provisions contained in Amendment 1 to the Atlantic Herring FMP, which was submitted to NMFS on May 3, 2006. This document also contains information and supporting analyses required under other applicable law, namely the National Environmental Policy Act (NEPA), Regulatory Flexibility Act (RFA), and Executive Order 12866.

Amendment 1 to the Atlantic Herring FMP was developed by the Council and submitted to NMFS on May 3, 2006. While the measures proposed in Amendment 1 are still under review, the Council is developing the herring fishery specifications under the assumption that several related provisions contained in Amendment 1 will ultimately be approved and implemented prior to January 1, 2007. The provisions in Amendment 1 allow for three-year specifications, as proposed in this document (2007-2009).

The proposed action requires the Council to conduct a one-year review of all fishery specifications. The current language for multi-year specifications in Amendment 1 already requires the Herring PDT to review stock status annually and allows the Council to adjust specifications during the interim years if necessary. The intent of specifically including this requirement in the proposed action, however, is to convey a formal commitment by the Council to review the fishery specifications (during a Council meeting for example) in one year. The specifications are still proposed to be set for three years, and no action would be required if the Council determines that the specifications should remain unchanged after

the first year. The one-year review would occur during the 2007 fishing year so that any adjustments to the specifications and TACs, if necessary, could be made for the 2008 and 2009 fishing years.

Allowable biological catch (ABC) – total removals from the Atlantic herring stock complex – is proposed to be set at **194,000 mt** for the 2007-2009 fishing years, consistent with the MSY value resulting from the most recent stock assessment (TRAC 2006, Appendix I). The specification of OY for the herring fishery relates to the geographic distribution of the selected total allowable catches (TACs), the relative risk of overfishing individual stock components, and the extent to which development of the offshore fishery should be encouraged. Hence, there may be important reasons to consider specifying OY at a level less than ABC, as the Council is proposing (see below). The risk of overfishing individual stock components is addressed through the risk assessment analysis described in Section 5.2.2 of this document. In addition, three-year projections provided in Section 5.2.1 of this document focus on the impacts of total removals from the herring stock complex, regardless of the management area from which the fish are harvested.

The Council is proposing a U.S. OY value of **145,000 mt**, which is 5,000 mt less than the current value and provides a 29,000 mt buffer between ABC and OY (including 20,000 mt Canadian catch). The proposed action provides the opportunity for total U.S. fishery landings to increase about 35% above recent (1995-2005) levels. The Council is proposing a buffer between ABC and OY for several reasons, which are discussed in more detail in this document:

- At the 2006 TRAC Assessment Meeting, scientists identified a significant retrospective pattern in the model utilized to estimate Atlantic herring biomass and fishing mortality. The retrospective pattern overestimates SSB (averaging + 14.5%/year, and ranging between 1-24%) and underestimates fishing mortality; this is a concern that should be considered in the context of allowing the herring fishery to expand significantly and/or rapidly above current levels. While a buffer still provides opportunities to expand the fishery in the appropriate areas, allowing removals from the fishery to increase all the way to ABC may be detrimental to the stock complex over the long-term, given the retrospective pattern.
- Recruitment for Atlantic herring is highly dependent on favorable environmental conditions. A buffer between ABC and OY may help to ensure that adequate SSB is available to produce strong and healthy recruitment in fluctuating and unpredictable environmental conditions.
- The importance of herring as a forage species for other Northeast region fish, mammals, and birds is another reason that a buffer between ABC and OY may be appropriate at this time.

Consistent with the recommendations of the Herring Committee and the Council, DAH for the fishery is proposed to be set at 145,000 mt, DAP is proposed to be set at 141,000 mt, and there would be no specification for either TALFF or JVP.

The Council-preferred alternative—which is what the Council proposed when it submitted its specification package (including the environmental assessment (EA))—set the TAC in Area 1A at 50,000 mt, which is less than what has been landed from the area in each of the years since the implementation of the Atlantic Herring FMP in 2000. In most of those years, the 1A TAC, which was set at 60,000 mt, has been fully utilized. The Council's decision to set the Area 1A TAC at 50,000 mt was based on a number of factors. Among them, that the inshore component of the Atlantic herring stock is the most vulnerable component of the stock complex; therefore, the management measures are focused on providing the greatest protection to the component that is thought to be most susceptible to overfishing. Although Area 1A is not synonymous with the "inshore component," there is a considerable amount of overlap. A risk assessment requested by the Council and performed by the PDT found that of all the alternatives, the Council-preferred action appears to be marginally successful in producing an exploitation rate that is consistent with F_{MSY} for the stock complex within the range of what is considered to be realistic summer

and winter mixing ratios (see Section 5.2.2). This is important because the Herring PDT argued that it would be advisable to establish an area 1A TAC that keeps exploitation of this component at or below F_{MSY}.

The rationale the Council used to reduce the Area 1A TAC by 10,000 mt is sound; however, NMFS believes that the PDT analysis demonstrates that an even deeper cut in the Area 1A TAC is warranted. NMFS is especially concerned about one of the issues raised by the Council in its specifications package: the strong retrospective pattern in the model utilized to estimate Atlantic herring biomass and fishing mortality. The retrospective pattern overestimates SSB (averaging + 14.5 percent/year, and ranging between 1-24 percent) and underestimates fishing mortality. The existence of a strong retrospective pattern in the assessment data can quickly transform optimistic assessments of the stock into ones that are cause for significant concern, and result in the need for corrective action. While the herring stock as a whole is currently in good shape, given the retrospective pattern identified, it is likely that as more data are collected and analyzed, it will turn out that the health of the stock today is not as robust as the current data imply.

The NMFS-preferred alternative (the proposed action), by reducing the area 1A TAC an additional 5,000 mt in 2008 and 2009, is more risk averse than the Council-preferred alternative, and it would better ensure that exploitation rates are more consistent with not exceeding F_{MSY}. NMFS believes that the extra amount of caution that a 45,000 mt Area 1A TAC affords is warranted given the strong retrospective pattern in this fishery. The Atlantic States Marine Fisheries Commission (Commission) has already specified measures for 2007 consistent with the Council-preferred alternative. To maintain consistent management, at least for the first year, the NMFS-preferred alternative would make the transition to a lower Area 1A TAC in two steps over the next three fishing years. The NMFS-preferred alternative also increases the Area 3 TAC by 5,000 mt, which does not increase risk to the inshore component, but does provide the herring fleet with an added opportunity to expand their landings from this area.

The NMFS-preferred alternative would not result in significant impacts to the herring resource, non-target species, protected resources, habitat or the herring fishery. The proposed reduction in ABC, OY and allocations to management areas would not increase the risk of reducing the herring stock size. The following table summarizes the impacts related to the reduction in the Area 1A TAC, the key component of the NMFS-preferred alternative (the proposed action), which is expected to produce the greatest social and economic impacts relative to the other proposed specifications. The Area 1A TAC is the only TAC that is fully utilized on an annual basis, and a 17% reduction in this TAC in the first year, then a 25% reduction in the second and third years, is expected to affect a number of individuals, from the harvesting and processing sectors as well as consumers (lobstermen, bait dealers, etc.).

Potential Social and Economic Impacts of the NMFS-preferred alternative (proposed action), 17% Reduction in the Area 1A TAC in 2007, and a 25% reduction in the Area 1A TAC in 2008 and 2009

TAC ALTS	WHO/WHAT MAY BE IMPACTED?	NATURE OF IMPACTS	OTHER COMMENTS
Proposed Action High Impact Key feature: Reduction of Area 1A TAC from 60,000 to 50,000 mt in 2007, and then to 45,000 mt in 2008 and 2009	• Purse seine vessels • Other vessels dependent on Area 1A • Sardine cannery • Other processors in communities adjacent to GOM • Lobster fishery	• Loss in revenues/income • Loss of supply/effects on markets • Localized Price effects • Derby fishing • Longer steam time • Safety considerations • Increased fuel costs • More time away from families/home	• Purse seine vessels most reliant on Area 1A and most limited in terms of flexibility • These impacts will be shaped by the implementation of Amendment 1 – particularly the PS/FG only area

The next table summarizes the potential loss in revenues for limited access vessels that were active in Area 1A from 2003-2005, assuming that Area 1A landings from these vessels stay proportionately the same as they were during the 2005 fishing year. The estimated impacts in this table are based on lost catch from Area 1A only and do not include costs associated with increased steam time to other areas and/or increased catches from other areas that may offset some of the lost 1A revenues. If they cannot increase their proportion of the Area 1A TAC, the four traditional purse seine vessels are likely to be the most impacted at the individual vessel level because they cannot safely access other management areas to fish for herring. These estimates also do not consider the potential impacts of the purse seine/fixed gear-only area that may be implemented as part of Amendment 1 to the Herring FMP (see discussion in Section 5.3.1.1.2 of this document).

Potential Loss in Revenues from Area 1A TAC Reduction to 50,000 mt in 2007 and 45,000 mt in 2008 and 2009 (Proposed Action), Assuming 2005 Proportion of Catch by Gear Type

Active Vessels (2003-2005)	% of 2005 Area 1A Catch	Maximum Projected Loss (mt) Based on Historic % of 2005 1A Catch	Gear Sector Total Potential Loss ($)	Individual Vessel Potential Loss ($)
Purse Seine (4)	27%	2,700 (at 50,000 mt level) 4,050 (at 45,000 mt level)	$545,400 (at 50,000 mt level) $818,100 (at 45,000 mt level)	$136,350 (at 50,000 mt level) $204,525 (at 45,000 mt level)
Midwater Trawl (4)	18%	1,800 (at 50,000 mt level) 2,700 (at 45,000 mt level)	$363,600 (at 50,000 mt level) $545,400 (at 45,000 mt level)	$90,900 (at 50,000 mt level) $136,350 (at 45,000 mt level)
Pair Trawl (12)	55%	5,500 (at 50,000 mt level) 8,250 (at 45,000 mt level)	$1,111,000 (at 50,000 mt level) $1,666,500 (at 45,000 mt level)	$92,583 (at 50,000 mt level) $138,875 (at 45,000 mt level)

Potential Positive Social and Economic Impacts

The summary of impacts provided above focuses on the negative impacts of a reduction in the Area 1A TAC on herring fishery-related businesses and communities. If this reduction in TAC leads to healthier herring stocks, then these measures may have positive benefits for all participants over the long-term. Healthy fish stocks are an essential foundation for economic and social sustainability in relation to this fishery. More plentiful herring could also lead to greater participation of the stop seine or weir fishery which depends on herring coming in shore. Moreover, where this action encourages activity in the offshore management areas, these fisheries may be further developed and may result in improved information about the location of stocks – an area where there is much room for growth.

In addition to the stakeholders described in the previous sections of this document, there are a number of stakeholder groups that may also stand to gain from a reduction in the inshore quota, as herring is an important forage species for a number of different fish and mammal species and plays an integral role in the overall health of the Gulf of Maine ecosystem. For example, to the extent to which a reduction in the Area 1A TAC improves the availability and quality of tuna, the tuna fishery may benefit. Additionally, more herring in the inshore gulf of Maine may be associated with increased numbers of marine mammals feeding in this area. If so, this would benefit ecotourism operations such as whale watching trip businesses operating in the Gulf of Maine. Participants in other fisheries (such as the groundfish fishery) may also gain from leaving more herring in the inshore areas. However, such impacts are difficult to predict, as the availability of tuna and marine mammals in the inshore Gulf of Maine is dependent on a number of additional factors. Nevertheless, the importance of herring in the ecosystem warrants mention of the potential long-term benefits of a healthier stock in the inshore Gulf of Maine.

The following table provides an overview of the likely impacts of the various alternatives on the valued ecosystem components (VECs). The table considers only the parts of the alternatives that would directly impact the herring stock. Other measures, such as USAP and BT are not included.

Measures/ Alternatives#	Differences from No Action	VECs			
		Herring Resource	**Habitat**	**Protected Resources**	**Socio-Economic Resources**
No Action	**No Change**	**NEUTRAL**	**NEUTRAL**	**NEUTRAL**	**NEUTRAL**
ABC* **OY/MSY***	< ABC < OY/MSY	**POSITIVE** > Herring stock due to < fishing mortality	**NEUTRAL**	**POSITIVE** Potential > in forage due to < fishing mortality	**NEGATIVE** < Revenue and/or product supply due to < ABC and < OY/MSY
Alternatives Exhibiting Area TAC Differences with No Action					
NMFS Preferred and Proposed Action	< TAC Area 1A > TAC Area 3	**MORE POSITIVE** for resource overall and for inshore component*** due to < fishing mortality	**NEUTRAL**	**POSITIVE** Potential > in forage due to < fishing mortality	**NEGATIVE** overall and in Area 1A** due to < revenue and/or product supply
Council Preferred	< TAC Area 1A > TAC Area 3	**POSITIVE** for resource overall and for inshore component*** due to < fishing mortality	**NEUTRAL**	**POSITIVE** Potential > in forage due to < fishing mortality	**NEGATIVE** overall and in Area 1A** due to < revenue and/or product supply
Alternative 1		**NEUTRAL**	**NEUTRAL**	**NEUTRAL**	**NEUTRAL**
Alternative 2	< TAC Area 1A > TAC Area 3	**MORE POSITIVE** for resource overall and for inshore component*** due to < fishing mortality	**NEUTRAL**	**POSITIVE** Potential > in forage due to < fishing mortality	**NEGATIVE** overall and in Area 1A** due to < revenue and/or product supply
Alternative 3	> TAC Area 3	**NEGATIVE** For resource overall due to > fishing mortality; and for inshore component, neutral	**NEUTRAL**	**NEGATIVE** Potential < in forage due to > fishing mortality	**NEUTRAL** in Area 1A and **POSITIVE** overall due to > revenue and/or product supply
Alternative 4	< TAC Area 1A > TAC Area 2 > TAC Area 3	**NEGATIVE** For resource overall due to > fishing mortality; and **POSITIVE** for inshore component due to < fishing mortality	**NEUTRAL**	**NEGATIVE** Potential < in forage due to > fishing mortality	**NEGATIVE** in Area 1A** due to < revenue and/or product supply, and **POSITIVE** overall due to > revenue and/or product supply

POSITIVE = Positive in comparison to No Action
MORE POSITIVE = Slightly more positive than positive in comparison to No Action

NEGATIVE = Negative in comparison to No Action
NEUTRAL = No Change in comparison to No Action or No Impact
* Applies to all Alternatives except No Action
** Reduced revenues in Area 1A may be ameliorated by a shift to increased offshore fishing effort
*** Resource overall means all TACs combined, and inshore component focuses on the impact on the inshore component of the stock

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1.0 INTRODUCTION

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and the Atlantic Herring Fishery Management Plan (FMP) requires the New England Fisheries Management Council (Council) to develop specifications recommendations for each fishing year. This document contains the "Proposed Atlantic Herring Specifications and associated EA, RIR and IRFA" for the 2007-2009 fishing years includes proposed values for, and analysis of, the following alternatives for specifications:

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The NMFS-preferred alternative would not result in significant impacts to the herring resource, non-target species, protected resources, habitat or the herring fishery. The proposed reduction in ABC, OY and allocations to management areas would not increase the risk of reducing the herring stock size. The following table summarizes the impacts related to the reduction in the Area 1A TAC, the key component of the NMFS-preferred alternative (the proposed action), which is expected to produce the greatest social and economic impacts relative to the other proposed specifications. The Area 1A TAC is the only TAC that is fully utilized on an annual basis, and a 17% reduction in this TAC in the first year, then a 25% reduction in the second and third years, is expected to affect a number of individuals, from the harvesting and processing sectors as well as consumers (lobstermen, bait dealers, etc.).

1.1 BACKGROUND: AMENDMENT 1 TO THE HERRING FMP

Amendment 1 to the Atlantic Herring FMP was developed by the Council and submitted to NMFS on May 3, 2006. While the measures proposed in Amendment 1 are still under review, the Council is developing the herring fishery specifications under the assumption that several related provisions contained in Amendment 1 will ultimately be approved and implemented prior to January 1, 2007. The Amendment 1 measures/provisions related to the herring fishery specifications are described below:

- **Three-Year Specification Process:** Amendment 1 establishes a process for setting herring fishery specifications for three years (Section 4.7 of the Amendment 1 FSEIS). While a SAFE Report will only be prepared every three years, the Herring PDT will meet at least once during interim years to review the status of the stock relative to the overfishing definition if information is available to do so. Additionally, this measure maintains flexibility to adjust the fishery specifications in the interim years. No action is required by the Council to maintain the same specifications for all three fishing years; Council action is only required if adjustments to the specifications during the interim years are to be made.

  This document incorporates information from the Atlantic Herring SAFE Report for the 2005 fishing year and proposes herring fishery specifications for the 2007-2009 fishing years, in accordance with the provisions contained in the Atlantic Herring FMP and Amendment 1. The analyses in this document consider the impacts of maintaining the proposed specifications on the herring resource and fishery-related businesses and communities for three fishing years (2007-2009). Should the measure

proposed in Amendment 1 to establish three-year specifications not be approved by NMFS (decision pending at this time), the Council would continue to develop specifications on an annual basis. If this is the case, the specifications proposed in this document would be implemented for the 2007 fishing year only, and the Council would consider the 2008 specifications during 2007.

- **Maximum Sustainable Yield (MSY):** Amendment 1 proposes a proxy value for MSY of 220,000 mt, recognizing the uncertainty associated with the 2003 TRAC Assessment for herring. However, the amendment includes language that if the next stock assessment for Atlantic herring produces one scientifically-accepted estimate of MSY, then the MSY value specified in the Atlantic Herring FMP (and its associated reference points) would automatically change to be consistent with the newly-accepted MSY value.

  The 2006 TRAC Assessment of the Atlantic herring complex reached agreement on a new MSY value of 194,000 mt (see Appendix I for more information), so this new value will automatically replace the 220,000 mt proxy proposed in Amendment 1, and the associated reference points will change accordingly. The Council is developing the 2007-2009 herring fishery specifications, including Allowable Biological Catch (ABC) and Optimum Yield (OY), based on the MSY value that was provided by the 2006 TRAC Assessment.

- **Determining the Distribution of TACs:** Amendment 1 authorizes the Herring PDT, in consultation with the Committee, AP, and other interested parties, to utilize the most appropriate analytical approach for determining the distribution of area-specific TACs during the fishery specification process, provided the PDT justifies its approach (Section 4.6 of Amendment 1 FSEIS). The approach that the PDT has developed for the 2007-2009 specifications is described in this document.

- **Research Set-Asides:** Amendment 1 authorizes the Council, in consultation with the ASMFC, to set-aside 0-3% of the TAC from any management area(s) to support herring-related research. The Council 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 (RSA) is intended to be in addition to the current 5% set-aside for incidental catch once the directed fishery in a management area closes.

  The timing of both the completion Amendment 1 and this fishery specification process precludes the Council from making a research set-aside available for the 2007 fishing year. However, the Council is proposing to establish a research set-aside for the 2008 and 2009 fishing years, as described in this document. The Council will identify research priorities, NMFS will publish the RFP, and proposals will be reviewed and approved during the 2007 fishing year so that funds could be made available for projects at the start of the 2008 fishing year. If the RSA measure proposed in Amendment 1 is not approved by NMFS (decision pending at this time), then the RSAs proposed in this document for the 2008-2009 fishing years would not be implemented, and the amount of fish proposed for set-aside would be returned to the appropriate area-specific TAC(s) prior to implementation of the TACs for the 2008 and 2009 fishing years.

- **Seasonal Split of 1A TAC:** The language in Amendment 1 (Section 4.6 of FSEIS) allows the Council to review and adjust the seasonal split of the Area 1A TAC through the specification process. This includes both the amount of the TAC split in Area 1A (currently 6,000/54,000 mt) as well as the timing of the split (currently Jan-May/June-December). Consistent with this provision, the **NMFS-preferred alternative (proposed action)** proposes to change the amount of the TAC split in Area 1A for the 2007-2009 fishery specifications (see Section 2.0).

- **TAC Set-Aside for Other Fixed Gear Fisheries in 1A:** According to Amendment 1, 500 mt of the Area 1A TAC would be set aside for the fixed gear fisheries in Area 1A (weirs and stop seines) that occur west of Cutler. This set-aside will be available to fixed gear fishermen west of Cutler in Area 1A until November 1. If the set-aside has not been utilized by the fixed gear fisheries west of Cutler

in Area 1A by November 1, then it will 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 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-pound trip limit). The language proposed in Amendment 1 also authorizes the Council to adjust the details of any TAC set-asides through the framework adjustment process in the future, as necessary.

- **Bycatch Caps:** Establishing and modifying catch/bycatch caps are identified Amendment 1 as measures that can be implemented through a framework adjustment to the Herring FMP or through the fishery specification process, whichever is most expeditious. Measures that could be implemented through a framework adjustment or the herring fishery specification process to address bycatch in the herring fishery also include seasonal and temporal closures in high bycatch areas and catch/bycatch caps.

  Framework 43 was very recently implemented (August 15, 2006) and establishes a cap and monitoring program for haddock incidental catch in the directed herring fishery. The measures proposed in this framework adjustment include a catch cap for haddock (0.2% of U.S. target TAC for haddock), an incidental catch allowance for other regulated multispecies (100 pounds), and a monitoring program for the catch cap. These measures will apply to Category 1 herring vessels during the 2006 fishing year and to vessels with a limited access directed fishery permit for herring once Amendment 1 to the Herring FMP is implemented. The classification of herring midwater trawl and purse seine gear relative to the multispecies fishery was modified through this action as well. No additional measures to address bycatch are proposed in this specifications package.

1.2 PURPOSE AND NEED

The Atlantic Herring FMP requires that the NMFS Regional Administrator, after consultation with the Council, determine the specifications for the herring fishery on an annual basis. The Herring FMP requires the Council and the Regional Administrator to review the best available information regarding the status of the resource and fishery and develop appropriate fishery specifications. The FMP also provides the Regional Administrator the authority to adjust the specifications in mid-season as necessary. Amendment 1 modifies the timing of this process and allows for three-year specifications, as proposed in this document.

The Herring FMP mandates that the total allowable catch (TAC) be distributed to the management areas shown in Figure 1 (Section 2.0) on an annual basis. If approved, Amendment 1 will modify these management areas to those shown in Figure 2, and the TACs will apply accordingly. The Council uses the best information available to estimate the proportion of each spawning component of the Atlantic herring stock complex in each area/season and distributes the TACs such that the risk of overfishing an individual spawning component is minimized.

The purpose of this action is to establish specifications for the Atlantic herring fishery during the 2007-2009 fishing years. The specifications are intended to meet the goal and many of the objectives of the Atlantic Herring FMP, as modified in Amendment 1, specifically:

Goal

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

Objectives

- Harvest the Atlantic herring resource consistent with the definition of overfishing contained in the Herring FMP and prevent overfishing

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

2.0 COUNCIL-PREFERRED AND NMFS-PREFERRED ALTERNATIVE (THE PROPOSED ACTION): 2007-2009 SPECIFICATIONS FOR THE ATLANTIC HERRING FISHERY

The Council-preferred alternative was the preferred alternative that the Council submitted with its original specifications package. NMFS reviewed the Council's specifications package and decided to develop an additional alternative (the NMFS-preferred alternative), which falls within the range of alternatives considered in the original EA and specification package submitted by the Council. The rationale for proposed the NMFS-preferred alternative is provided in Section 1.0, and the specific impacts are described in Section 5.0.

Although the Council-preferred alternative and the NMFS-preferred alternative (the proposed action) are different, they have many similarities, e.g., OY, USAP, BT, etc. Given these similarities and the importance of enabling the reader to compare and contrast the two alternatives, they are presented together so that their similarities and differences can be more easily highlighted and analyzed.

2.1 FISHERY SPECIFICATIONS AND TACS

The Council-preferred and the NMFS-preferred alternative for the Atlantic herring fishery during the 2007-2009 fishing years are summarized in Table 1. The current management areas for the Atlantic herring fishery, to which the proposed TACs apply, are depicted in Figure 1. Amendment 1 to the Herring FMP proposes several adjustments to the management area boundaries, intended primarily to redefine Area 3; if these changes are approved, then the proposed specifications for 2007-2009 will apply to the management areas depicted in Figure 2.

Figure 1 Current (2006) Management Areas for the Atlantic Herring Fishery

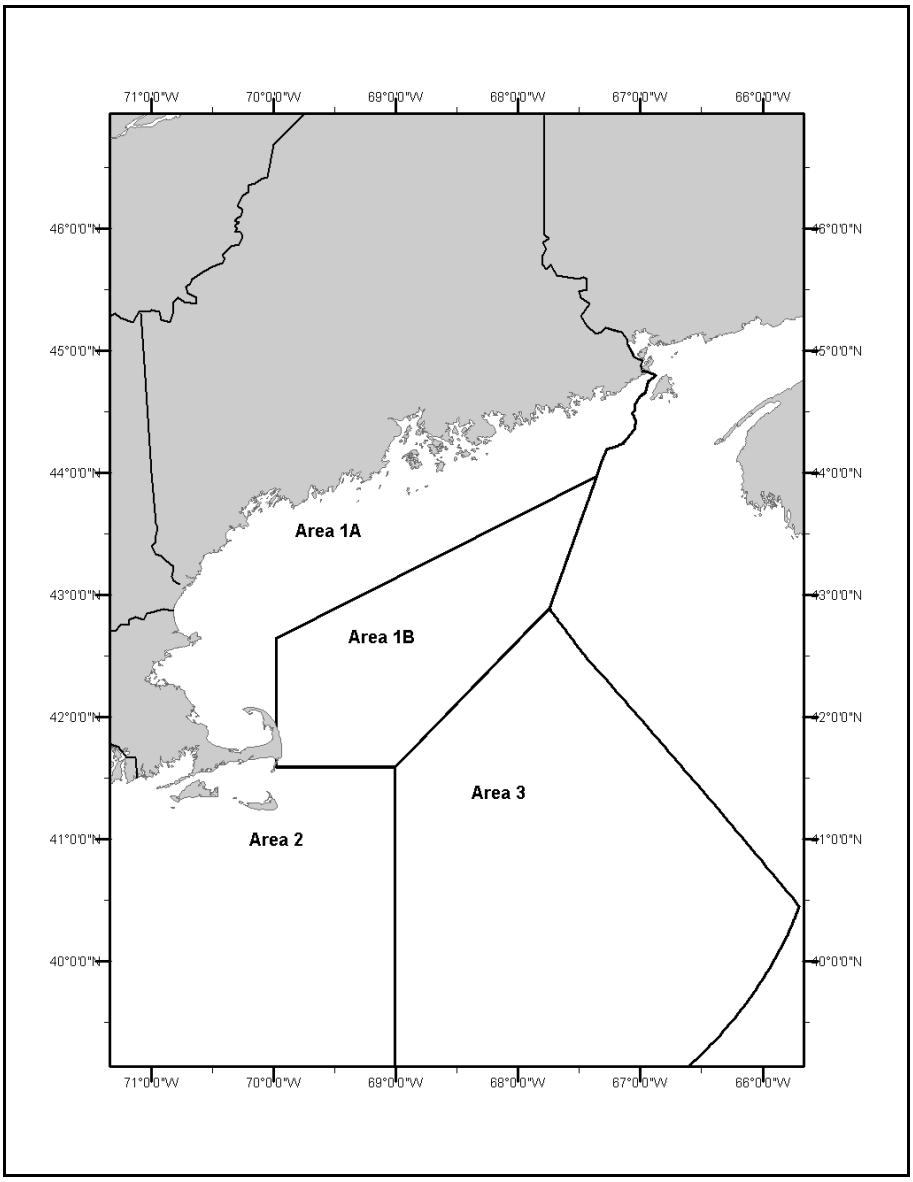
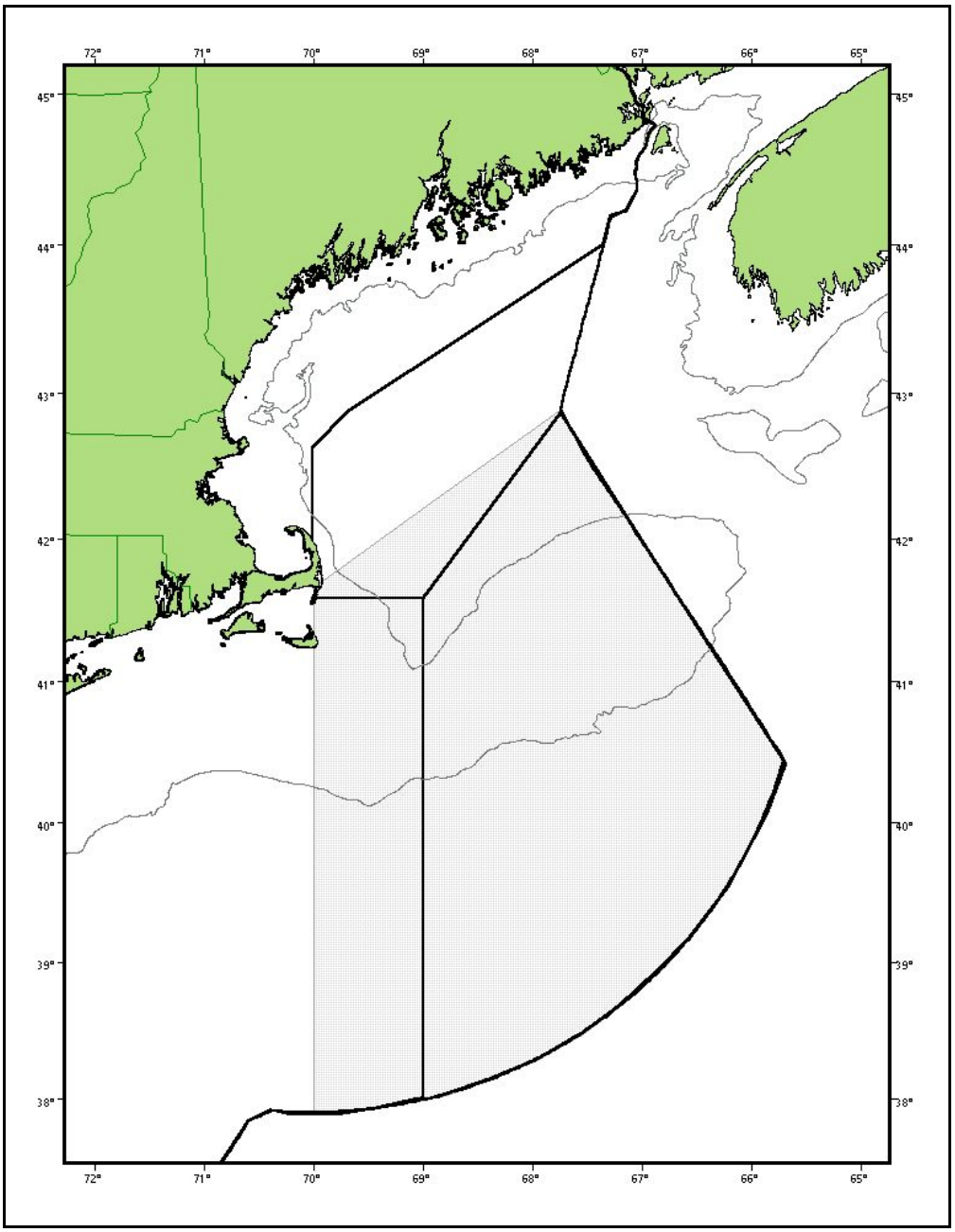


Figure 2 Proposed Revisions to Management Area Boundaries (Shaded, Amendment 1)



New Area 3 – *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.*

Area numbers (1A, 1B, 2, and 3) would be the same as they are in Figure 1 with the new boundaries shown in the above figure.

The Council-preferred and the NMFS-preferred alternative (proposed action) set the Allowable Biological Catch (ABC) based on the most recent stock assessment for herring and establishes an OY value of 145,000 mt for the U.S. Atlantic herring fishery. Consistent with the recommendations of the Herring Committee and the Council, DAH for the fishery is proposed to be set at 145,000 mt, DAP is proposed to be set at 141,000 mt, and there would be no specification for either TALFF or JVP. The proposed action provides a buffer of 29,000 mt between ABC and OY with the inclusion of Canadian harvest, and it provides the opportunity for total U.S. fishery landings to increase about 35% above recent (1995-2005) levels.

Table 1 Council-preferred and NMFS-preferred alternative (proposed action): Atlantic Herring Fishery Specifications for 2007-2009

SPECIFICATION	Council-preferred	NMFS-Preferred * (the same as Council-Preferred in 2007, but as follows for 2008-2009)
Allowable Biological Catch (ABC)	194,000	194,000
Optimum Yield (OY)	145,000	145,000
Domestic Annual Harvest (DAH)	145,000	145,000
Domestic Annual Processing (DAP)	141,000	141,000
Total Foreign Processing (JVPt)	0	0
Joint Venture Processing (JVP)	0	0
Internal Waters Processing (IWP)	0	0
U.S. At-sea Processing (USAP)	20,000 (Areas 2 and 3 only)	20,000 (Areas 2 and 3 only)
Border Transfer (BT)	4,000	4,000
Total Allowable Level of Foreign Fishing (TALFF)	0	0
Reserve	0	0
TAC Area 1A	50,000 (5,000 available Jan-May)	45,000 (5,000 available Jan-May)
TAC Area 1B	10,000	10,000
TAC Area 2	30,000	30,000
TAC Area 3	55,000	60,000
Research Set-Aside	3% from each area TAC (2008 and 2009 FY only)	3% from each area TAC (2008 and 2009 FY only)

* **The NMFS-Preferred alternative is the proposed action**.

Note: These specifications will apply to the herring management areas, as modified in Amendment 1.

In addition, the proposed action requires the Council to conduct a one-year review of all fishery specifications. The current language for multi-year specifications in Amendment 1 already requires the Herring PDT to review stock status annually and allows the Council to adjust specifications during the interim years if necessary. The intent of specifically including this requirement in the proposed action, however, is to convey a formal commitment by the Council to review the fishery specifications (during a Council meeting for example) in one year. **The specifications are still proposed to be set for three years, and no action would be required if the Council determines that the specifications should remain unchanged after the first year.** The one-year review would occur during the 2007 fishing year so that any adjustments to the specifications and TACs, if necessary, could be made for the 2008 and 2009 fishing years.

Three percent of each management area TAC is proposed to be set-aside in 2008 and 2009 to support herring-related research. The research set-aside (RSA) is in addition to the current set-aside for incidental catch in an area once 95% of the TAC is projected to be reached, so under the proposed action, the directed herring fishery in a management area would close if 92% of the TAC is projected to be reached, assuming that all of the proposed set-aside is allocated for research in 2008 and 2009. RSAs will be allocated prior to the start of the 2008 and 2009 fishing years, so any un-allocated portion of the set-aside will be returned to the directed fishery prior to the start of the fishing year. As an example:

> Three percent of the Area 1A TAC (as well as all other areas) is set-aside to support research during the 2008 fishing year. If only 1% of the Area 1A TAC is allocated for research projects in 2008, the remaining 2% of the TAC that was set-aside would be returned to the 1A TAC prior to the start of the 2008 fishing year, and the fishery in 1A would close if 94% of the TAC is projected to be reached in 2008.

The differences between the Council-preferred 2007-2009 specifications and the current (2005/2006) specifications are:

- Reduction of ABC from 220,000 mt to 194,000 mt,
- Reduction of OY from 150,000 mt to 145,000 mt,
- Reduction of DAH from 150,000 mt to 145,000 mt,
- Reduction of DAP from 146,000 mt to 141,000 mt,
- Reduction in the Area 1A TAC from 60,000 mt (6,000 Jan-May) to 50,000 mt (5,000 Jan-May);
- Increase in the Area 3 TAC from 50,000 mt to 55,000 mt, and
- Establishment of 3% Research Set-Asides in all areas during 2008 and 2009.

The differences between the NMFS-preferred (proposed action) 2007-2009 specifications and the current (2005/2006) specifications are:

- Reduction of ABC from 220,000 mt to 194,000 mt,
- Reduction of OY from 150,000 mt to 145,000 mt,
- Reduction of DAH from 150,000 mt to 145,000 mt,
- Reduction of DAP from 146,000 mt to 141,000 mt,
- Reduction in the Area 1A TAC from 60,000 mt (6,000 Jan-May) to 50,000 mt (5,000 Jan-May) in 2007, and to 45,000 mt (5,000 Jan-May) in 2008 and 2009;
- Increase in the Area 3 TAC from 50,000 mt to 60,000 mt, and
- Establishment of 3% Research Set-Asides in all areas during 2008 and 2009.

Additional background and supporting information for the proposed specifications can be found in Section 5.1 of this document (p. 92).

2.2 ASMFC SPECIFICATIONS FOR 2007-2009 AND ADDITIONAL ASMFC MEASURES

The specification process for the Atlantic herring fishery in both State and Federal waters continues to be a joint process. The ASMFC Atlantic Herring Section meets with the NEFMC Herring Oversight Committee to establish area-specific TACs that apply throughout the management area despite the border between State and Federal waters. Under Interstate Amendment 2 (ASMFC) and Amendment 1 to the NEFMC Fishery Management Plan, the NEFMC's Herring PDT and the ASMFC's Herring Technical Committee (TC) will meet tri-annually to review the most recent stock and fishery information. The PDT and TC will recommend necessary changes to the next three fishing year's specifications. Within this multi-year management measure, the NEFMC and ASMFC will have the ability to modify the specifications during the interim years as necessary.

At its October 2006 meeting, the ASMFC Herring Section reviewed the Council's recommendations for the 2007-2009 fishery specifications and agreed to implement consistent specifications and management area TACs (Table 2). While the herring resource is considered rebuilt and overfishing is not occurring, scientific models have suggested that total herring biomass may be overestimated and fishing mortality underestimated. In addition, abundance survey trends in the inshore Gulf of Maine are declining. Given these findings, the ASMFC Herring Section opted to manage the fishery in a more cautious manner like the New England Council had proposed, limiting the Area 1A TAC to 50,000 metric tons – a 10,000 metric ton reduction from the initial specification that the Section voted at the September 2006 joint meeting with the Council's Herring Committee. At this time, the only difference between the ASMFC specifications and the NMFS-preferred alternative during 2007 is that ASMFC voted to specify USAP at 0 mt, so USAP for 2007 activities will be limited to 20,000 mt in Federal waters in Areas 2 and 3 only. There are additional differences between the ASMFC and NMFS-preferred alternative (proposed action) in 2008 and 2009. For both years, the ASMFC voted to specify USAP at 0 mt, so USAP for 2008 and 2009 activities will be limited to 20,000 mt in Federal waters in Areas 2 and 3 only. For 2008 and 2009, the NMFS-preferred alternative (proposed action) sets the Area 1A 5,000 mt lower than the ASFMC TAC for the same area. Therefore, in those two years when 95 percent of the federally-set 45,000 mt cap for Area 1A is reached, all federally-permitted herring vessels will be limited to 2,000 lb possession limit, even though the state waters TAC for Area 1A will be 5,000 mt.

Table 2 ASMFC Herring Specifications for 2007-2009 Fishing Years

SPECIFICATIONS	ASMFC Specifications for 2007 – 2009 (mt)
ABC	194,000
U.S. OY	145,000
TAC Area 1A	50,000 (5,000 available Jan-May)
TAC Area 1B	10,000
TAC Area 2	30,000
TAC Area 3	55,000
Research Set-Aside	3% from each area TAC (2008 and 2009 FY only)

Under ASMFC Amendment 2, there are two ASMFC-only management measures that relate directly to the joint specifications process summarized above: days out and spawning restrictions. The ASMFC-specific measures are discussed in more detail below.

Days Out

Section 4.3.1 of ASMFC Amendment 2 describes the days out provision as a way of controlling effort in the fishery. 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.

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, the States within the management area (primarily Maine, New Hampshire, and Massachusetts for Area 1A) will meet to discuss implementation of the "days out" measure. 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.

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 midwater trawl gear stowed. 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.

For the 2006 fishing year, two days are to be taken out of the Area 1A Atlantic herring fishery beginning June 1, 2006. Based on this start date, the estimated week of closure for the directed herring fishery (60,000 mt Area 1A TAC reached) is December 6, 2006. For Maine, days out will begin at 6:00 pm Friday and continue through 6:00 pm Sunday. For New Hampshire and Massachusetts, days out will begin at midnight Friday and continue through midnight Sunday. Vessels must be at the dock at the start of the days out period and off-loading of catch is permitted during this time.

Since the NMFS-preferred alternative (proposed action) for 2007-2009 reduces the Area 1A TAC from 60,000 mt to 50,000 mt the first year, and then to 45,000 mt the latter two years, the days out provision will likely affect effort in the fishery in Area 1A. A lowering of the TAC will likely require States to extend the number of days taken out of the fishery and will likely require vessels to fish further offshore in management areas not subjected to days out.

Spawning Restrictions

Section 4.3.2 of ASMFC Amendment 2 describes spawning restrictions in the Atlantic herring fishery. 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.

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. The ASMFC 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.

Figure 3 displays the spawning areas defined in this management 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

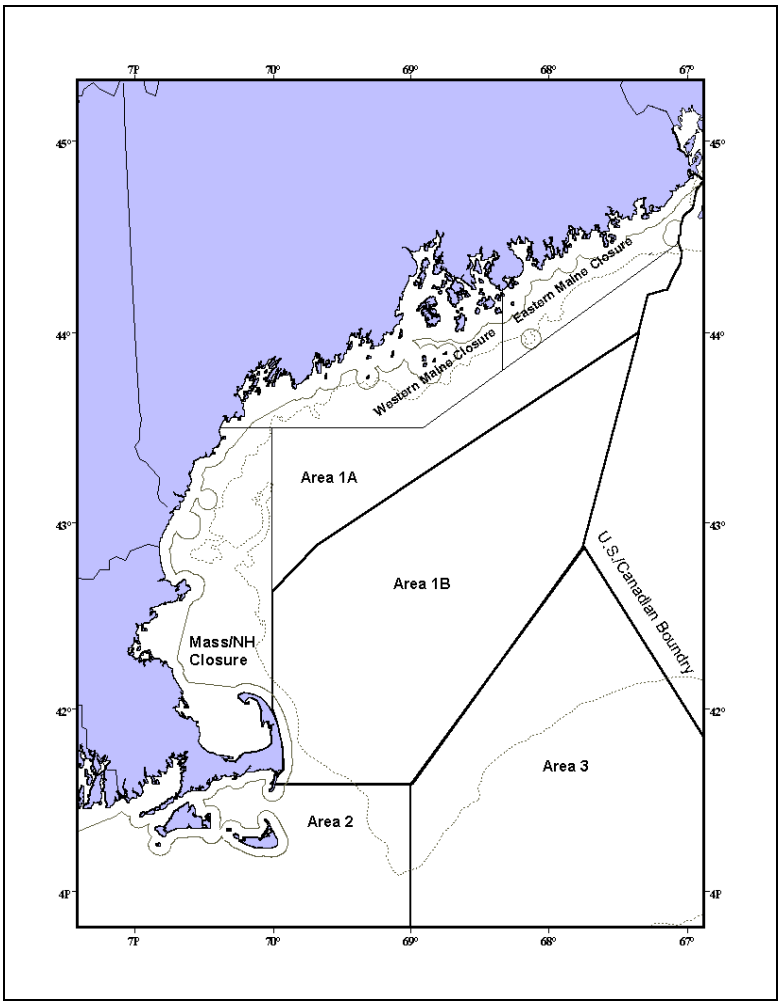
North to Maine coast at 68° 20' W

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 3 ASMFC Spawning Areas for Atlantic Herring



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.

Reviewing the closure information over the last several 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 has 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.

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. In many states, it can take 3-5 business days between notice and implementation of a spawning closure because of public notification requirements.

Section 4.3.2.3 of the ASMFC document describes the zero tolerance provision of the spawning restrictions in Amendment 2. 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. Under this measure, 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.

From discussions held amongst the states directly affected by the zero tolerance provision described above, the language was clarified through Technical Addendum 1 to Interstate Amendment 2 to equate the zero tolerance provision with a complete closure of the spawning area during restricted times. Contention focused on use of the word 'spawn' in the provision as described above; some States interpreted this language to mean vessels could be in closure areas during restricted times as long as they were directing their fishing efforts on herring not in ICNAF gonadal stages V and VI. Technical Addendum 1 now clarifies the provision to mean that any vessel is prohibited to fish for, take, land, or possess herring from or within a restricted spawning area. 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. "Spawn" herring shall be identified as Atlantic herring in ICNAF gonadal stages V and VI. Vessels are permitted to transit the restricted spawning areas with herring on board provided they comply with the provision above (spawn herring must be landed outside a restricted area) and the bycatch allowance as listed in the previous paragraph.

Section 4.3.2.4 of ASMFC Amendment 2 provides an exemption for East of Cutler Fixed Gear Fisheries from the spawning restrictions detailed above. Under ASMFC 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. 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.

The Technical Addendum clarifies the Section's intent regarding the spawning closure provisions and does not alter the compliance schedule of Amendment 2; however, for the 2006 fishing year (effective around the default closure date of September 21, 2006), the Massachusetts and New Hampshire have initiated the process of fully implementing the spawning closure of Technical Addendum 1. For the 2006 fishing season, Maine has adopted spawning restrictions and regulations (effective September 1, 2006) as detailed in Interstate Amendment 2.

Regarding specifications for the 2007-2009 fishing years, States are expected to fully implement all spawning restrictions as detailed in Amendment 2 and further clarified by Technical Addendum 1. These restrictions are expected to protect the inshore component of the Atlantic herring stock complex during the spawning season. As a result, fishing effort may be forced further offshore during this approximate four-week time period. States will enforce spawning restrictions through at-sea and dockside activities.

3.0 OTHER ALTERNATIVES CONSIDERED BY THE COUNCIL

The other alternatives considered by the Council during the development of the 2007-2009 herring fishery specifications are described in the following subsections.

3.1 NO ACTION ALTERNATIVE

The no action alternative equates to status quo conditions for the Atlantic herring fishery during the 2007-2009 fishing years (Table 3). The 2005/2006 specifications and TACs would be maintained, based on an ABC value of 220,000 mt. No set-asides would be established under the no action alternative.

Table 3 Atlantic Herring Fishery Specifications for 2007-2009: No Action Alternative

SPECIFICATION	ALLOCATION (MT)
ABC	220,000
U.S. OY	150,000
DAH	150,000
DAP	146,000
JVPt	0
JVP	0
IWP	0
USAP	20,000 (Areas 2 and 3 only)
BT	4,000
TALFF	0
RESERVE	0
TAC Area 1A	60,000 (6,000 available Jan-May)
TAC Area 1B	10,000
TAC Area 2	30,000
TAC Area 3	50,000
Research Set-Aside	N/A

3.2 NON-PREFERRED ALTERNATIVES

When selecting the specifications for the 2007-2009 fishing years, the Council considered four alternatives in addition to the proposed action and the no action alternative. These alternatives are described below and are considered non-preferred alternatives for the purposes of this EA. Analyses in this document address the NMFS-preferred alternative (proposed action), the Council-preferred alternative, the no action alternative, as well as all of the non-preferred alternatives described in the following subsections.

3.2.1 Alternative 1 (Non-Preferred)

Alternative 1 is the most similar to the no action alternative. Alternative 1 maintains the 2005/2006 management area TACs for the 2007-2009 fishing years, but the specifications are based on a new ABC value of 194,000 mt, and research set-asides (3% from every area) are proposed for the 2008 and 2009 fishing years. OY for the U.S. fishery under this alternative remains at its current value of 150,000 mt, and TACs remain the same as they were for 2005 and 2006 (Table 4). Total removals from the herring stock complex (U.S. and Canada) are assumed to be 170,000 mt under this alternative if the TACs are fully utilized and the Canadian catch is consistent with the 20,000 mt assumption. Three percent of each management area TAC is proposed to be set-aside in 2008 and 2009 to support herring-related research.

Consistent with the recommendations of the Herring Committee at its July 6, 2006 meeting, DAH for the fishery would be set at 150,000 mt (current value), DAP would be set at 146,000 mt (current value), and there would be no specification for either TALFF or JVP. This alternative provides a buffer of 24,000 mt between ABC and OY with the inclusion of Canadian harvest, and it provides the opportunity for total U.S. fishery landings to increase about 40% above recent (1995-2005) levels.

Table 4 Atlantic Herring Fishery Specifications for 2007-2009: Alternative 1 (Non-Preferred)

SPECIFICATION	ALLOCATION (MT)
ABC	194,000
U.S. OY	150,000
DAH	150,000
DAP	146,000
JVPt	0
JVP	0
IWP	0
USAP	20,000 (Areas 2 and 3 only)
BT	4,000
TALFF	0
RESERVE	0
TAC Area 1A	60,000 (6,000 available Jan-May)
TAC Area 1B	10,000
TAC Area 2	30,000
TAC Area 3	50,000
Research Set-Aside	3% from each area TAC (2008 and 2009 FY only)

3.2.2 Alternative 2 (Non-Preferred)

Alternative 2 proposes to reduce the Area 1A TAC by 15,000 mt (to 45,000 mt) and increase the Area 3 (Georges Bank) TAC by 10,000 mt (to 60,000 mt). OY for the U.S. fishery under this alternative would be 145,000 mt (Table 1). Total removals from the herring stock complex (U.S. and Canada) are assumed to be 165,000 mt under this alternative if the TACs are fully utilized and the Canadian catch is consistent with the 20,000 mt assumption. For the herring resource as a whole, this alternative represents the most conservative alternative under consideration, as the total removals from the stock complex expected under this alternative would be the lowest. Three percent of each management area TAC is proposed to be set-aside in 2008 and 2009 to support herring-related research.

Consistent with the recommendations of the Herring Committee at its July 6, 2006 meeting, DAH for the fishery would be set at 145,000 mt, DAP would be set at 141,000 mt, and there would be no specification for either TALFF or JVP. This alternative provides a buffer of 29,000 mt between ABC and OY with the inclusion of Canadian harvest, and it provides the opportunity for total U.S. fishery landings to increase about 35% above recent (1995-2005) levels.

In considering the impacts presented in this document relative to the NMFS-preferred alternative (the proposed action), it is important to keep in mind that the NMFS-preferred alternative is most similar to alternative 2. Another way of looking at is that the NMFS-preferred alternative, in 2007, will have impacts identical to those projected for the Council-preferred alternative, and in 2008 and 2009, the NMFS-preferred alternative will have impacts virtually identical to those projected for alternative 2.

Table 5 Atlantic Herring Fishery Specifications for 2007-2009: Alternative 2 (Non-Preferred)

SPECIFICATION	ALLOCATION (MT)
ABC	194,000
U.S. OY	145,000
DAH	145,000
DAP	141,000
JVPt	0
JVP	0
IWP	0
USAP	20,000 (Areas 2 and 3 only)
BT	4,000
TALFF	0
RESERVE	0
TAC Area 1A	45,000 (6,000 available Jan-May)
TAC Area 1B	10,000
TAC Area 2	30,000
TAC Area 3	60,000
Research Set-Aside	3% from each area TAC (2008 and 2009 FY only)

3.2.3 Alternative 3 (Non-Preferred)

Alternative 3 proposes to maintain current TACs for Areas 1A, 1B, and 2 and increases the Area 3 TAC to 70,000 mt (from its current value of 50,000 mt). OY for the U.S. fishery under this alternative would be 170,000 mt (Table 6). Total removals from the herring stock complex (U.S. and Canada) are assumed to be 190,000 mt under this alternative if the TACs are fully utilized and the Canadian catch is consistent with the 20,000 mt assumption. This alternative encourages expansion of the offshore fishery (Georges Bank) by significantly increasing the TAC in Area 3 where all herring removals are assumed to come from the (more robust) offshore component of the resource. Three percent of each management area TAC is proposed to be set-aside in 2008 and 2009 to support herring-related research.

Consistent with the recommendations of the Herring Committee at its July 6, 2006 meeting, DAH for the fishery would be set at 170,000 mt, DAP would be set at 166,000 mt, and there would be no specification for either TALFF or JVP. This alternative provides a buffer of 4,000 mt between ABC and OY with the inclusion of Canadian harvest, and it provides the opportunity for total U.S. fishery landings to increase about 60% above recent (1995-2005) levels.

Table 6 Atlantic Herring Fishery Specifications for 2007-2009: Alternative 3 (Non-Preferred)

SPECIFICATION	ALLOCATION (MT)
ABC	194,000
U.S. OY	170,000
DAH	170,000
DAP	166,000
JVPt	0
JVP	0
IWP	0
USAP	20,000 (Areas 2 and 3 only)
BT	4,000
TALFF	0
RESERVE	0
TAC Area 1A	60,000 (6,000 available Jan-May)
TAC Area 1B	10,000
TAC Area 2	30,000
TAC Area 3	70,000
Research Set-Aside	3% from each area TAC (2008 and 2009 FY only)

3.2.4 Alternative 4 (Non-Preferred)

Alternative 4 proposes to re-distribute the management area TACs such that OY can be almost fully utilized (similar to Alternative 3) and some concerns about fishing effort in the inshore Gulf of Maine can be addressed. OY for the U.S. fishery under this alternative would be 170,000 mt (Table 7). Total removals from the herring stock complex (U.S. and Canada) are assumed to be 190,000 mt under this alternative if the TACs are fully utilized and the Canadian catch is consistent with the 20,000 mt assumption. This alternative also encourages expansion of the offshore fishery (Georges Bank) by significantly increasing the TAC in Area 3 where all herring removals are assumed to come from the (more robust) offshore component of the resource. It also proposes to address concerns about fishing effort in Area 1A by reducing the 1A TAC and re-allocating some of the inshore component to the Area 2 fishery. Three percent of each management area TAC is proposed to be set-aside in 2008 and 2009 to support herring-related research.

Consistent with the recommendations of the Herring Committee at its July 6, 2006 meeting, DAH for the fishery would be set at 170,000 mt, DAP would be set at 166,000 mt, and there would be no specification for either TALFF or JVP. This alternative provides a buffer of 4,000 mt between ABC and OY with the inclusion of Canadian harvest, and it provides the opportunity for total U.S. fishery landings to increase about 60% above recent (1995-2005) levels.

Table 7 Atlantic Herring Fishery Specifications for 2007-2009: Alternative 4 (Non-Preferred)

SPECIFICATION	ALLOCATION (MT)
ABC	194,000
U.S. OY	170,000
DAH	170,000
DAP	166,000
JVPt	0
JVP	0
IWP	0
USAP	20,000 (Areas 2 and 3 only)
BT	4,000
TALFF	0
RESERVE	0
TAC Area 1A	45,000 (6,000 available Jan-May)
TAC Area 1B	10,000
TAC Area 2	45,000
TAC Area 3	70,000
Research Set-Aside	3% from each area TAC (2008 and 2009 FY only)

4.0 AFFECTED ENVIRONMENT – UPDATED STOCK AND FISHERY INFORMATION

This section provides background information and data for the valued ecosystem components (VECs) impacted by the proposed action. This information is presented to fulfill the requirements of both NEPA and the 2005 Herring SAFE Report. The following description of the affected environment is incorporated by reference from the Atlantic Herring FMP (March 1999), the Final Environmental Impact Statement (FEIS) for Minimizing Impacts of the Atlantic Herring Fishery on Essential Fish Habitat (NMFS, January 2005), and the recently-submitted Final EIS for Amendment 1 to the Herring FMP (May 3, 2006). Relevant information is presented below in summary form and is updated through the 2005 fishing year wherever possible. All of the above documents, as well as the Environmental Assessment for the Essential Fish Habitat (EFH) components of the Herring FMP (October 1998), should be referenced for more complete information about the environment affected by the Atlantic herring fishery.

4.1 HERRING RESOURCE

Atlantic herring are distributed along the Atlantic coast from North Carolina to the Canadian Maritime provinces. The management unit for the Atlantic Herring FMP is defined as the Atlantic herring resource throughout the range of the species within the U.S. waters of the northwest Atlantic Ocean from the shoreline to the seaward boundary of the exclusive economic zone (EEZ). The stock complex includes herring, which migrate through Canadian waters, beyond the range of management of the proposed Atlantic Herring FMP. Schools of adult herring undertake extensive migrations to areas where they feed, spawn and overwinter. Herring are found all along the coast in inshore and offshore waters to the edge of the continental shelf during late winter and early spring. The changing seasonal distribution of herring has given rise to both mobile and fixed gear fisheries that harvest herring of all age groups.

Atlantic herring have a tendency to return to natal spawning grounds throughout their lifetime to spawn (Ridgway 1975, Sindermann 1979). 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 to 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 Jonesport (44º 32' N), and at various other locations along the western Gulf of Maine coast (Reid et al. 1999, Munroe 2002). In Canada, spawning also occurs south of Grand Manan Island (in the entrance to the Bay of Fundy) and on various banks and shoals south of Nova Scotia. Herring also spawn on Nantucket Shoals and Georges Bank, but not further south. 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). Herring in the Gulf of Maine region usually reproduce at relatively high temperatures (10-15º C) and at high salinities (Munroe 2002). They do not spawn in brackish water.

Atlantic herring spawn on the bottom in discrete locations by depositing adhesive eggs which 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). 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 to 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. Drapeau (1973) reported that gravel is the preferred substrate on Georges Bank. Spawning sites are located in areas with strong bottom currents (1.5-3 knots) which prevent the accumulation of fine sediment and provide circulation to supply oxygen and remove metabolites (Reid et al. 1999). Hatching success remains relatively high down to 20-25% dissolved oxygen levels (Aneer 1987).

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). Underwater video observations have shown that female herring deposit their eggs on the bottom after the males release milt (Messieh 1988). 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). 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). Hatching success is also temperature dependent: in experimental studies, all eggs held at 15ºC hatched, and none hatched at 0-5ºC or at 20º C (MacFarland 1931).

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). Larvae are transported long distances from spawning grounds and 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. In some years, a few larvae that hatch later in the year in this area of the Gulf of Maine are transported eastward and enter the Sheepscot estuary (Lazzari and Stevenson 1992). 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). Atlantic herring larvae have been collected from inshore waters as far south as New Jersey (Able and Fahay 1998). Surveys conducted during the years when there was little or no spawning activity on Georges Bank have shown that larvae from Nantucket Shoals disperse to the east on to Georges Bank (Smith and Morse 1993). 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.

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 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 the number, location, and extent of geographically stable retention areas. Such retention areas have been described off southwest Nova Scotia, around Grand Manan Island, on Georges Bank (Iles and Sinclair 1982), and in eastern Maine coastal waters (Chenoweth et al. 1989).

Adult Atlantic herring are found in shallow inshore waters, 20 meters deep, to offshore waters up to 200 meters deep (NEFMC 1999; Bigelow and Schroeder 1953), but seldom migrate to depths more than 50 fathoms (300 ft or 91.4 meters) (Kelly and Moring 1986). They prefer water temperatures of 5^{o} – 9^{o} C (Bigelow and Schroeder 1953; Zinkevich 1967), but may overwinter at temperatures as low as 0^{o} C (Reid et al 1999). The lower salinity limit for adult herring is 28ppt, with a preference for increasing salinities with increasing fish age.

Juvenile Atlantic herring are usually found in water depths of 15-135 meters (NEFMC 1998a). They prefer water temperatures of 8^{o} –12^{o} C, and a salinity range of 26 - 32 ppt, although they can tolerate salinities as low as 5 ppt for short periods (Bigelow and Schroeder 1953; Kelly and Moring 1986; Brawn 1960a; Stickney 1969; Reid et al 1999). This salinity tolerance allows juvenile herring to penetrate the inshore waters of estuaries and bays. There are records of juveniles being found as far as 68 km up the Hudson River (Able and Fahay 1998; Smith 1985).

A complete description of the Atlantic herring resource can be found in Section 7.1 of the FSEIS for Amendment 1 to the Herring FMP. The following subsections update trawl survey data through 2005 if possible (also provided in Amendment 1) and summarize results of the recently-completed benchmark stock assessment (TRAC 2006) for Atlantic herring.

4.1.1 Updated Trawl Surveys

Research trawl surveys are conducted region-wide by the National Marine Fisheries Service (NMFS) and in inshore areas by the Massachusetts Division of Marine Fisheries (MA DMF) as well as the Maine Department of Marine Resources (ME DMR). Available sources of information have been updated through 2005 when possible and are presented in the subsections below.

4.1.1.1 NMFS Trawl Survey – All Strata

Table 8 summarizes data (mean weight per tow in kilograms and mean number per tow) from the NMFS spring and autumn bottom trawl surveys from 1990 – 2005. Table 9 summarizes data from the NMFS winter bottom trawl survey from 1992 – 2005. Survey data through 2004 are also depicted in Figure 4. All of the NMFS bottom trawl surveys have been variable over time with respect to sampling Atlantic herring, especially in recent years. No trends are apparent from the most recent years of the survey across all strata. The survey strata for the inshore Gulf of Maine are examined independently in Section 4.1.1.2.1 of this document (p. 27) and discussed in more detail in Section 4.1.1.2.4.

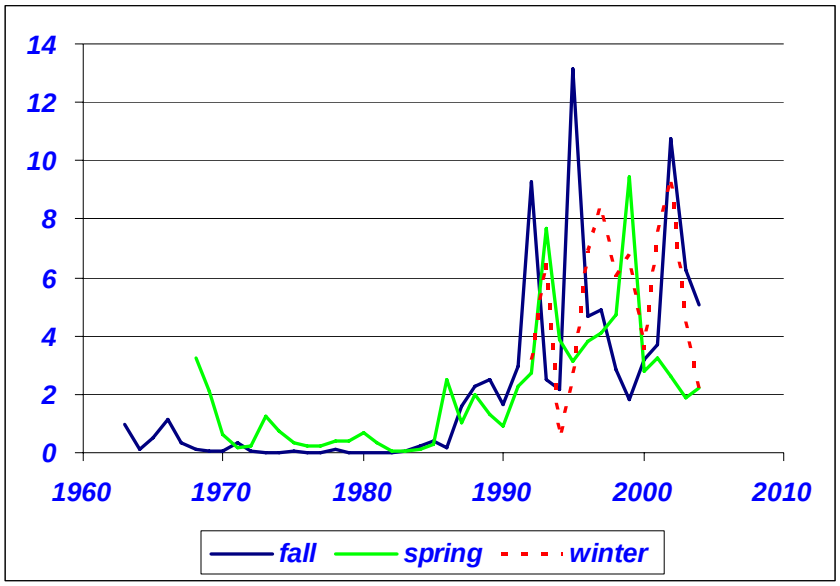
Table 8 NMFS Trawl Survey – Herring Catch Per Tow (Mean Number and Weight in kg), 1990-2005

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

Table 9 NMFS Winter Trawl Survey – Herring Catch Per Tow (Mean Number and Weight in kg), 1992-2005

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

Figure 4 Herring Catch (kg/tow) from the NMFS Autumn (Fall), Spring, and Winter Trawl Surveys Through 2004



4.1.1.2 NMFS, MA DMF, and ME DMR Trawl Surveys – Inshore Only

A selected subset of NMFS and MA DMF trawl survey strata were chosen to represent trends in the inshore herring component during 1963-2004. NMFS strata 26-27,38-40 and Mass DMF strata 25-29 (Cape Cod Bay) and 31-36 (Mass. Bay North) were used during spring and autumn (Figure 5, Figure 6).

Figure 5 NMFS Trawl Survey Strata

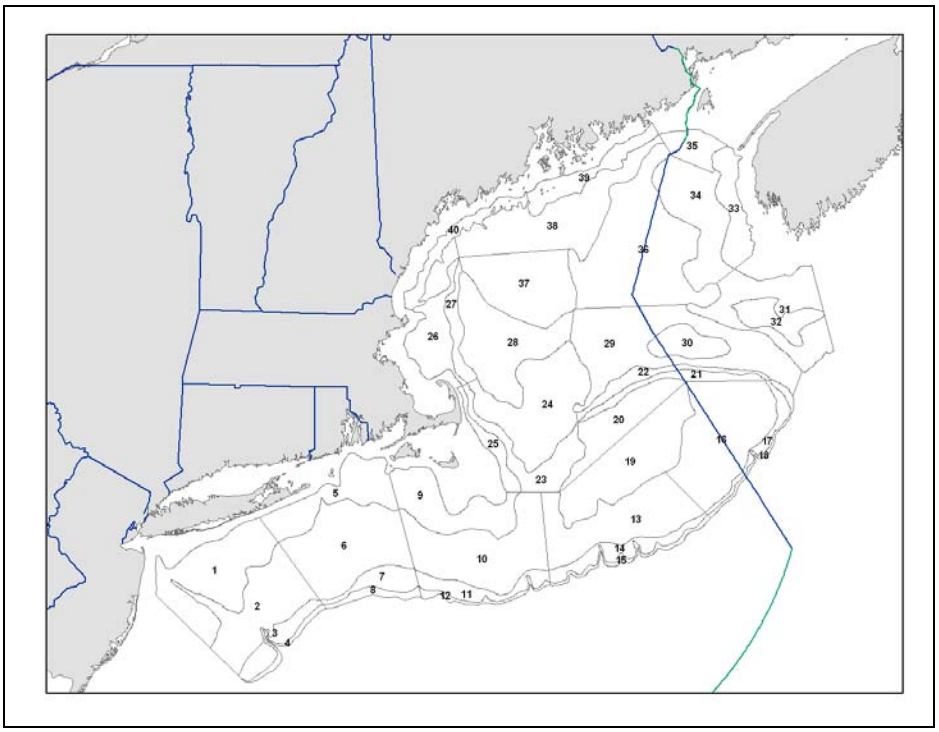
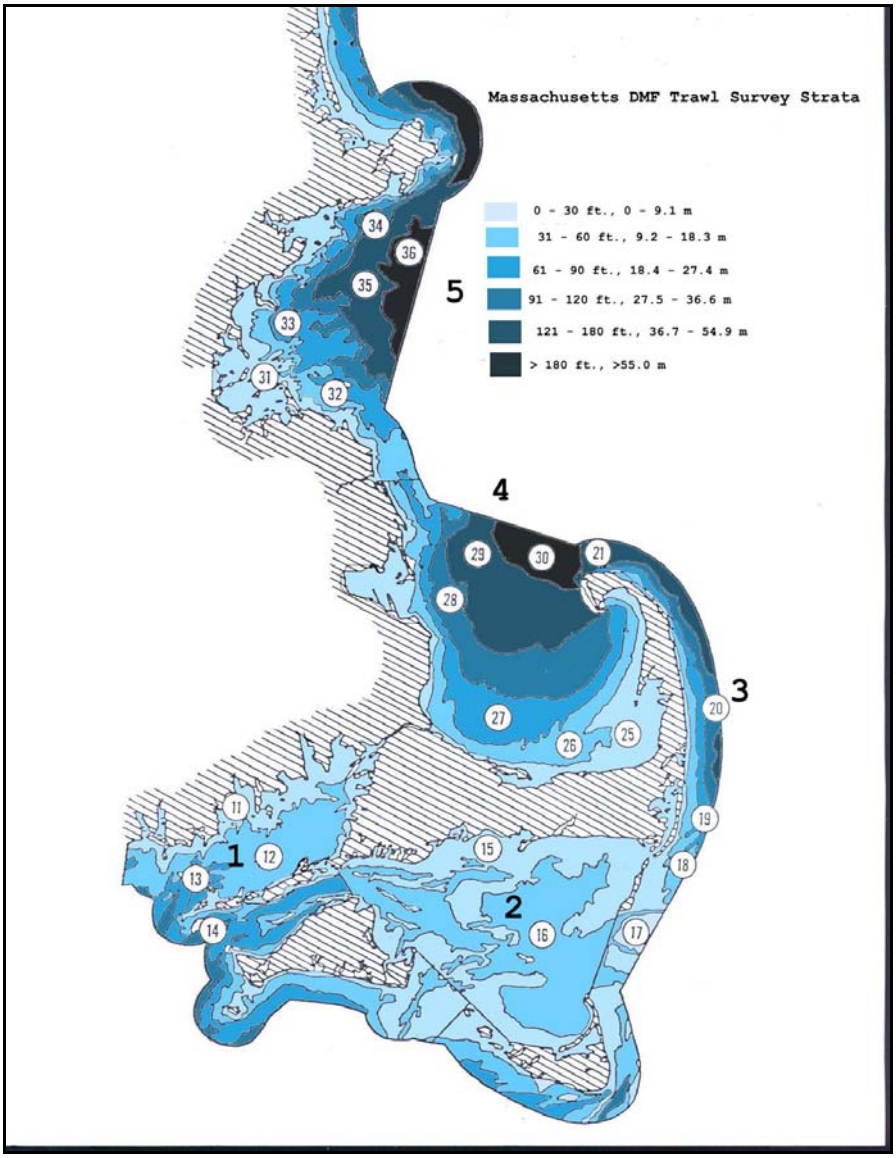


Figure 6 MA DMF Inshore Trawl Survey Strata



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

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

4.1.1.2.1 NMFS Trawl Survey – Inshore Only

4.1.1.2.1.1 Catch Per Tow

When examining the inshore Gulf of Maine survey strata separately, the NMFS spring survey was relatively flat, averaging a few fish per tow, during the late 1960s through the early 1980s (Figure 7, Figure 8). In the late 1980s, the index increased significantly, and although variable, has remained relatively high, averaging 40-50 fish per tow, since that time. The number of fish per tow increased to a record high in the 2004 spring survey but declined slightly in the autumn survey during the same year.

The 2005 and 2006 spring surveys sampled very few fish in the inshore Gulf of Maine strata; a preliminary loess smoothing analysis (Figure 11) suggests that there may have been a 50% decline in the ten-year average of the NMFS bottom trawl survey for inshore strata with the inclusion of data from the two most recent survey years (2004 and 2005 for the fall survey; 2005 and 2006 for the spring survey). However, similar trends are not apparent in recent inshore trawl surveys conducted by MA DMF and ME DMR (see Section 4.1.1.2.2 and 4.1.1.2.3).

The autumn survey time series for the inshore Gulf of Maine strata was very low from 1963 to the mid-1980s. Since that time, the autumn survey index has increased to about an average of 50 fish per tow and has remained relatively high (Figure 9, Figure 10). An increase in the number of fish per tow, when combined with an increase in the encounter rate (see following subsection), is suggestive of increased relative abundance when compared to the 1980s. Similar to the spring survey, the 2004 and 2005 autumn surveys sampled very few fish in the inshore strata (see above discussion).

The low values for inshore Gulf of Maine strata during the most recent survey years warrant consideration. The Herring PDT examined recent trends in the fall trawl surveys for herring more thoroughly – see Section 4.1.4 of this document for additional discussion of this issue.

Figure 7 Herring Catch/Tow (Number) Indices from the NMFS Spring Bottom Trawl Survey Strata 26-27,38-40 (Inshore), 1968-2006

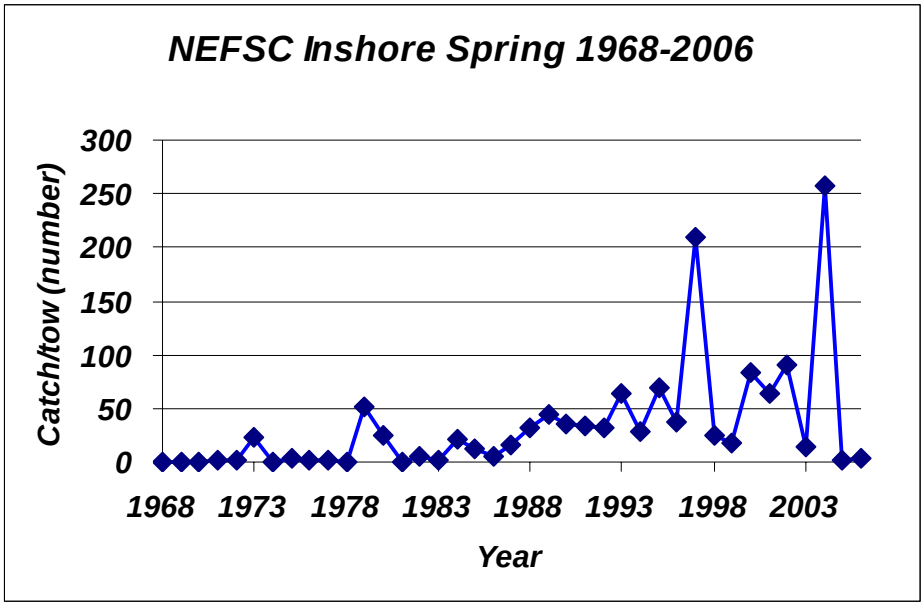


Figure 8 Herring Catch/Tow (Kilograms) Indices from the NMFS Spring Bottom Trawl Survey Strata 26-27,38-40 (Inshore), 1968-2006

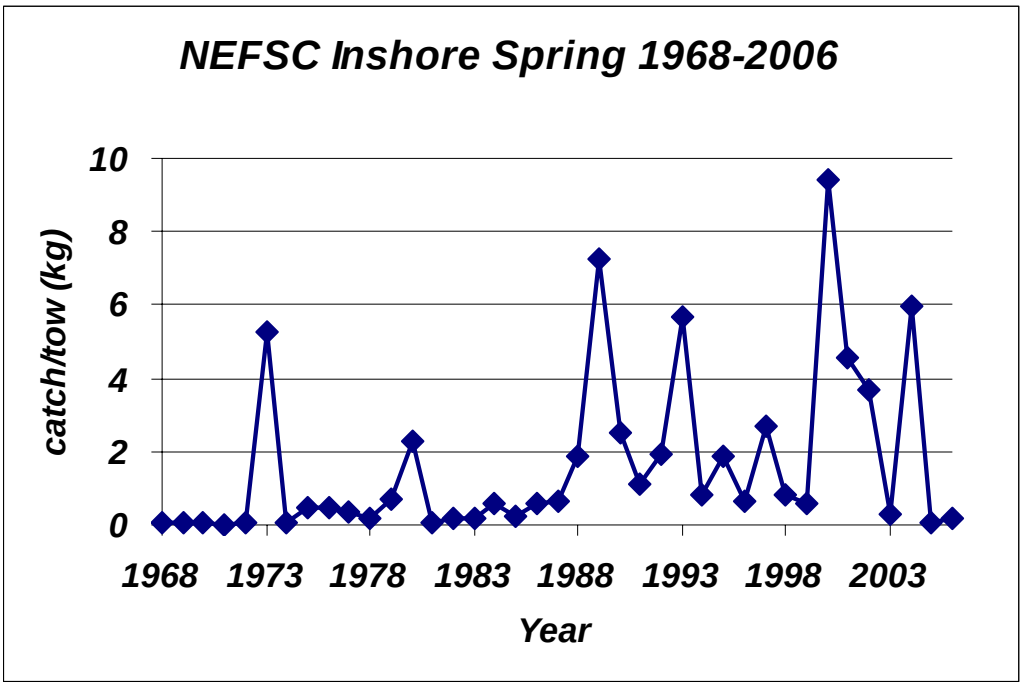


Figure 9 Herring Catch/Tow (Number) Indices from the NMFS Autumn Bottom Trawl Survey Strata 26-27,38-40 (Inshore), 1963-2005

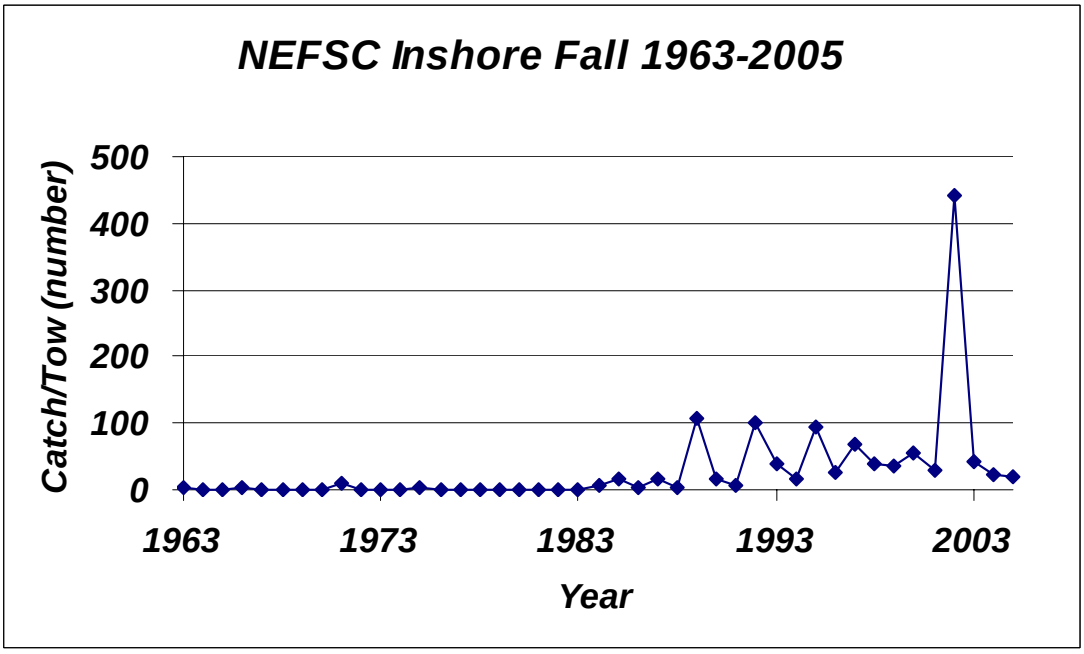


Figure 10 Herring Catch/Tow (Kilograms) Indices from the NMFS Autumn Bottom Trawl Survey Strata 26-27,38-40 (Inshore), 1963-2005

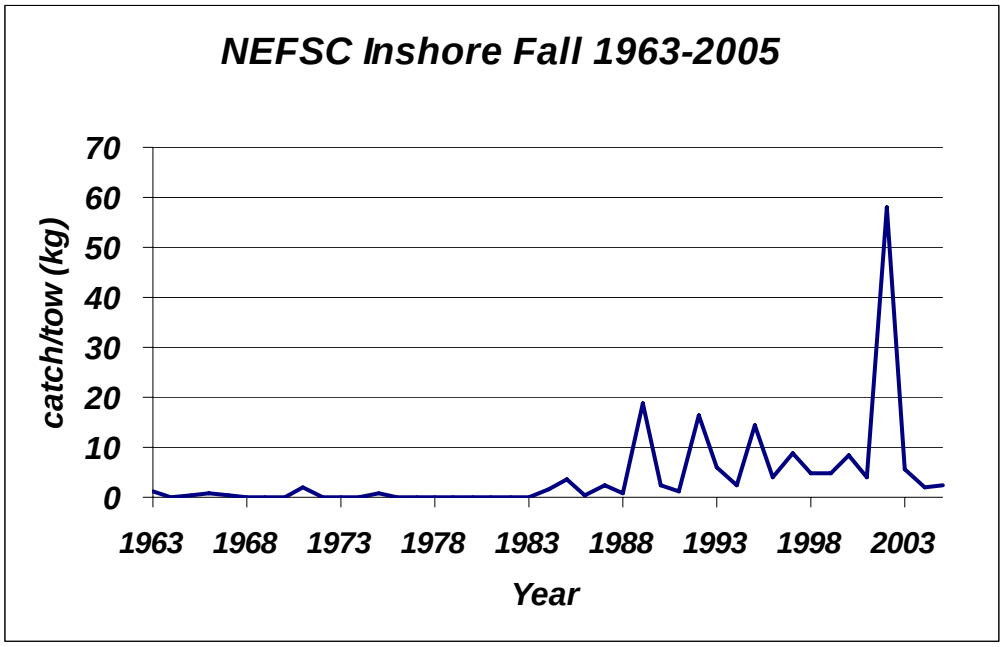
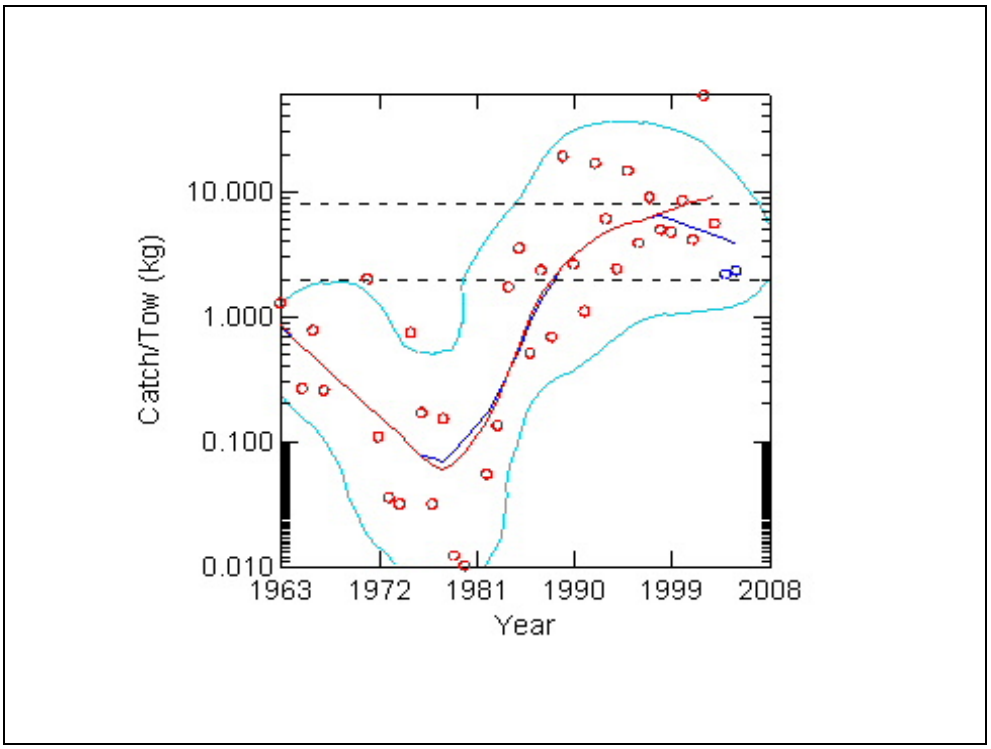


Figure 11 Preliminary Results of Loess Smoothing Analysis for NMFS Fall Survey, Inshore Strata Only

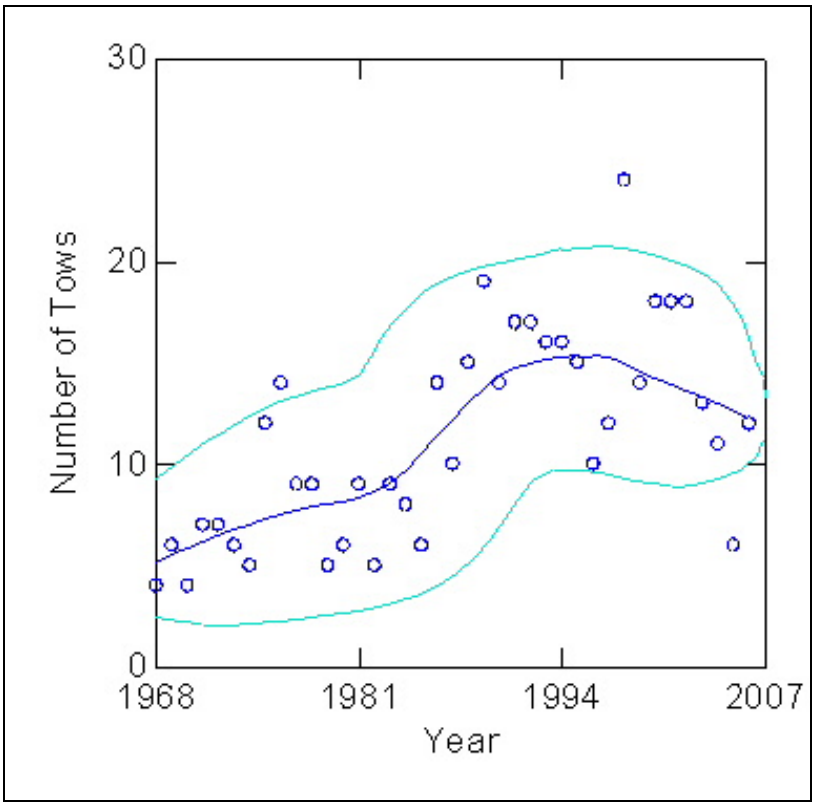


Note: A loess smoothing line has been added to illustrate trends as well as the impact of the addition of the 2004 and 2005 fall survey data, and the 80% confidence kernel facilitates interpretation of the trend.

4.1.1.2.1.2 Survey Encounter Rates

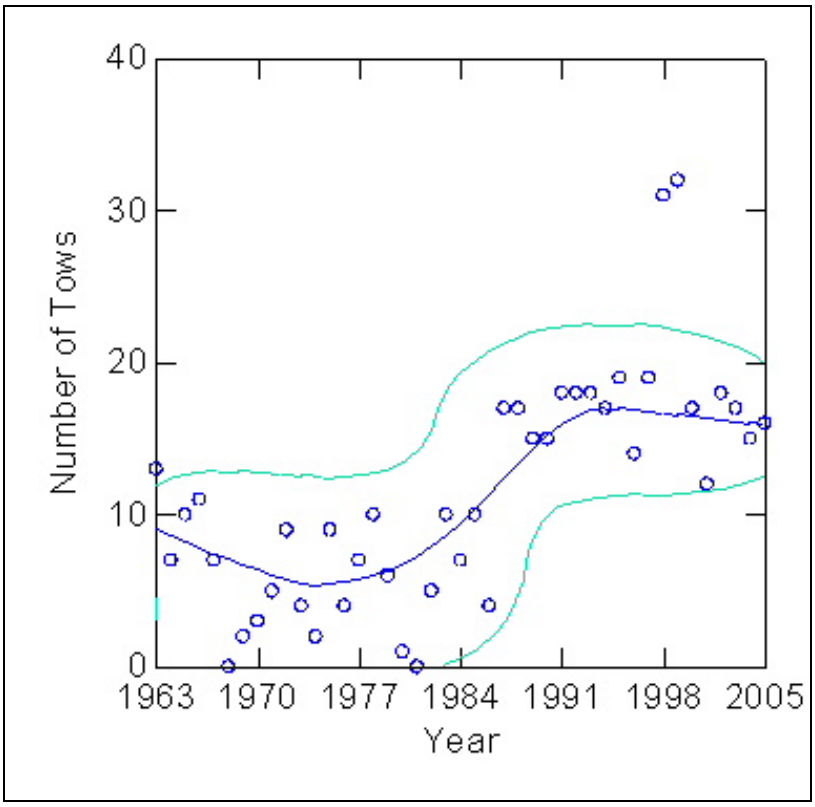
Bottom trawl survey encounter rates are useful data to consider when characterizing abundance/biomass trends for pelagic species like Atlantic herring, for which bottom trawl surveys are not specifically designed. The encounter rate for herring sampled in the inshore Gulf of Maine during the spring NMFS research bottom trawl survey increased over the time series, as measured by an increase in the number of tows that encountered herring (called non-zero tows). The trend increased linearly from 1968 to the mid-1990s and appears to be at least two times higher now than during the late 1960s and early 1970s (Figure 12). However, spring survey encounter rates in the inshore Gulf of Maine strata have been lower in recent years. In the autumn survey, which is thought to better characterize trends for Atlantic herring, the trend in non-zero tows was relatively low during the 1960s and early 1970s and increased by a factor of two since that time (Figure 13). Such an increase in encounter rate may suggest increased abundance. The trend for the fall bottom trawl survey has remained relatively flat since the early 1990s. It is also important to remember that because herring is a schooling pelagic fish, it should be noted that an increase in the number of non-zero tows may reflect an increase in the number of schools of herring encountered during the survey and may not represent an increase in overall abundance.

Figure 12 Non-Zero Tows for NMFS Spring Survey for Herring in Strata 26-27, 38-40 (inshore), 1968-2006



Note: A loess smoothing line has been added to illustrate trends, and the 80% confidence kernel facilitates interpretation of the trend.

Figure 13 Non-Zero Tows for NMFS Autumn Survey for Herring in Strata 26-27,38-40 (inshore), 1963-2005



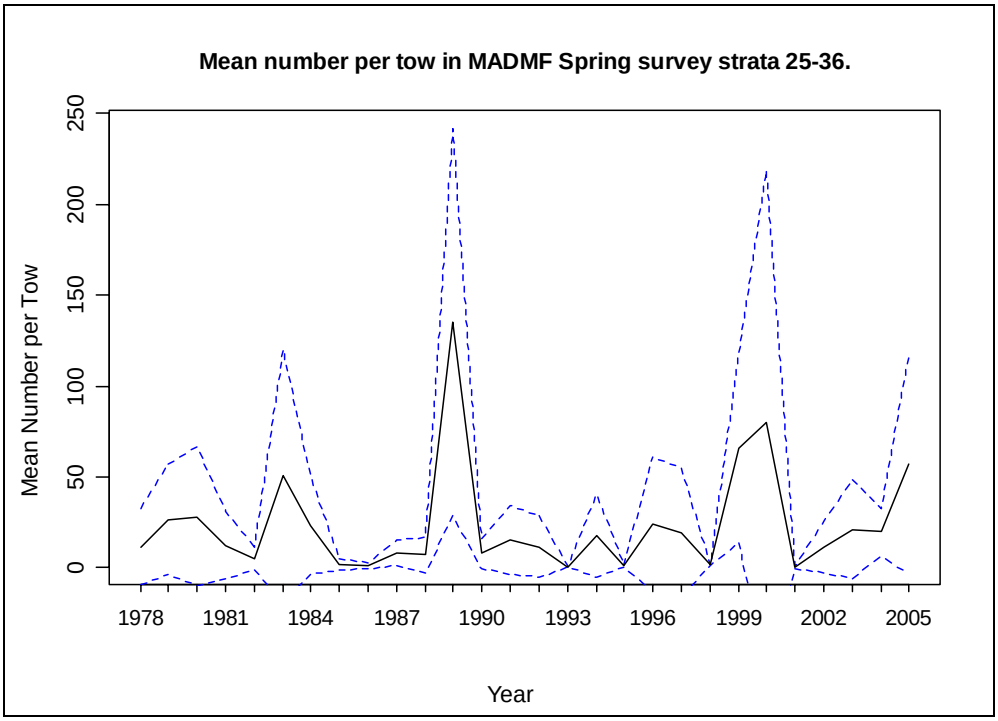
Note: A loess smoothing line has been added to illustrate trends, and the 80% confidence kernel facilitates interpretation of the trend.

4.1.1.2.2 MA DMF Inshore Trawl Survey

The MA DMF research bottom trawl surveys (Cape Cod Bay Strata 25-30, Mass. Bay and north Strata 31-36) for spring and fall through 2005 were examined for trends in the inshore herring component. In general, the MA DMF inshore survey is dominated by young herring and does not track adult herring abundance (Figure 18, p. 34). These indices, however, may be more useful as a measure of recruitment to the inshore component of the resource.

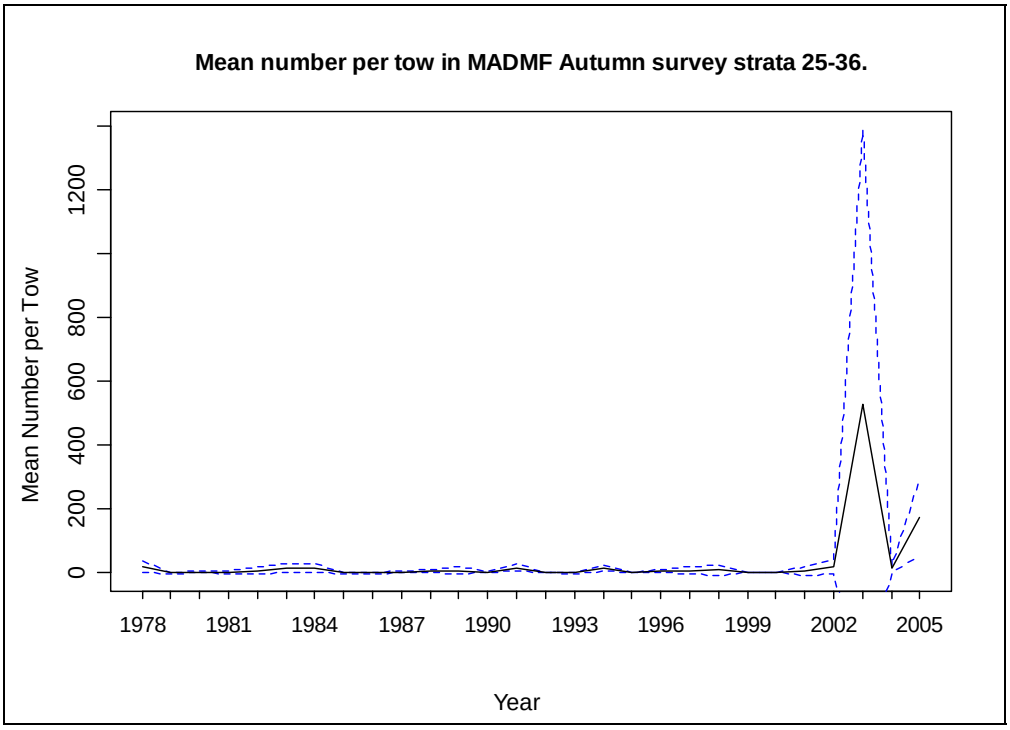
Both the fall and spring survey time series are highly variable. The spring survey fluctuates without trend and the fall survey may show a slight upward trend (Figure 14, Figure 15). Note that the large increase in the fall 2003 index was heavily influenced by two very large tows in Region 4 (Cape Cod Bay, Strata 25-30).

Figure 14 MA DMF Spring Survey Mean Number Per Tow (Strata 25-36)



Dashed line represents mean ± two standard error units.

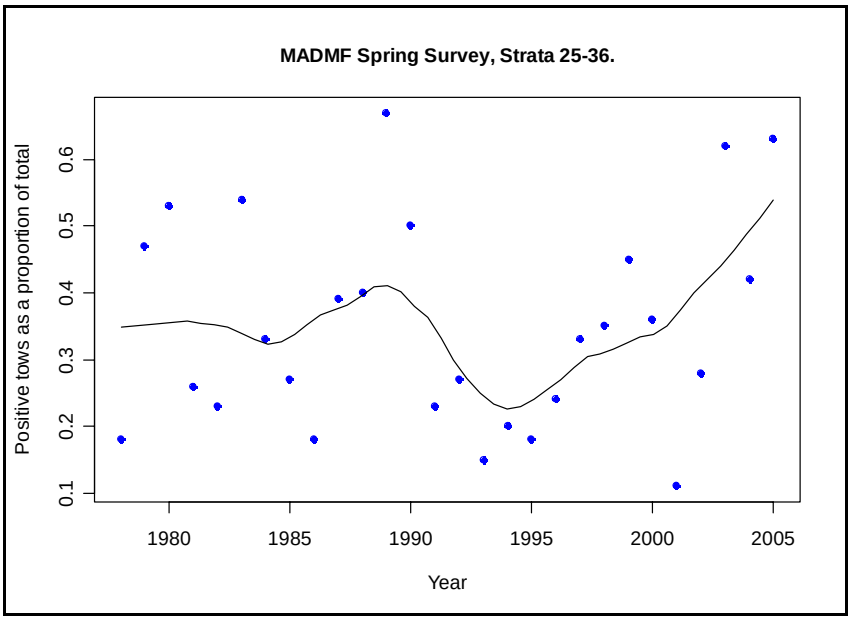
Figure 15 MA DMF Fall Survey Mean Number Per Tow (Strata 25-36)



Dashed line represents mean ± two standard error units.

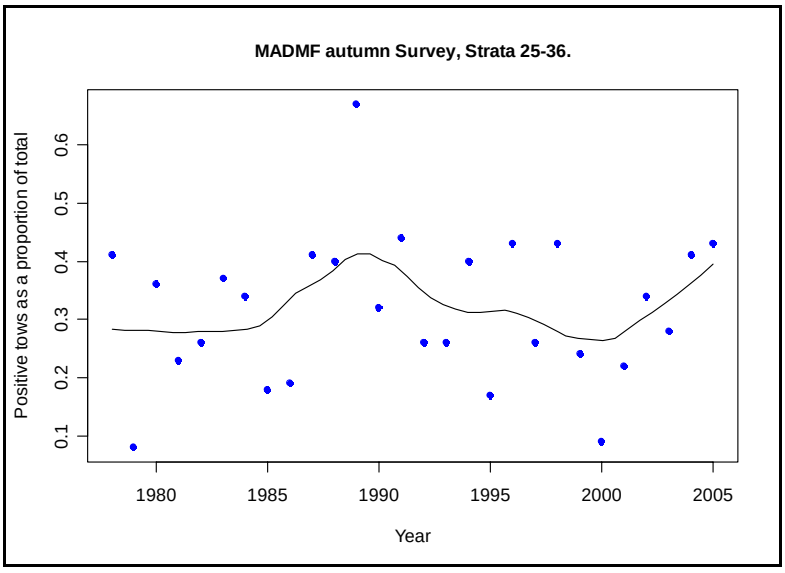
The encounter rate for herring in the MA DMF inshore bottom trawl survey, as measured by the ratio of tows with herring to total tows, is shown in Figure 16 and Figure 17. Both the spring and fall time series are highly variable and have fluctuated without trend for most of the time series. Encounter rates in the spring time series may be increasing recent years. The encounter rate may track abundance of recruit fish, but it is less sensitive to the influence of large tows. However, because herring is a schooling pelagic fish, the encounter rate may be tracking the number of schools rather than abundance.

Figure 16 Number of MA DMF Spring Survey Tows that Encountered Herring, as a Proportion of Total Tows for Strata 25-36



Solid line is loess fit with span=0.5 and degree=1.

Figure 17 Number of MA DMF Fall Survey Tows that Encountered Herring, as a Proportion of Total Tows for Strata 25-36



Solid line is loess fit with span=0.5 and degree=1.

Figure 18 Proportion of Total Mean Number Per Tow at Length, MA DMF Spring Survey, 1978-2005

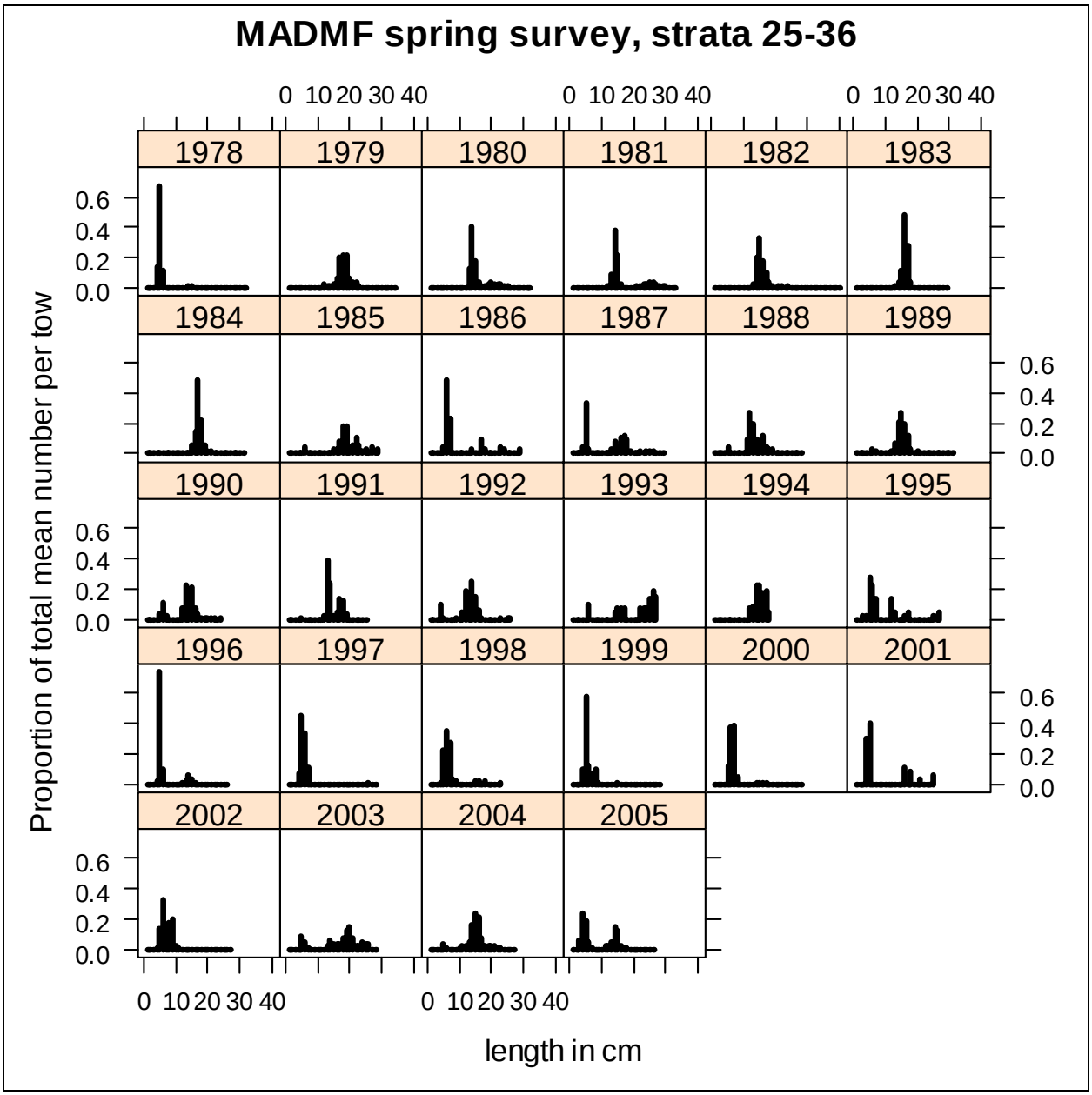
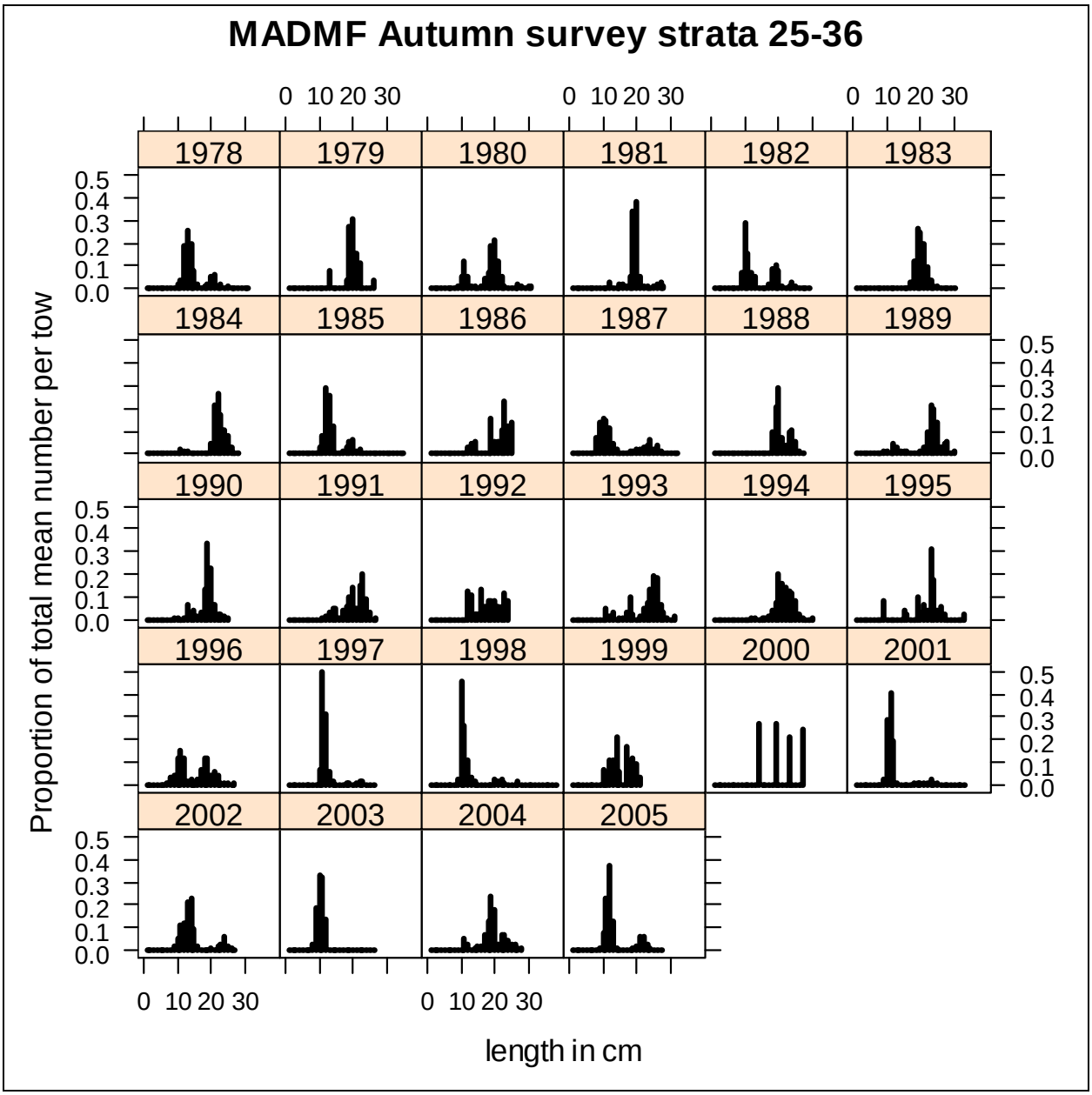


Figure 19 Proportion of Total Mean Number Per Tow at Length, MA DMF Fall Survey, 1978-2005

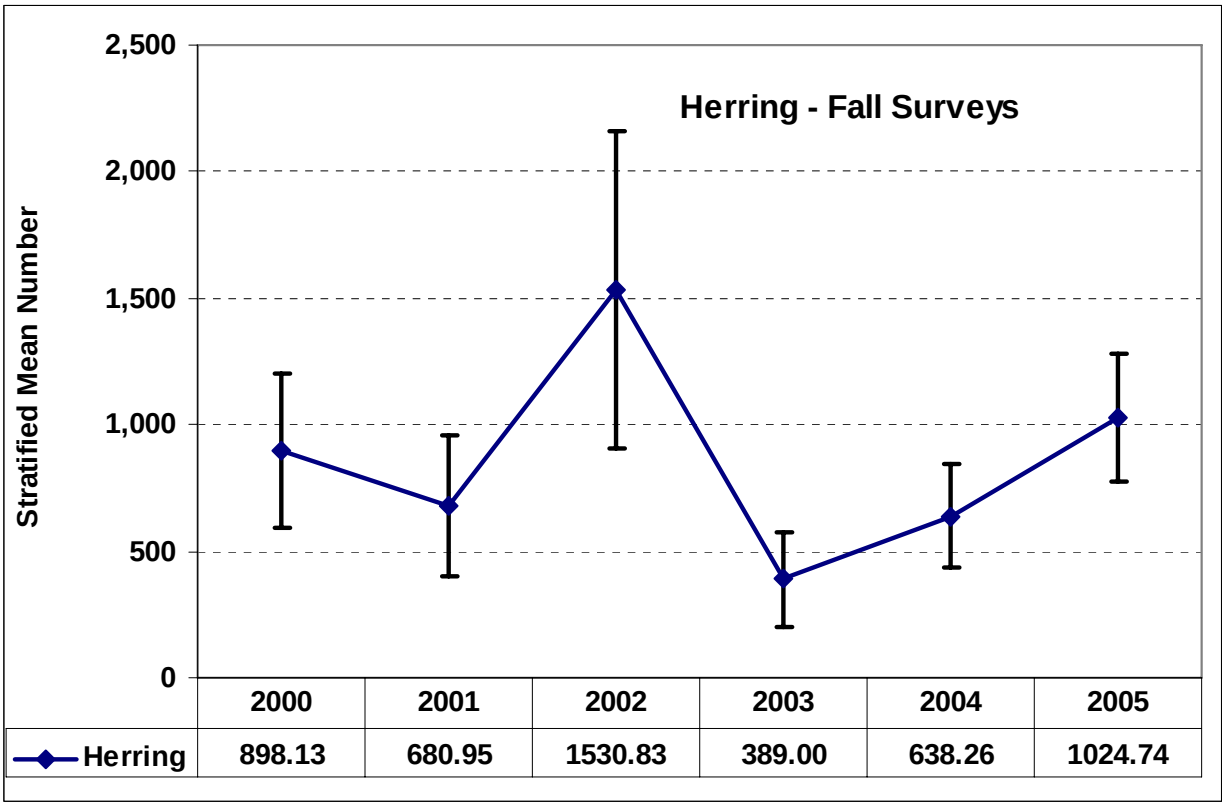


4.1.1.2.3 ME DMR Inshore Trawl Survey

Since Fall 2000, Maine DMR, in conjunction with the Gulf of Maine Research Institute and the State of New Hampshire, have been conducting an inshore bottom trawl survey. While this survey targets principal groundfish species from the NH/MA boarder to Canada, it regularly samples herring in many of its strata. Results from the fall and spring survey (Figure 20, Figure 21) have been variable over the last five years. No trend is apparent from either survey, given the short time series available.

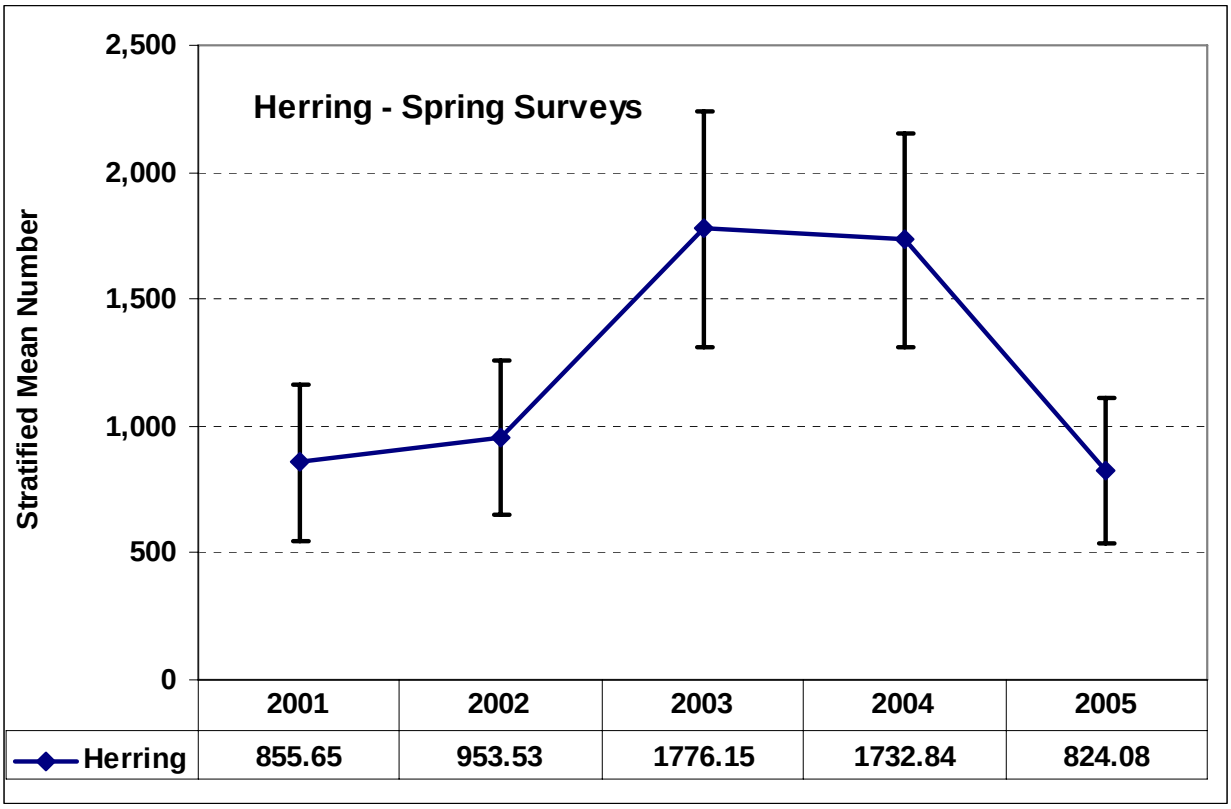
The ME/NH inshore bottom trawl survey samples mostly juvenile fish (less than 23 cm); which may or may not be a part of the inshore spawning component in future years (Figure 22, Figure 23). This is a ME/NH coast-wide bottom trawl survey, the results of which should not be viewed as an index of spawning stock biomass (SSB) for the inshore component of the herring resource. In fact, most of the fish sampled by this survey are age 1 fish. Similar to the MA DMF survey, this bottom trawl survey may provide an indication of pre-recruitment year class strength.

Figure 20 ME DMR Fall Inshore Bottom Trawl Survey Catch (# Fish) Per Tow



Note: Error is +/- one standard error of the stratified mean.

Figure 21 ME DMR Spring Inshore Bottom Trawl Survey Catch (# Fish) Per Tow



Note: Error is +/- one standard error of the stratified mean.

Figure 22 Length Frequencies for Herring Sampled by the ME DMR Fall Inshore Bottom Trawl Survey

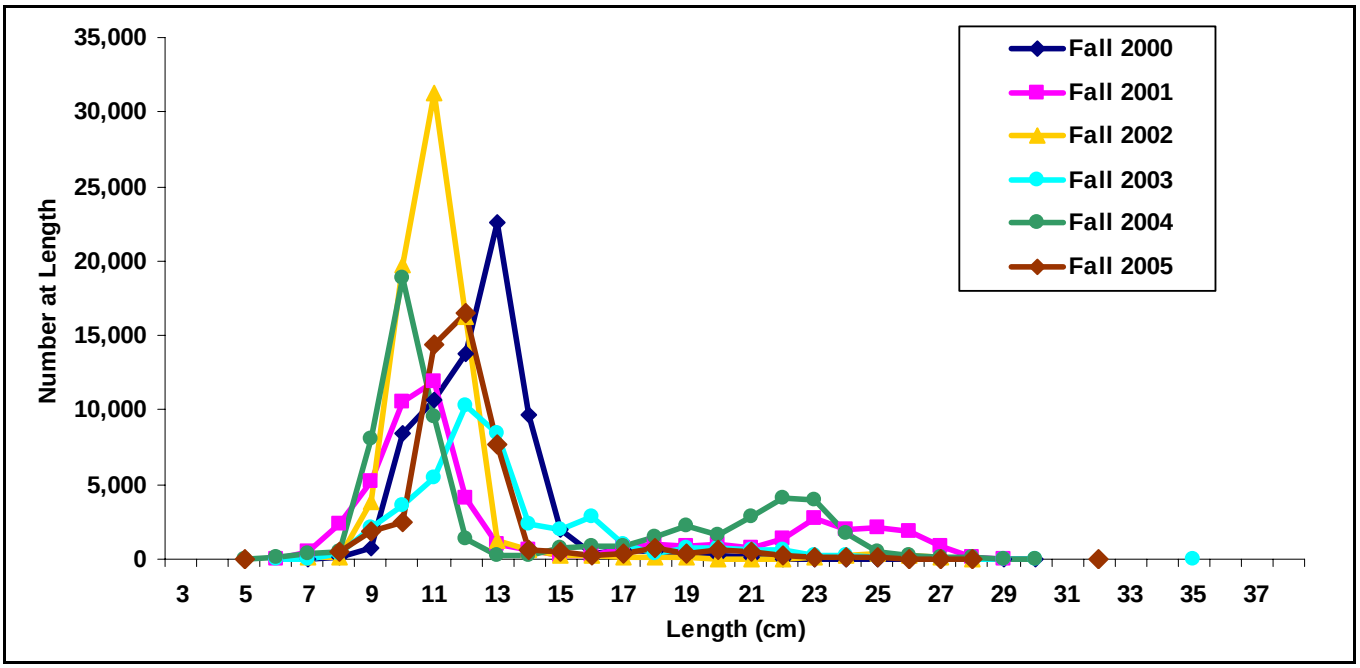
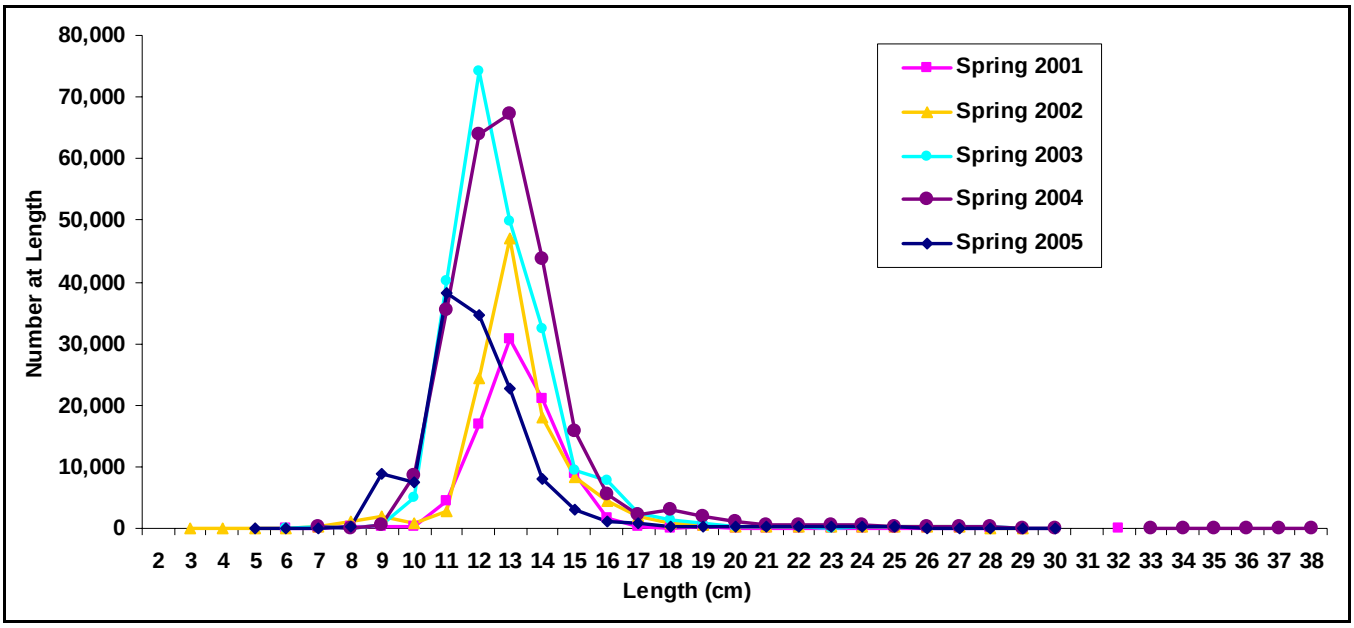


Figure 23 Length Frequencies for Herring Sampled by the ME DMR Spring Inshore Bottom Trawl Survey



4.1.1.2.4 Survey Trends in the Inshore Gulf of Maine

The Herring PDT examined recent trends in the fall trawl surveys for the inshore Gulf of Maine component of the resource more closely since survey abundance decreased for the last two years in both the spring and fall surveys. Figure 11 on p. 29 of this document indicates that based on a loess smoothing analysis, long-term trends in herring abundance, illustrated from the fall bottom trawl survey, change direction with the addition of the two most recent survey sample points (2004 and 2005). While data specific to the inshore component of the stock is limited and the Herring PDT cannot make a status determination based on bottom trawl indices alone, a change in the direction of the trend line is an important consideration.

The Herring PDT recommends that trends in the inshore area be monitored closely in upcoming years. The multi-year specification process still provides the PDT with an opportunity to monitor survey trends and other indicators of biomass/abundance on an annual basis and recommend action to the Council as necessary. The PDT adds the following for consideration:

- Fall surveys are generally thought to serve as better indicators of Atlantic herring abundance, as the samples tend to include a greater proportion of adult fish that have assembled for spawning purposes.
- In general, inshore Gulf of Maine bottom trawl surveys have declined in recent years, long-term survey trends in the inshore GOM have changed, and the Council should manage this fishery based on the level of concern it has for the inshore component and the degree of precaution it believes to be appropriate at this time. Additionally, conditions in the inshore Gulf of Maine should be monitored closely on an annual basis.
- The time series for herring sampled in the NMFS bottom trawl survey has always been very noisy, and trends should be interpreted with caution. The spring and fall surveys have been variable over the entire time series, as the bottom trawl surveys that are not specifically designed to sample pelagic fish. Nevertheless, they are another useful tool to help monitor stock conditions, and survey results should be considered accordingly when selecting fishery specifications. While the survey has indeed

been variable, it is notable that point values have been very low for two consecutive years across both the spring and fall surveys.

- With the available information, it is very difficult for the Herring PDT to provide specific advice on how to manage the inshore fishery and ensure that overfishing of the inshore component of the resource does not occur. There is very little biological information on which to base a status determination for the inshore component. While information from the TRAC Assessment can be used to provide some perspective on appropriate levels of yield from the inshore component (see discussion of this issue in Section 4.1.4.4), it becomes very difficult to translate an estimate of overall yield into area-specific TACs for management purposes.
- Figure 13 (p. 31) illustrates another important consideration relative to interpreting bottom trawl survey data for Atlantic herring – encounter rates, the number of tows that sample herring (non-zero tows). Encounter rates in the bottom trawl survey are especially important to consider for pelagic species like herring, since the survey itself is not designed to sample pelagic fish in significant quantities. In general, the trend in encounter rates for the fall bottom trawl survey has remained relatively flat since the early 1990s; recent declines in the amount of herring sampled in the trawl survey are not reflected in the encounter rates at this time.
- The MA DMF and ME DMR research bottom trawl surveys (inshore Gulf of Maine) were examined for trends in the inshore herring component. In general, both surveys are dominated by young herring and do not track adult herring abundance, but they may serve as useful indicators of recruitment in the inshore Gulf of Maine (new year classes entering the fishery). While the time series is much shorter, no declining trends in herring recruitment are apparent based on these inshore surveys.

The Council acknowledges the need to prevent overfishing of the inshore component and considered recent survey trends in the inshore Gulf of Maine carefully when developing the proposed action. The risk assessment presented in Section 5.2.2 of this document evaluates the proposed action and other TAC alternatives under consideration relative to the risk of overfishing the inshore component. The analysis incorporates the best available scientific information from the 2006 TRAC Assessment of Atlantic herring.

4.1.2 Acoustic Surveys

Amendment 1 includes the most recent information about the inshore and offshore herring acoustic surveys. There is no additional information relative to the acoustic surveys provided in this document, and for the reasons discussed in Amendment 1, the acoustic surveys were not utilized in the TRAC Assessment or the analyses of the proposed action and other alternatives considered for the specifications.

4.1.3 Update – Morphometric Studies

Morphometric studies are those that investigate physical differences between fish in order to differentiate fish stocks and/or their spawning components. It is also called "biological shape analysis." Morphometrics (from the Greek: "morph," meaning shape or form, and "metron," meaning measurement) is a term that is applied to biological topics in the widest sense – schools of morphometrics are characterized by what aspects of biological "form" they are concerned with, what they choose to measure, and what kinds of questions they ask of the measurements once they are made. In many cases, morphometric studies involve calculating angles, areas, volumes and other quantitative data from landmark and segmentation data.[1]

[1] http://en.wikipedia.org/wiki/Morphometrics

Morphometric studies continue to investigate whether herring from the inshore spawning component are morphometrically different than those from the offshore spawning component, those from the Scotian Shelf component, etc. Samples obtained from seasonal herring fisheries are being studied, and morphometric differences may provide a more accurate assessment of how the herring spawning components mix in the various seasonal fisheries. The Abstract from an ongoing study – *Morphometric Discrimination of Atlantic Herring (Clupea harengus harengus) in the Northwestern Atlantic Ocean* – is provided below as an update. Additional information will be provided as the study nears completion and results are available.

Atlantic herring stock structure may be defined by regional spawning components that aggregate in unique spawning locations in Canada, the Gulf of Maine, and on Georges Bank. However, the currently defined U.S. management unit is a stock complex including all herring that spawn in the Gulf of Maine and on Georges Bank. As a result, less productive components within the complex may be at risk of being overfished. Truss network analysis and multivariate statistical techniques were used in this research to effectively discriminate among these spawning stock components during autumn of 2003 and 2004. Significant results showed that herring were correctly classified to their stock of origin at 67 to 87%. The new models can be used for in-season mixed-stock composition analyses to determine the proportions of spawning stock herring that constitute mixed survey or commercial catches.

4.1.4 TRAC Stock Assessment 2006

Since 1998, the Transboundary Resources Assessment Committee (TRAC) has reviewed stock assessments and projections necessary to support management activities for shared resources across the USA Canada boundary in the Gulf of Maine-Georges Bank region. These assessments are necessary to advise decision makers on the status of these resources and likely consequences of policy choices. The most recent TRAC benchmark assessment of the Atlantic herring complex occurred from May 2-5, 2006 in Woods Hole, Massachusetts. **The TRAC Status Report from this assessment is provided as Appendix I to this document and should be referenced for more complete information about the current status of the Atlantic herring resource complex**.

4.1.4.1 Summary of Atlantic Herring Stock Status

The TRAC Status Report (Appendix I) provides a consensus summary of the TRAC on stock status and future resource outlook. It also provides reference points for management purposes, which were agreed upon by the U.S. and Canadian scientists who participated in the TRAC meeting.

The following information summarizes the results of the 2006 TRAC Assessment and the current status of the Atlantic herring complex:

- Combined Canada and USA herring landings increased from 106,000 mt in 2002 to 110,000 mt in 2003, increased further to 115,000 mt in 2004, and declined to 105,000 mt in 2005.
- Stock biomass (2+) increased from about 105,000 mt in 1982 to about 1.3 million mt in 2000. Subsequently, biomass has declined slightly and was 1.0 million mt in 2005.
- Recruitment at age 2 increased in the late 1980s with several moderate year classes. In the past decade, three very large year classes have been produced (the 1994, 1998, and 2002 cohorts).
- Fishing mortality (age 2+) declined from peak values above 0.70 in the 1970s to an average of 0.30 during the mid-late 1980s. Fishing mortality declined to 0.15 in 1991 and has remained at about 0.1 since 2002.

- Assuming that fishing mortality in 2006 is equal to that in 2005 (F=0.11) produces a catch in 2006 of 105,000 mt (the same catch as in 2005). The resulting SSB in 2007 would be 952,000 mt, a decline of about 6%. Assuming average recruitment in 2006 through 2008, continuing to fish at F=0.11 in 2007 would generate a catch in 2007 of 99,000 mt, and SSB in 2008 would be 901,000 mt.
- The relative proportion of the inshore component of the overall herring stock complex was 18% based on the average proportion from three different data sources (commercial acoustic survey biomass estimates; morphometric studies; and NEFSC autumn survey swept biomass estimates).

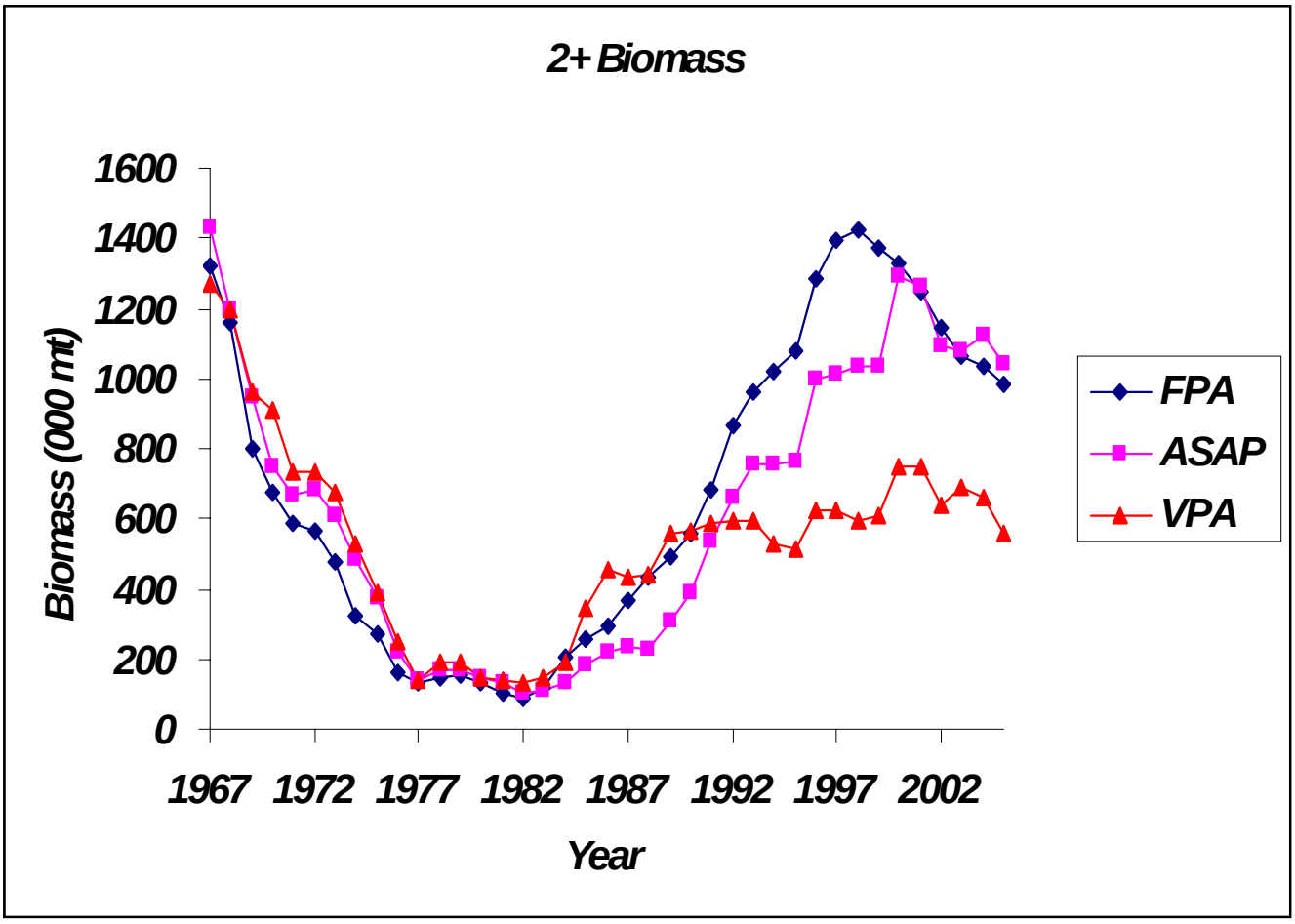
The Herring PDT reviewed the TRAC 2006 Assessment results and adds the following:

- The 2006 TRAC Assessment was a joint assessment of the Atlantic herring stock complex conducted by U.S. and Canadian scientists. Consensus was reached at the assessment regarding assessment methodology, input data, current status of the resource, and appropriate biological reference points for the herring stock complex. The 2006 TRAC Assessment information represents the best available scientific information at this time.
- Overall, the Atlantic herring stock complex appears to have recovered to high levels and stabilized. Survey trends for the resource as a whole were updated and evaluated as part of the assessment and have remained relatively flat in more recent years. The resource appears to have re-distributed throughout much of its historical range, and sampling suggests that the age structure of the stock has expanded, both of which are positive signs of a healthy, recovered stock complex.
- Assessment of the Atlantic herring resource remains complex-wide; data are not available at this time to generate a biomass estimate, apply a target fishing mortality rate, or estimate an appropriate level of yield specifically from the inshore component of the resource. The TRAC assessment did estimate that the inshore component of the resource represents 18% of the total stock biomass, an average estimate based on three sources of information (range 10%-30%). The assessment did not, however, provide guidance on either the appropriateness of TAC distributions among management areas or mixing rates between stock components.
- Consensus was reached at the 2006 TRAC Assessment regarding the following reference points for the Atlantic herring stock complex: **MSY 194,000 mt; B_{MSY} 629,000 mt; F_{MSY} 0.31. Current fishing mortality was estimated to be 0.1, and it was agreed that current biomass (2005) is around 1 million mt. Based on these reference points, the stock is fully recovered, and overfishing is not occurring.** Three particularly large year classes seem to have driven the recovery and high biomass in recent years: 1994, 1998, and 2002.
- The model utilized in the assessment exhibits a retrospective pattern; the model tends to over-estimate biomass and under-estimate fishing mortality (see additional discussion below). Despite this pattern, it is clear that current levels of removals from the stock complex (around 100,000 mt for the last 15 years) are sustainable and should not cause concern relative to the health of the resource as a whole. The retrospective pattern in the model suggests that the Council may want to be cautious about allowing removals to increase significantly above what has been observed in the fishery over the last 15 years.

4.1.4.2 TRAC Assessment Model

The state of the resource was based on results from an age-structured, analytical assessment which used fishery catch statistics and biological samples to characterize the size and age composition of the catches during 1967 to 2005. Several model formulations were considered, all of which give similar trends in stock size but differed in scale (Figure 24). The final model formulation was selected, with some difficulty, to balance various data sources and their uncertainty, and was calibrated to trends in abundance from the NMFS spring, fall and winter bottom trawl surveys, as well as the NMFS hydroacoustic survey.

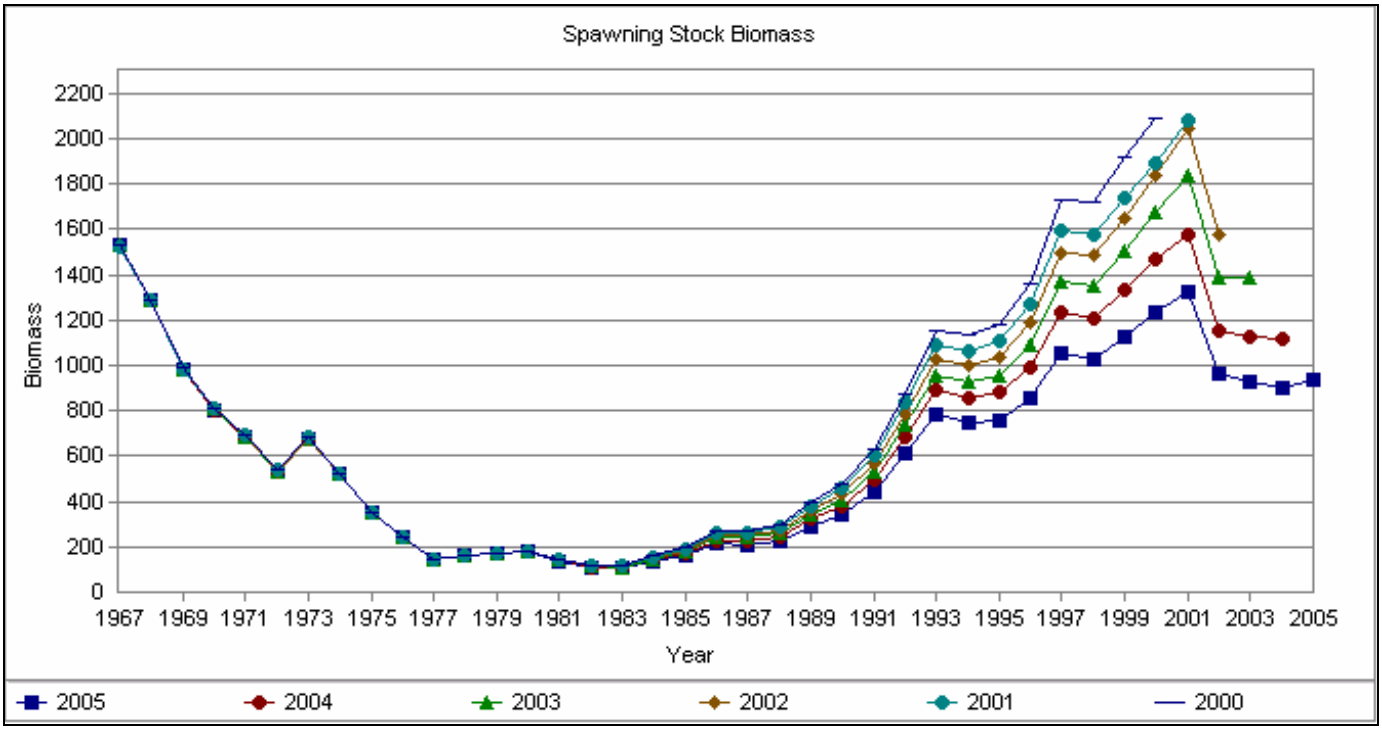
Figure 24 TRAC 2006 Assessment of Atlantic Herring Stock Complex – Models Considered (ASAP Selected)



4.1.4.3 TRAC Model – Retrospective Pattern

Retrospective analyses were used to detect any patterns to overestimate – or underestimate – fishing mortality, biomass and recruitment relative to the terminal year estimates. A significant retrospective pattern was detected in this assessment in overestimating SSB (averaging + 14.5%/year, and ranging between 1-24%), and this is a concern. The pattern has persisted for several years and is expected to continue in the future (Figure 25). Despite this pattern, it is clear that current levels of removals from the stock complex (around 100,000 mt for the last 15 years) are sustainable and should not cause concern relative to the health of the resource. The retrospective pattern in the model was considered by the Council when it determined that allowing removals to increase significantly to ABC levels during 2007-2009 may not be a prudent approach. The Council is concerned about the retrospective pattern in the stock assessment and is instead recommending more conservative specifications that still provide for expansion of the fishery beyond current levels.

Figure 25 Retrospective Pattern in TRAC 2006 Atlantic Herring Assessment



4.1.4.4 Proportion of Resource from Inshore Stock Component (18%)

While the 2006 TRAC Assessment did not evaluate the status of the individual stock components separately, assessment scientists did estimate that the inshore component of the resource represents 18% of the total stock biomass, an average based on three sources of information (range 10%-30%). The assessment did not, however, provide guidance on either the appropriateness of TAC distributions among management areas or mixing rates between stock components.

To address the following Term of Reference, TRAC Assessment scientists estimated the proportion of the Atlantic herring resource that is composed of fish from the inshore component (18%):

- Using available data from acoustic, trawl surveys, and recent tagging studies, evaluate the relative proportions of the biomass between the inshore Gulf of Maine and Georges Bank to give guidance on the usefulness and the degree to which these results can be used to provide advice to managers.

This estimate is an average based on four sources of information: commercial acoustics, morphometric analyses, estimates from the KLAMZ model, and the NMFS Autumn trawl survey.

1. Commercial Acoustics

Acoustic data loggers were installed on commercial vessels in the Gulf of Maine during the late 1990s. During 1999 and 2000, the F/V Providian fished on Georges Bank and in the nearshore waters of the Gulf of Maine. Data from these fishing trips were used to estimate herring biomass in the vicinity of the fishing operations conducted by F/V Providian. Ratios between inshore and offshore biomass in these two years were calculated and the percentages for the GOM were 10% in 1999 and 9 % in 2000.

2. Morphometric Analysis

A recent morphometrics study of herring documented phenotypic differences between herring from the Gulf of Maine, Georges Bank, and the Scotian Shelf. Using these results, seasonal samples of herring from the commercial fishery in the winter and spring off Southern New England, were analyzed to estimate the relative composition of the catch in that Results suggested that the relative composition of herring in the area ranges from about 10-20% of fish from the Gulf of Maine.

3. K2FPA (KLAMZ) Model Estimates

One component of the KLAMZ model allows for the estimation of a survey q for the hydroacoustic survey using data from 1999-2002. This estimate is the proportion of the total stock complex that represents the Georges Bank component. The estimate from the last assessment was 0.905, while the estimate from the current assessment is 0.849.

4. NMFS Autumn Bottom Trawl Survey

Data from the NMFS autumn bottom trawl survey were analyzed to determine if they could be used to estimate the relative proportions of nearshore GOM and offshore GB herring. The data were organized into two strata sets, strata 26-28 and 37-40 for the GOM and strata 9-11, 13-14, 16-17, 19-25 and 29-30 for GB. Area swept biomass (kg) from the two sets were calculated and then smoothed using Loess. The year by year estimates were summed and the relative proportions for each region were calculated. The percent of total for Georges Bank averaged about 65% in the early 1990s and gradually increased to 71% in 2004.

Average Percentage for the Inshore Component (18%)

Three of the four data sources were used in the final estimate of the proportion of the total herring complex represented by the inshore component. Results from the commercial acoustics, morphometric analysis, and the NMFS Autumn bottom trawl survey were used in the analysis. Estimates from each analysis were averaged and then an average of these three values was calculated, producing an estimate of 18%. The TRAC decided that all three analyses should be equally weighted in the results. The estimate from the KLAMZ model was not used in the analysis because the model was not used in the overall herring assessment for the complex.

The Herring PDT reviewed the information from the TRAC Assessment and discussed possible approaches for determining the area-specific TACs based on the estimate that the inshore component represents 18% of the total stock biomass. There was also brief discussion of this issue at the July 6, 2006 Herring Committee/Advisory Panel meeting, as one advisor asked whether the 18% estimate could be applied to determine the TACs for the upcoming fishing years.

During the Committee deliberations, the Herring PDT provided the following advice relative to this issue:

- It may be possible for the PDT to apply a fishing mortality rate to an average biomass for the inshore component (based on 18% of total biomass) and estimate a TAC specifically for the inshore component. Using this approach would likely result in a TAC *for the inshore stock component* of about 35,000 mt – 42,000 mt. However, a TAC for the inshore stock component does not equate to a TAC for Area 1A, as fish from both the inshore and offshore component are caught in Areas 1A, 1B, and 2. The TAC for the inshore component would have to be distributed among these management areas appropriately and monitored accordingly.
- This approach is quite different than the Council's current approach for both setting fishery specifications and managing the fishery on an area-specific basis, as there would be great difficulty associated with apportioning an overall yield for the inshore component across various management areas that catch these fish. In addition, there are some substantial administrative, monitoring, and enforcement issues associated with this approach at this time.
- Information about mixing ratios in the various management areas should be relatively certain to determine how much of an overall inshore stock TAC to allocate to Area 1A, 1B, and/or 2, where these fish are caught seasonally in different proportions along with the offshore component. Ongoing morphometric studies are examining mixing rates and should provide better information in the future, but mixing rates currently remain a source of uncertainty. Moreover, the estimate provided by the TRAC Assessment that the inshore component represents 18% of the total stock biomass was an average estimate derived from multiple sources ranging from 10%-30% (see above), so there may be some uncertainty associated with that estimate.
- An approach that utilizes the 18% estimate to derive a TAC for the inshore component of the resource presents new and more complex accounting problems, as previously noted, and interactions with Canadian herring fisheries also would need to be factored more thoroughly into this kind of approach.
- While the Herring PDT can provide estimates of an inshore TAC at various fishing mortality rates if the Herring Committee requests this information, it would be up to the Committee and Council to determine how to apportion the available inshore yield between the existing management areas and establish appropriate TACs for Area 1A, 1B, and 2 that reflect the level of concern that the Council may have about the health of the inshore resource at this time, recognizing the uncertainties associated with the mixing ratios.

- This may be a more appropriate way to manage the herring fishery in the future to ensure that stock components are not overfished, but it requires a different and perhaps more complicated approach to allocating and monitoring TACs, presents enforcement issues would need to be addressed, and relies on information about stock mixing ratios that is more conclusive than currently exists. Once stock mixing ratios become more certain and/or once data are adequate to complete a separate benchmark stock assessment of the inshore component, the Council should further consider this approach in an amendment or framework adjustment to the Herring FMP.
- **The Herring PDT intends to make progress towards developing this approach over the course of the next few years, once the 2007-2009 specifications are completed**. During the winter of 2007, the PDT plans to meet and review new information related to several important and relevant issues: (1) morphometric studies (Section 4.1.3) are continuing to sample herring and investigate stock component mixing ratios associated with the seasonal fisheries; preliminary results may be available this winter to develop a model that can accurately account for stock mixing and help to distribute TACs appropriately across the fishery; (2) tagging studies are yielding preliminary results that should be reviewed by the PDT; unfortunately, funding has not been continued for ME DMR's tagging studies, but data collected thus far may improve knowledge about stock mixing; and (3) the catch-at-age matrix for Atlantic herring has been revised and should be reviewed by the PDT.

4.1.4.5 TRAC Assessment - Outlook

An outlook is provided from the TRAC Assessment in terms of the consequences on SSB and for yield in 2006, 2007, and 2008 of maintaining the current (2005) fishing mortality rate (F=0.11, see Table 10 below). Although uncertainty in stock size and recruitment generates uncertainty in forecast results, a formal risk analysis was not undertaken due to the significant retrospective pattern in SSB and the difficulty and uncertainty in selecting the final model formulation. Nevertheless, the forecasts are considered useful for general management guidance.

The projections assumed that recruitment of the 2004-2006 year classes was equal to the long-term average (2.3 billion fish at age 2, see figures in Appendix I). A fishing mortality of F=0.11 in 2006 generates a catch of 105,000 mt (equal to the 2005 landings) and an SSB in 2007 of 952,000 mt, a decline of about 6%. Continuing to fish at F=0.11 in both 2007 and 2008 produces annual catches of 99,000 mt and 94,000 mt, respectively, and results in a slight decline in SSB in 2008 to 901,000 mt.

Table 10 2006 TRAC Assessment – General Outlook for 2006-2008 at Current F

SSB, Yield (thousands mt)			
	SSB	**Yield**	**F**
2006	1008	105	0.11
2007	952	99	0.11
2008	901	94	0.11

4.2 HERRING FISHERY

A complete description of the Atlantic herring fishery – vessels, processors, and communities – is provided in Amendment 1 to the Herring FMP. The following subsections update general fishery information through the 2005 fishing year and is consistent with information provided in previous SAFE Reports. The Amendment 1 FSEIS should be referenced for more detailed information about the herring fishery.

4.2.1 Herring IVR Landings

The main reason for utilizing the interactive voice response (IVR) system in the Atlantic herring fishery is to monitor the Total Allowable Catch (TAC) limits set for the four Federal management areas. As part of the herring FMP, each management area is annually assigned a TAC (in metric tons). Although harvesters are required to report catches with VTR forms, near real-time data is obtained through the IVR system allowing the TACs to be monitored. When the catch in a management area is projected to reach 95% of its specified TAC, the Regional Administrator enacts a closure for all directed herring fishing. The 2005 fishing year was the fifth year of mandatory IVR reporting for the Atlantic herring fleet.

Table 11 Total Allowable Catches for 2005 and 2006

Management Area	TAC (mt)	95% of TAC (mt)
Area 1A (Jan 1st – May 31st)	6,000	5,700
Area 1A (June 1st – Dec 31st)	54,000	51,300
Area 1A TOTAL	60,000	57,000
Area 1B	10,000	9,500
Area 2	30,000	28,500
Area 3	50,000	47,500

Table 12 Total IVR Landings of Atlantic Herring, 2000-2004

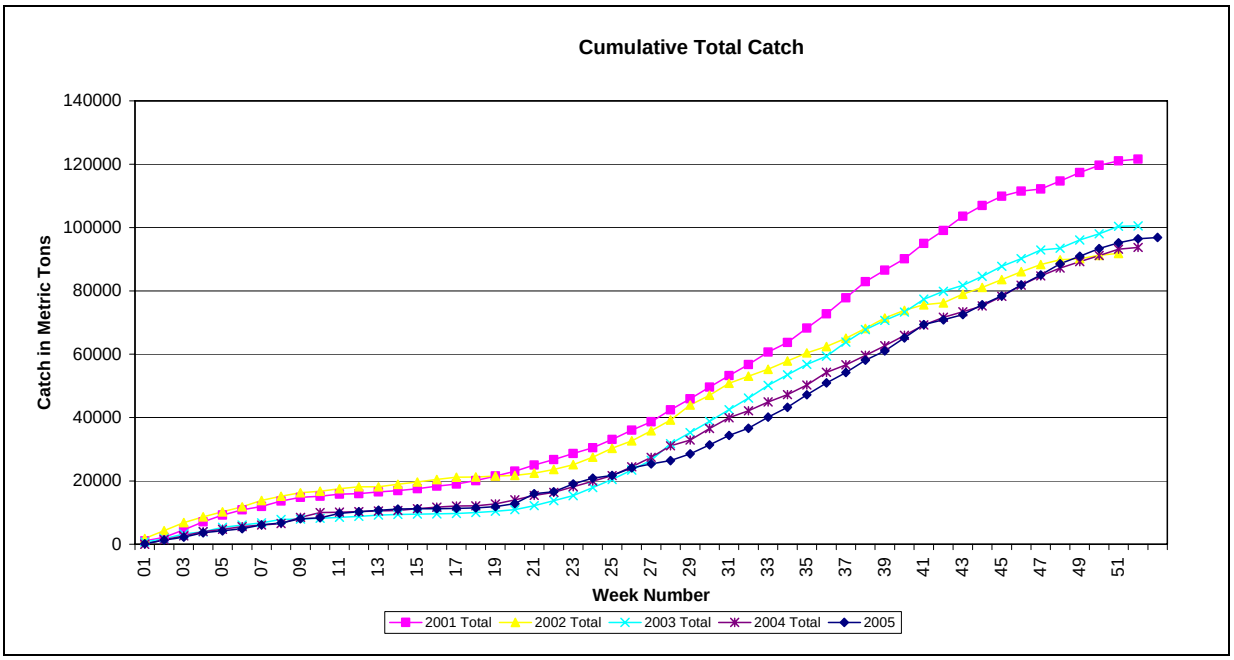
Year	Total IVR Landings (MT)
2000	107,387
2001	121,569
2002	91,831
2003	100,544
2004	93,722

Table 13 provides IVR catches for the 2005 fishing year. Overall, the IVR reports totaled 96,895 mt of herring across all management areas. The Area 3 landings remained relatively low, similar to 2004 (11,905 mt), and only 26% of the Area 3 TAC was utilized during the 2005 fishing year. Note that IVR reports do not include trip-level information and precise fishing locations, so some discrepancies in catch and area must be resolved by cross-checking the IVR data with VTR data. However, the IVR system is useful for near real-time quota monitoring but not so much for stock assessment, or management questions that require information by sub-area or gear.

Table 13 IVR Herring Catch for 2005 Fishing Year

Management Area	IVR Catch (mt)	% of TAC
Area 1A (Jan 1st – May 31st)	0	0
Area 1A (June 1st – Dec 31st)	61,570	102.6% of 60,000
Area 1B	7,873	78.73% of 10,000
Area 2	14,423	48.1% of 30,000
Area 3	13,029	26.1% of 50,000

Figure 26 Total Catch of Atlantic Herring by Week, 2001-2005 (IVRs)



4.2.2 Herring Fishery – Economic Factors

The information provided in this section is based on VTR data through the 2005 fishing year.

In 2005, the overall VTR-reported herring landings of **93,390 mt** were not significantly different from the 2004 VTR landings of 93,894 mt. The gear type that brought the largest amount of herring to market was the **midwater pair trawl at 56,571 mt**. This is a 1.0% decrease from 2004 levels. In 2005, single midwater trawl landings rose by 35.7% to 19,129 mt. Purse seine landings totaled 16,306 metric tons; a 16.4% decline from 2004. Bottom trawl gear accounted for 1,367 metric tons. There were no landings by U.S. weirs reported in 2005.

Most herring sold in 2005 was taken from Area 1A (59,165 mt), which is capped at 60,000 mt. Area 1B landings were 6,109 mt, which is a 54% decrease from 2004. (In 2004, some Area 3 landings were erroneously reported in VTRs as Area 1B landings.) The Area 2 landings in 2005 were 14,589 metric tons, which is 24.7% more than 2004 levels. Area 3 landings were 13,397 metric tons in 2005, which is 54.7% higher than 2004 landings. Table 14 shows landings from the various gears used in 2002 through 2005 and the activities of each in the herring management areas.

Table 15 also reports landings (and number of trips and days-at-sea) by management area except that instead of listing herring landings by gear used, each vessel was assigned a principal gear based on the gear that landed the most herring. Since some vessels used multiple gears to catch herring, this principal gear designation was necessary to describe herring fishery activity by vessel. For example, some vessels that primarily used midwater trawl gear landed herring with other gears; the actual gear used is shown in Table 14, while Table 15 lists all landings under the primary gear used by the vessel. For pair trawl gear, trips and days are counted for each participating vessel. For example, if two vessels make a two day pair trawl trip, the total number of trips would equal two and the total number of days at sea would equal four. Table 16 reports the number of vessels associated with the landings and effort information in Table 15.

Table 14 Metric Tons of Herring Sold by Gear and Management Area in 2002 – 2005

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
	2005	104.0	2.3	1,261.0			1,367.3
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
	2005	32,639.6	2,717.4	1,1008.1	10,074.2	131.5	56,570.9
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
	2005	10,315.3	3,181.1	2,311.2	3,322.4		19,129.9
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
	2005	16,098.6	207.7				16,306.3
Weir	**2002**			0.8			0.8
	2003			0.5			0.5
	2004			4.4			4.4
	2005						
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
	2005	7.3		8.5			15.8
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
	2005	59,164.8	6,108.5	14,588.8	13,396.5	131.5	93,390.1

Table 15 Herring Trips and Days, and Herring Sold (mt) by Management Area and Principal Herring Gear for 2002 – 2005

(Continued for 2005 on following page)

Principal Gear		Area 1A			Area 1B			Area 2			Area 3			Unknown Area		
		2002	2003	2004	2002	2003	2004	2002	2003	2004	2002	2003	2004	2002	2003	2004
Bottom Trawl	**No. Trips**	306.0	168.0	317.0	5.0	8.0	10.0	186.0	116.0	170.0	10.0	37.0	1.0	2.0	4.0	
	Days-at-sea	162.4	84.0	155.9	23.0	10.9	12.7	136.5	155.2	172.2	49.9	197.6	7.2	1.1	4.4	
	Landings (mt)	343.8	100.8	1,673.6	0.9	1.2	4.8	1,051.8	968.2	1,549.6	12.1	85.3	1.9	0.5	1.0	
Pair Trawl	**No. Trips**	428.0	392.0	374.0	74.0	40.0	97.0	59.0	104.0	78.0	103.0	129.0	61.0	7.0	6.0	1.0
	Days-at-sea	467.9	501.4	476.3	116.9	69.6	166.9	71.0	236.2	173.3	280.4	421.4	170.3	10.4	6.5	0.8
	Landings (mt)	29,697.8	32,839.9	29,689.5	5,624.7	4,230.6	11,790.9	6,144.3	11,767.9	7,764.5	8,818.7	17,795.2	7,177.2	465.0	477.1	49.0
Midwater Trawl	**No. Trips**	236.0	183.0	213.0	15.0	11.0	15.0	67.0	55.0	47.0	25.0	10.0	7.0	2.0		
	Days-at-sea	197.0	148.5	144.6	33.3	13.1	19.0	107.8	102.3	110.3	82.5	37.8	20.4	2.1		
	Landings (mt)	10,193.6	7,365.3	8,326.3	982.4	980.5	1,486.7	4,104.4	3,001.5	2,343.7	5,322.7	3,453.6	1,479.7	4.5		
Purse Seine	**No. Trips**	328.0	321.0	274.0	9.0	5.0			11.0					6.0	2.0	2.0
	Days-at-sea	237.2	242.2	197.8	7.4	4.3			8.7					6.0	1.4	1.5
	Landings (mt)	19,445.6	19,569.6	20,377.5	660.8	152.8			737.7					362.4	115.7	143.6
Weir	**Landings (mt)**							0.8	0.5	4.4						
Other	**No. Trips**	31.0	63.0	22.0		5.0	1.0	201.0	326.0	289.0	1.0			5.0		29.0
	Days-at-sea	24.5	23.3	32.7		2.4	0.6	76.7	117.3	91.5	2.4			1.1		8.9
	Landings (mt)	0.9	14.5	3.8		0.8	0.0	7.1	13.3	26.7	0.3			0.3		0.8
All Gears	**No. Trips**	1,329.0	1,127.0	1,200.0	103.0	69.0	123.0	516.0	613.0	588.0	139.0	176.0	69.0	22.0	12.0	32.0
	Days-at-sea	1,089.1	999.3	1,007.3	180.6	100.2	199.2	393.5	620.0	548.7	415.2	656.8	197.9	20.9	12.3	11.2
	Landings (mt)	59,681.6	59,890.1	60,070.7	7,268.8	5,365.9	13,282.4	11,308.3	16,489.0	11,688.9	14,153.8	21,334.1	8,658.7	832.5	593.7	193.4

Table 15 continued. Herring Trips and Days, and Herring Sold (mt) by Management Area and Principal Herring Gear for 2002 – 2005

Principal Gear		Area 1A	Area 1B	Area 2	Area 3	Unknown
		2005	2005	2005	2005	2005
Bottom Trawl	No. Trips	306	1	170		
	Days-at-sea	138	1	184		
	Landings (mt)	110	2	1,217		
Pair Trawl	No. Trips	314	32	113	69	1
	Days-at-sea	476	62	267	225	2
	Landings (mt)	32,791	2,781	11,040	9,429	132
Midwater Trawl	No. Trips	173	22	44	26	
	Days-at-sea	208	46	125	96	
	Landings (mt)	9,226	3,118	2,323	3,968	
Purse Seine	No. Trips	213	1			
	Days-at-sea	172	1			
	Landings (mt)	17,031	208			
Other	No. Trips	104	1	277		5
	Days-at-sea	34	0	78		1
	Landings (mt)	7	0	8		0
All Gears	No. Trips	1,110	57	604	95	6
	Days-at-sea	1,027	110	654	321	3
	Landings (mt)	59,165	6,109	14,588	13,397	132

Table 16 Number of Vessels by Principal Herring Gear for 2002 – 2005

	2002	2003	2004	2005
Bottom Trawl	67	56	56	58
Midwater Pair Trawl	13	16	13	12
Midwater Trawl	15	10	9	11
Purse Seine	7	6	4	4
Other	45	52	43	58
Total	**147**	**140**	**125**	**143**

The Herring FMP distinguishes between vessels catching herring incidentally while pursuing other species and those targeting herring by defining vessels that average less than 1 metric ton (actually 2,000 pounds which is 205 pounds less than a metric ton) of herring caught per trip (in all areas) as incidental herring vessels. Table 17 and Table 18 are similar to Table 15 and Table 16 except they exclude the incidental catch vessels and therefore characterize the directed fishery for herring.

During the 2005 fishing year, there were **33 vessels**, defined as directed herring vessels, which sold 93,265 metric tons of herring. This is seven (7) fewer vessels than in the 2004 directed fishery. However, four (4) of the seven (7) fewer directed vessels can be attributed to a decrease in the bottom trawl sector. The other three (3) are from the pair trawl sector. There was also an increase of two (2) vessels in the single midwater trawl fleet, but this was offset by a decline of two (2) vessels in the "other" gear sector.

Table 17 Herring Trips and Days, and Herring Sold (mt) by Management Area and Principal Herring Gear for Vessels (no weir landings) Averaging more than 1 Metric Ton of Herring per Trip in All Areas During 2002 – 2005

(Continued for 2005 on following page)

Principal Gear		Area 1A			Area 1B			Area 2			Area 3			Unknown Area		
		2002	2003	2004	2002	2003	2004	2002	2003	2004	2002	2003	2004	2002	2003	2004
Bottom Trawl	**No. Trips**	1.0	17.0	9.0		1.0	2.0	39.0	42.0	69.0	2.0	35.0	1.0			
	Days-at-sea	9.1	6.8	8.2		4.5	0.9	43.1	105.6	133.1	9.0	180.7	7.2			
	Landings (mt)	267.6	77.9	1,549.8		0.5	3.4	1,029.5	957.5	1,528.1	6.4	85.0	1.9			
Pair Trawl	**No. Trips**	428.0	392.0	374.0	74.0	40.0	97.0	59.0	104.0	78.0	103.0	129.0	61.0	7.0	6.0	1.0
	Days-at-sea	467.9	501.4	476.3	116.9	69.6	166.9	71.0	236.2	173.3	280.4	421.4	170.3	10.4	6.5	0.8
	Landings (mt)	29,697.8	32,839.9	29,689.5	5,624.7	4,230.6	11,790.9	6,144.3	11,767.9	7,764.5	8,818.7	17,795.2	7,177.2	465.0	477.1	49.0
Midwater Trawl	**No. Trips**	210.0	160.0	159.0	15.0	11.0	15.0	66.0	55.0	47.0	25.0	10.0	7.0	1.0		
	Days-at-sea	190.5	144.1	133.6	33.3	13.1	19.0	107.2	102.3	110.3	82.5	37.8	20.4	1.8		
	Landings (mt)	10,175.1	7,349.9	8,283.5	982.4	980.5	1,486.7	4,103.5	3,001.5	2,343.7	5,322.7	3,453.6	1,479.7	3.6		
Purse Seine	**No. Trips**	328.0	320.0	274.0	9.0	5.0			11.0					6.0	2.0	2.0
	Days-at-sea	237.2	241.6	197.8	7.4	4.3			8.7					6.0	1.4	1.5
	Landings (mt)	19,445.6	19,569.0	20,377.5	660.8	152.8			737.7					362.4	115.7	143.6
Other	**No. Trips**		2.0	1.0						2.0						
	Days-at-sea		0.4	0.9						1.3						
	Landings (mt)		8.4	1.6						2.2						
All Gears	**No. Trips**	967.0	891.0	817.0	98.0	57.0	114.0	164.0	212.0	200.0	130.0	174.0	69.0	14.0	8.0	3.0
	Days-at-sea	904.7	894.3	816.9	157.6	91.4	186.7	221.4	452.7	419.4	372.0	639.9	197.9	18.3	7.9	2.3
	Landings (mt)	59,586.1	59,845.2	59,901.9	7,267.9	5,364.3	13,281.0	11,277.4	16,464.6	11,638.5	14,147.8	21,333.8	8,658.7	831.0	592.7	192.6

Table 17 continued. Herring Trips and Days, and Herring Sold (mt) by Management Area and Principal Herring Gear for Vessels (no weir landings) Averaging more than 1 Metric Ton of Herring per Trip in All Areas During 2002 – 2005

Principal Gear		Area 1A	Area 1B	Area 2	Area 3	Unknown Area
		2005	2005	2005	2005	2005
Bottom Trawl	Number of Trips	28	1	36		
	Days-at-sea	10	1	67		
	Landings (mt)	42	2	1,181		
Pair Trawl	Number of Trips	311	32	109	69	1
	Days-at-sea	472	62	256	225	2
	Landings (mt)	32,790	2,781	11,037	9,429	132
Midwater Trawl	Number of Trips	169	22	44	26	
	Days-at-sea	207	46	125	96	
	Landings (mt)	9,223	3,118	2,323	3,968	
Purse Seine	Number of Trips	213	1			
	Days-at-sea	172	1			
	Landings (mt)	17,031	208			
All Gears	Number of Trips	721	56	189	95	1
	Days-at-sea	860	109	447	321	2
	Landings (mt)	59,086	6,109	14,541	13,397	132

Table 18 Number of Vessels by Principal Herring Gear for Vessels (no weir landings) Averaging more than 1 Metric Ton of Herring per Trip in All Areas During 2002 – 2005

	2002	2003	2004	2005
Bottom Trawl	5	9	13	9
Midwater Pair Trawl	13	16	13	10
Midwater Trawl	10	8	8	10
Purse Seine	7	5	4	4
Other		1	2	
Total	**35**	**39**	**40**	**33**

Figure 27 shows the average monthly herring prices for 2001-2005. Prices for herring have been steadily increasing through the 2001 – 2005 time period. Since U.S. producers of herring products are price takers in a world herring market, U.S. prices do not vary with landings. Therefore, observed price increases are more likely a response to changing world market conditions than to any changes in U.S. landings. Fuel costs increases may also be a factor in creating upward pressure on world herring prices. Since 2001, the average yearly herring price has increased from $138 per mt to $202 in 2005, a 46% increase over the 5-year period shown in Figure 27. Prices leveled somewhat during 2002 ($169 per mt), 2003 ($179 per mt), and 2004 ($183 per mt). If prices are adjusted for inflation using the Consumer Price Index, the percentage change from 2001 to 2005 is +30%. Multiplying the 2005 average price by total landings provides an estimate of $18,864,780 for the total value of all herring sold in 2005.

Figure 27 Average Monthly Herring Prices for 2001 – 2005

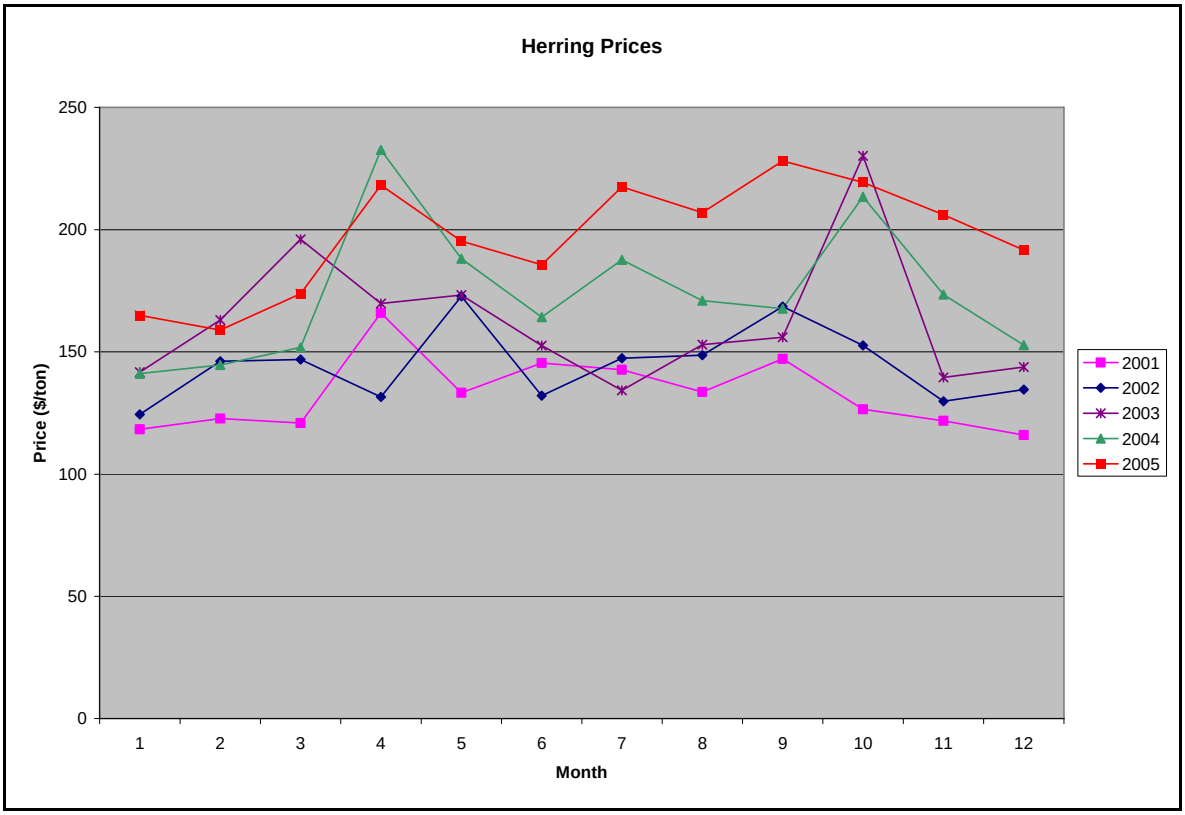


Table 19 reports per vessel average value of herring landings and the average dependence on herring and mackerel by principal gear for vessels that averaged greater than 1 mt per trip. Vessels principally using purse seine gear are the most dependent on herring in that approximately 84% of the value of their catch is derived from herring. Purse seine vessels do not depend on mackerel for income. The purse seine average in 2005 was $773,375. However, in 2005, pair trawl vessels had the highest average yearly gross revenue of $994,086 per vessel. This is the first year since 2002 that pair trawl per vessel average landings were greater than the purse seine average. Single midwater trawls derive as much as 51% of their revenue from herring and as much as 25% from mackerel, on average. However, in 2005, the average dependency on mackerel for single midwater trawl vessels was much less than in prior years (1.5%). These vessels had yearly gross revenues from herring in 2005 of $390,413 per vessel which is about $100,000 more than previous years. This may partially explain the shift in dependence from mackerel to herring. Pair trawl vessels derive as much as 65% of their revenue from herring and as much as 49% of their revenue from mackerel. Bottom trawl vessels are the least dependent on herring and only derive about 6% of their revenue from herring. Their average gross revenue from herring in 2005 was $29,434.

Table 20 shows the breakdown of quantity and value of landings by State landed and gear used. The State of Massachusetts landed 43,183 mt of herring in 2005 at a value of $8.7 million. Maine follows next in the ranking with landings of 37,646 mt and a value of $8.0 million. During 2002 through 2004, Maine's herring landings were higher than Massachusetts'. Rhode Island, other New England States, and the Mid-Atlantic States have significantly lower landings of herring. Table 21 shows the number of vessels associated with the landings and value reported in Table 20.

Table 22 reports the average number of crew members (including the captain) per trip by principal gear for vessels averaging greater than 1 mt per trip as reported on logbooks.

Table 19 Per Vessel Average Herring Value and Dependency on Herring and Mackerel by Principal Herring Gear for 2002 – 2005 (vessels averaging greater than 1 mt per trip)

		2002	2003	2004	2005
Bottom Trawl	**Average Herring Value**	36,585	21,041	36,257	29,434
	Average Percent Herring	7.1%	4.1%	3.9%	1.9%
	Average Percent Mackerel	6.6%	7.6%	6.7%	0.04%
Pair Trawl	**Average Herring Value**	555,265	660,050	684,139	994,086
	Average Percent Herring	50.6%	63.1%	64.2%	64.6%
	Average Percent Mackerel	49.3%	31.6%	30.7%	9.0%
Midwater Trawl	**Average Herring Value**	297,454	289,282	266,335	390,413
	Average Percent Herring	31.4%	43.9%	47.2%	50.6%
	Average Percent Mackerel	24.8%	19.1%	18.7%	1.5%
Purse Seine	**Average Herring Value**	436,533	676,463	828,277	773,375
	Average Percent Herring	81.7%	85.6%	84.0%	85.1%
	Average Percent Mackerel	0.0%	0.0%	0%	0%

Table 20 Landings and Value by Gear Used and State 2002-2005

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	
		2005	41	15	1,182	61	69	
	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	
		2005	8,785	3,277	213,696	12,893	13,292	
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	
		2005	34,149	14,195	3,898	4,173	156	
	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	
		2005	6,882,049	2,968,482	636,129	888,711	26,422	
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			
		2005	8,881	7,720	1,778	751		
	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			
		2005	1,823,961	1,572,737	304,191	149,609	99	
Purse Seine	**Landings (mt)**	2002		19,800		548		
		2003	456	16,736		1,219		
		2004	15	18,949		533		
		2005	113	15,710		420		
	Value	2002		3,227,327		89,342		
		2003	74,372	2,727,952		198,713		
		2004	2,365	3,088,757		86,811		
		2005	23,212	3,414,206		89,234		13,929
Other	**Landings (mt)**	2002		2		11	7	
		2003	10	6			13	
		2004	1	1		2	27	
		2005		6		1	8	
	Value	2002	44	350		1,762	1,193	
		2003	1,663	905		8	2,095	
		2004	184	191	18	259	4,476	
		2005	8	1,381		175	1,660	57

Table 20 continued. Landings and Value by Gear Used and State 2002-2005

Weir	**Landings (mt)**	2002	1					
		2003						
		2004	4					
		2005						
	Value	2002	126					
		2003	73					
		2004	717					
		2005						
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**	
		2005	**43,183**	**37,646**	**6,857**	**5,407**	**234**	
	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**	
		2005	**8,738,015**	**7,960,083**	**1,154,017**	**1,140,621**	**41,473**	13,986

Table 21 Number of Vessels by Principal Gear and Principal State (vessels averaging greater than 1 mt per trip) for 2005

	MA	**ME**	**RI**	**Other New England**	**Mid-Atlantic**	**Total**
Bottom Trawl	1	2	5		1	9
Midwater Pair Trawl	5	2		2	1	10
Midwater Trawl	2	6	2			10
Purse Seine		4				4
Total	8	14	7	2	2	33

Table 22 Average Crew Size (Including Captain) by Principal Gear for Vessels Averaging Greater than 1 mt per Trip

	2002	2003	2004	2005
Bottom Trawl	4.7	3.7	4.0	2.4
Midwater Pair Trawl	4.4	4.7	4.7	5.0
Midwater Trawl	4.4	4.4	3.9	3.9
Purse Seine	5.0	4.7	5.4	5.5

Table 23 lists the top five ports of landing for Atlantic herring based on 2005 VTR data. Overall, Gloucester and New Bedford, Massachusetts, as well as Portland, Prospect Harbor, and Rockland, Maine, accounted for 75.8% of the total Atlantic herring landings reported in VTRs for the 2005 fishing year.

Table 23 Top Ports of Landing for Atlantic Herring During the 2005 Fishing Year

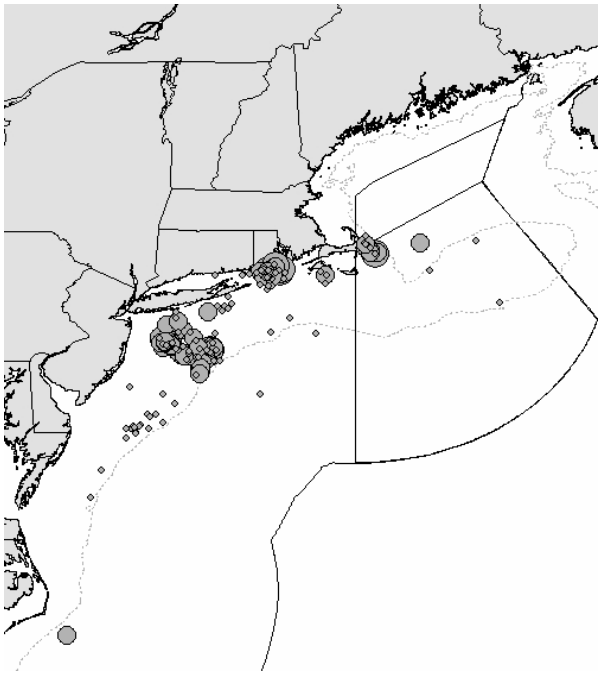
STATE	PORT NAME	TOTAL (MT)
MA	Gloucester	31,809
	New Bedford	9,973
MA Total		**41,782**
ME	Portland	13,902
	Prospect Harbor	1,133
	Rockland	13,942
ME Total		**28,977**
Grand Total		**70,759**

4.2.3 Spatial Distribution of Fishing Effort

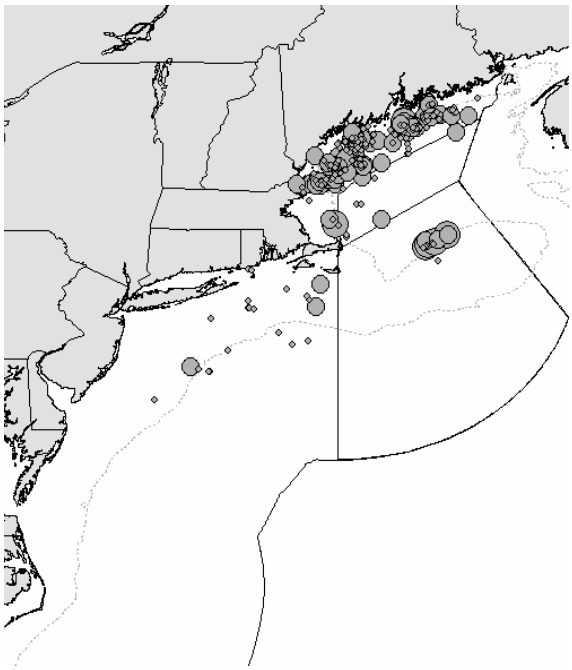
Section 7.4.1.2.3 of the Amendment 1 FSEIS includes figures that illustrate the annual distribution of herring fishing effort (trips landing more than 500 pounds) from 2000-2004 and also provides charts that compare the seasonal distribution of fishing effort during 1996, 2000, and 2004. Figure 28 updates this information and illustrates the distribution of herring fishing effort during the 2005 fishing year. (Note that while the distribution of effort is very similar to previous years, the months used to identify the seasonal fisheries in the Amendment 1 document are slightly different – Jan-Apr for winter, May-Aug for summer, Sept-Dec for fall.)

Figure 28 Seasonal Distribution of Atlantic Herring Catch During the 2005 Fishing Year

Winter Fishery (December – March)

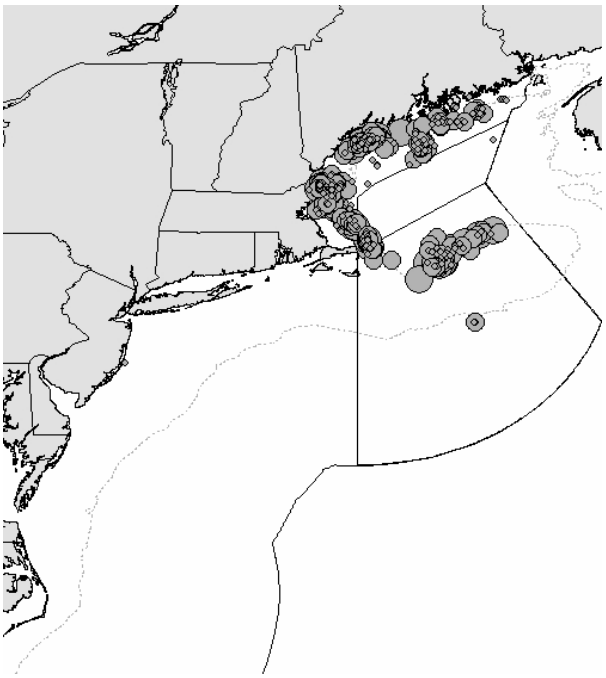


Summer Fishery (April – July)



Symbols represent the following divisions:
Small Circle = 1-100 mt
Medium Circle = 101-250 mt
Large Circle = 251-500 mt

Fall Fishery (August – November)



Note that while the distribution of effort is very similar to previous years, the months used to identify the seasonal fisheries in the Amendment 1 document are slightly different – Jan-Apr for winter, May-Aug for summer, Sept-Dec for fall.

4.2.4 Mapping the Herring Fishery: 2000-2003 Herring Flows and Areas of Impact

This section is provided from the Amendment 1 FSEIS to help readers and reviewers better understand important social and economic relationships between vessels, processors, communities, and other fisheries, and to better characterize the potential impacts of the proposed action and other alternatives for the 2007-2009 fishery specifications.

4.2.4.1 Mapping Background and Purpose

The purpose of the following maps is to illustrate linkages between herring stocks in Management Areas 1A, 1B, 2, and 3 and coastal communities in New England. These maps show the characterization of the herring fishery in terms of geographic distribution, gear type, and processing types and locations. In their current state, the maps identify primary herring ports (that is, ports accounting for the majority of herring landings in the NE) and link these ports with the principal vessels landing their catch in these ports. The individual vessels are color-coded by type (single midwater trawl, pair midwater trawl, single bottom trawl and purse seiners). The locations of pumping stations, freezer plants, canneries, lobster bait dealers and importantly, lobster permit holders are all identified on the maps. Fixed gear is not currently shown on the maps because it does not account for a significant portion of landings in the fishery. Major roads are also present to indicate possible truck routes for the distribution of herring to the more remote coastal areas.

The notion leading to the creation of these maps is that the human/environment nexus as it relates to fisheries is not always clear since most are unfamiliar with how fisheries function. Even for those who are 'insiders' (fishermen, industry participants, council staff, etc.), a bird's eye view of the fishery can provide perspective leading to a better understanding of how decisions based on biological information may influence use patterns and have important socio-economic impacts.

In addition, there has been a trend towards more lengthy text-based reports on impacts and changes to fisheries. While it is increasingly difficult to make sense of these reports due to their length, maps such as these could be used as 'visual baselines' to measure (albeit in a qualitative manner) changes in a fishery over time. Much information could be gleaned by simply comparing or overlaying maps from two different time periods instead of reading long reports and text-based information. Textual information could still be accessed (along with links to more information on each subject) by simply clicking on different icons or locations of an interactive version of the map. For example, clicking on a key port would link the viewer to the community profile for that port that would include socio-cultural and economic information for that location. While the maps currently exist in only a static form (and nonetheless provide a considerable amount of information), it is easy to envision an interactive application allowing for incorporation of community profiles and other information as well as permitting comparisons between time periods.

As part of the report on the herring fishery's Affected Human Environment in Amendment 1, qualitative and quantitative data accompany these figures and include the following:

- Demographic profiles of each of the 'key' communities that might be positively or negatively impacted by changes in the herring fishery (see Appendix XI, Volume II of Amendment 1 FSEIS);
- Qualitative descriptions of the processing plants, canneries and bait dealers that are associated with this fishery (Section 7.4.1.4 of Amendment 1 FSEIS);

- Information on the different gear types associated with this fishery (Section 7.4.1 of Amendment 1 FSEIS); and
- Historical information providing a background to this socio-ecological network (various sections of Amendment 1 as well as the original Herring FMP).

4.2.4.2 Mapping Data

Described in more detail in the technical reference below, the data used to generate this map include vessel trip reports (VTR) as well as state landings data and state permit data (for lobster permits). Should the map take a more interactive form, text-based information relating to the Affected Human Environment of this fishery will be linked to each icon. This information was collected by Herring PDT members using qualitative and quantitative data techniques including site visits, structured and unstructured interviews with fishery participants, and a review of existing literature, census data, and web links.

Assumptions/Limitations

The following include some of the assumptions made in producing this map:

- The top 34 vessels in the fishery (accounting for 99.5% of landings during the 2000-2003 period) are represented.
- Links are drawn to ports where a vessel offloads at least 10% of its total landings.
- Vessels are displayed using different symbols based on their primary gear type.
- Lobster permits are shown based of the permit holder's address. Thus, there is an implicit assumption that lobstermen fish where their permits are addressed.

Technical Reference

As was previously noted, utilizing data from a variety of sources, these maps attempt to illustrate the linkages between the herring fishery and the coastal communities of New England. Herring landings data was provided by the state of Maine, while vessel trip reports came from NMFS databases. The number of lobster permits by each town in Maine, New Hampshire and Massachusetts was provided by the respective states, and was included to identify those individuals who could be most impacted by changes in the availability of herring. Roads were included to indicate possible trucking routes for the distribution of herring. The location of primary herring ports and the facilities (pumping stations, freezer plants, canneries, and bait dealers) located at or near those ports also appear on the map.

Data processing was accomplished within Microsoft Access, while the mapping was performed by a series of scripts in ArcMap. It was suggested that a different pattern of activity might emerge from the data when fishing seasons were considered separately. Therefore, maps were generated for both the Winter/Spring (December-May) and Summer/Fall (June-November) seasons.

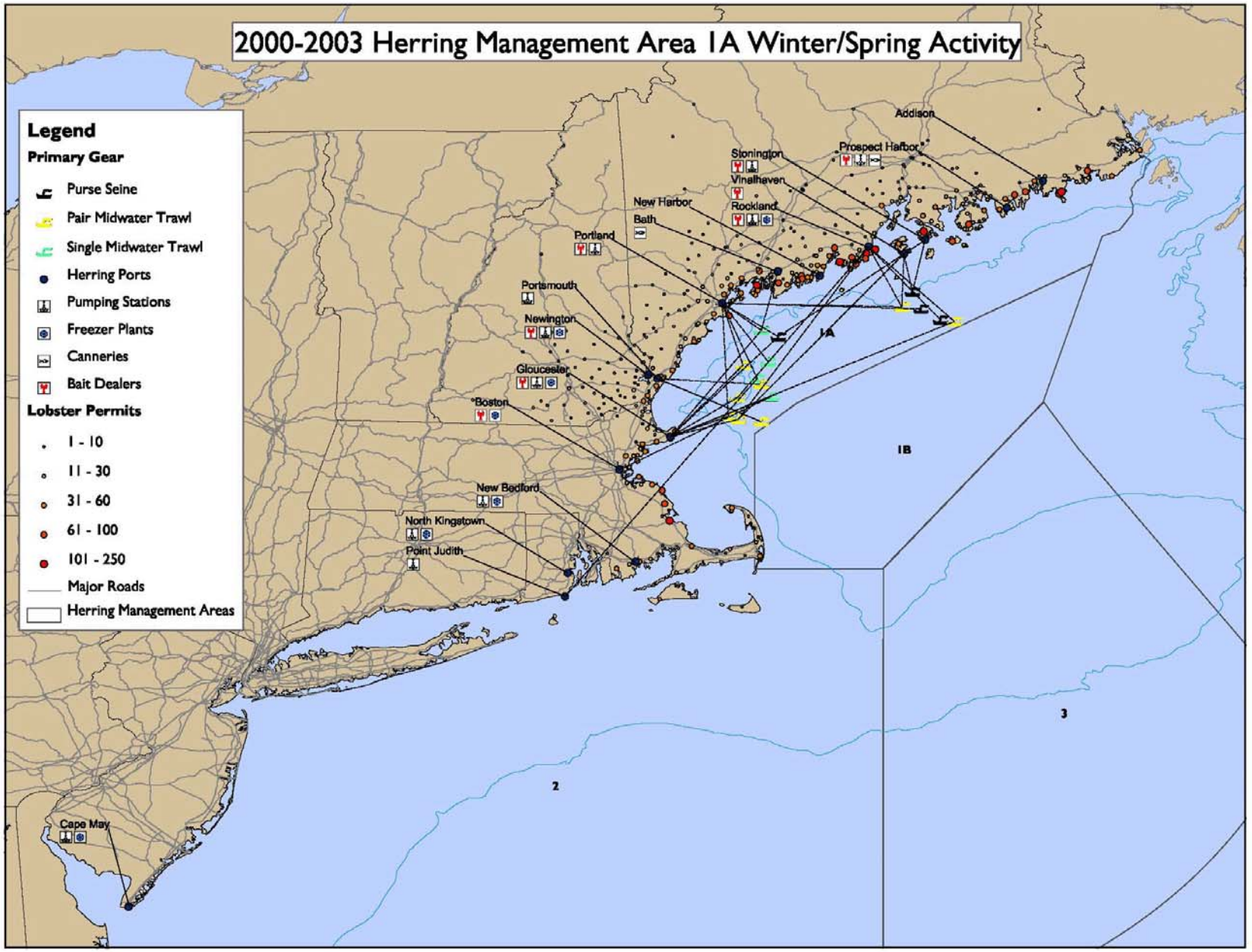
Using the recorded trip identification numbers in the herring landings data, data from the corresponding vessel trip reports was merged. Total landings for each vessel were summed for the 2000-2003 period to determine the primary vessels within the fishery, and it was found that the top 34 vessels accounted for 99.5% of the landings during this period. An additional requirement was that the vessels had made at least 20 trips within the combined management areas during the period, to ensure that the vessels represented regular participants in the fishery. For each of these 34 vessels, the primary gear used during each season in each management area was identified, as well as the port where they unloaded the largest percentage of their catch during the winter/spring and summer/fall seasons. Then, the distance from these

primary ports to the recorded latitudes and longitudes on the trip reports was calculated. Summary tables containing each vessel's landings by port in each management area for both seasons were also created.

These summary tables and the distance calculation tables were then read into ArcMap to create the maps. It is necessary to note that these maps are meant to be illustrative in nature, rather than a specific representation of fishing activity at any particular point in time. That said, the location of each vessel on the map was chosen to minimize the distance between the trip location as it appears in the vessel log and the port where the vessel unloaded the largest percentage of its catch. To accomplish this, for each management area and season combination the trips reported as occurring in the particular management area were plotted on the map using the latitudes and longitudes reported on the trip reports. In many cases, the reported coordinates lie outside of the management area, so these points were deleted. The remaining points were then ranked for each vessel based on their distance to the primary port, and the point with the minimum distance was used to represent that vessel. For clarity of presentation, these locations were adjusted slightly to prevent overlaps. Thus, the locations should not be construed as indicating any vessel's particular fishing pattern.

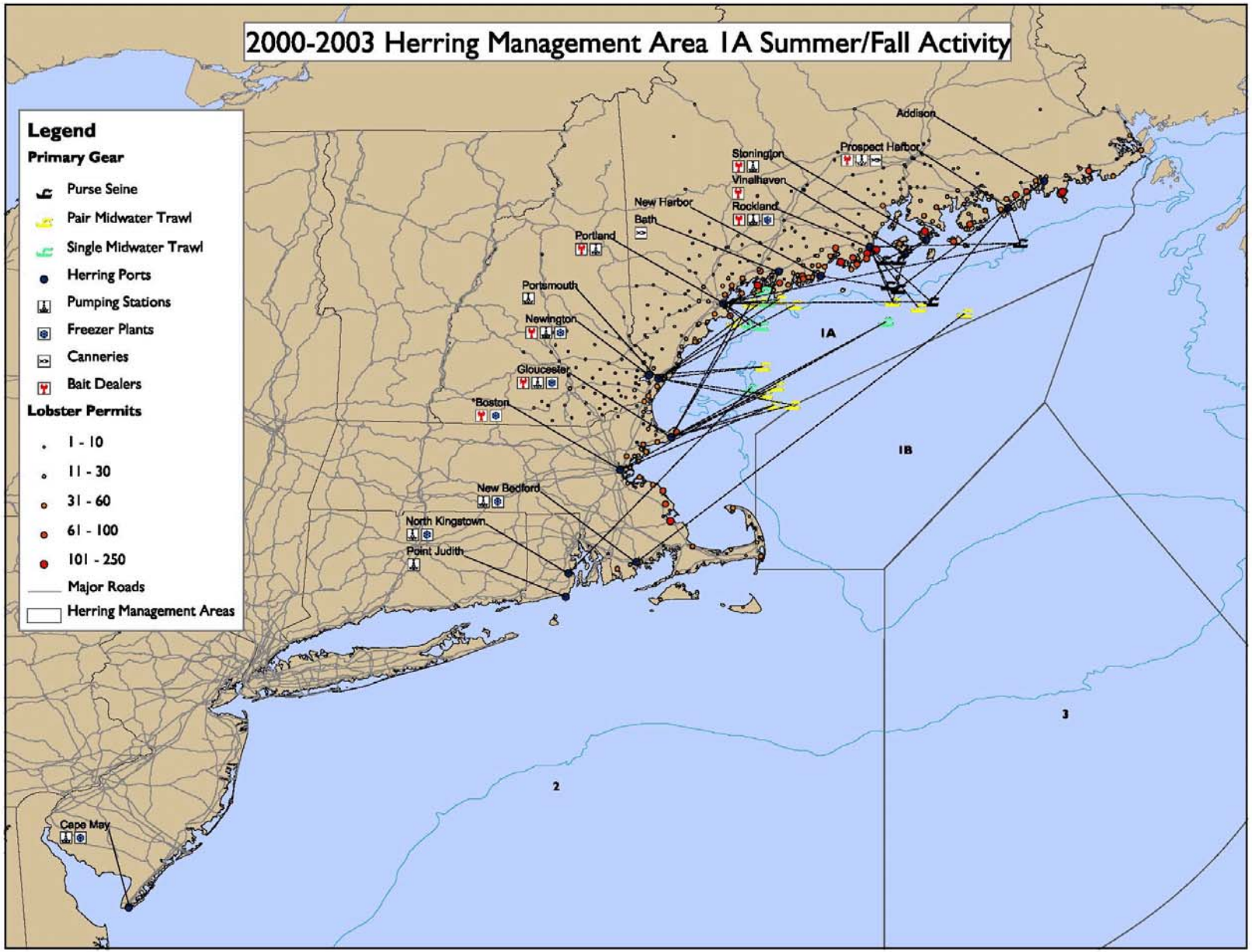
Having created a point for each vessel, lines were then drawn to each port where the vessel landed herring while fishing in that management area during that particular season. Again for clarity of presentation, it was required that a vessel had landed at least 10% of its catch in a particular port for a line to be drawn to that port. Then, the symbol for each vessel was changed to indicate its primary fishing gear.

Figure 29 Mapping the Herring Fishery: 2000-2003 Flow of Winter/Spring Fishing Activity in Area 1A (December – May)



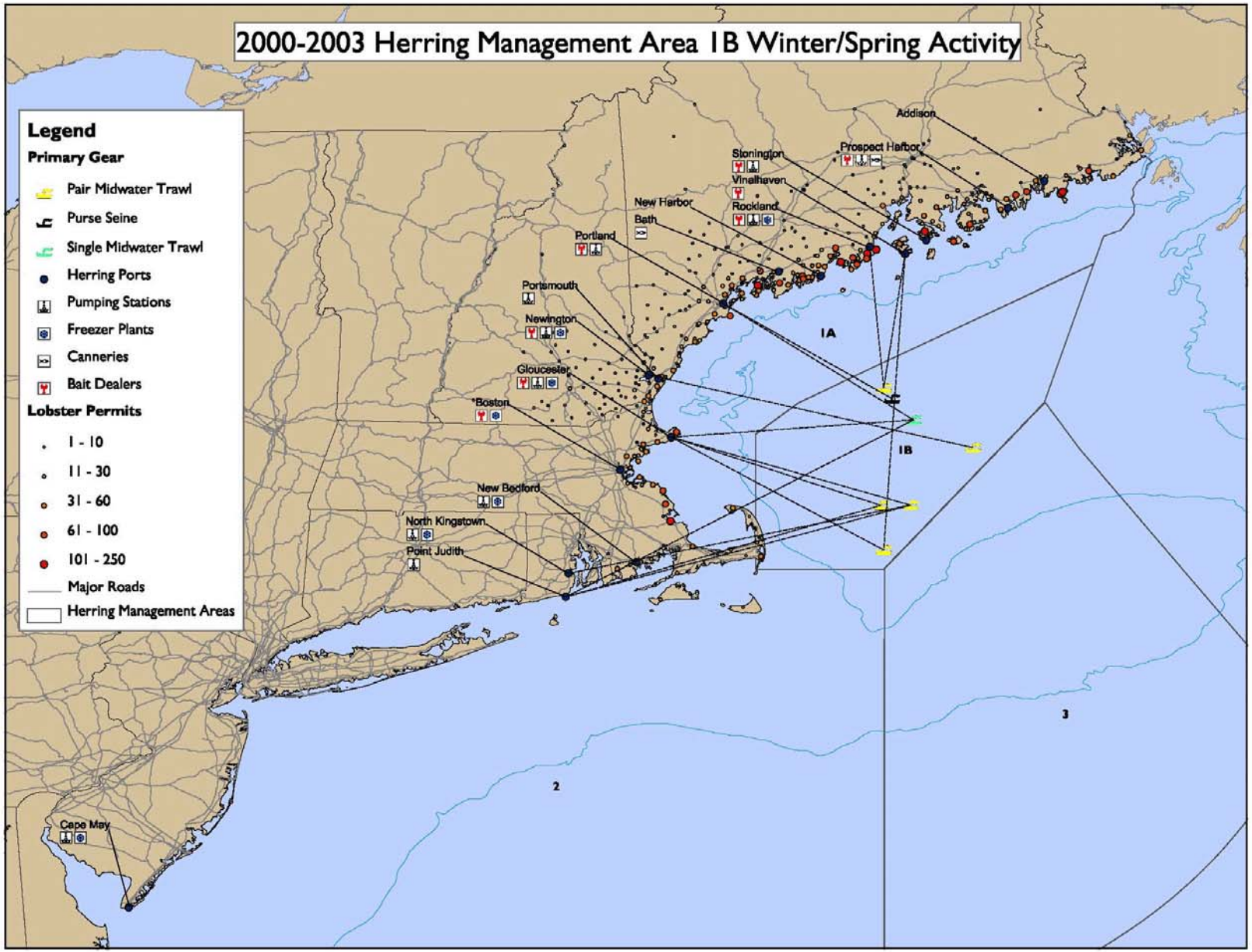
Note: Color copies can be obtained by contacting the Council office or visiting the herring page on the Council's website (www.nefmc.org).

Figure 30 Mapping the Herring Fishery: 2000-2003 Flow of Summer/Fall Fishing Activity in Area 1A (June – November)



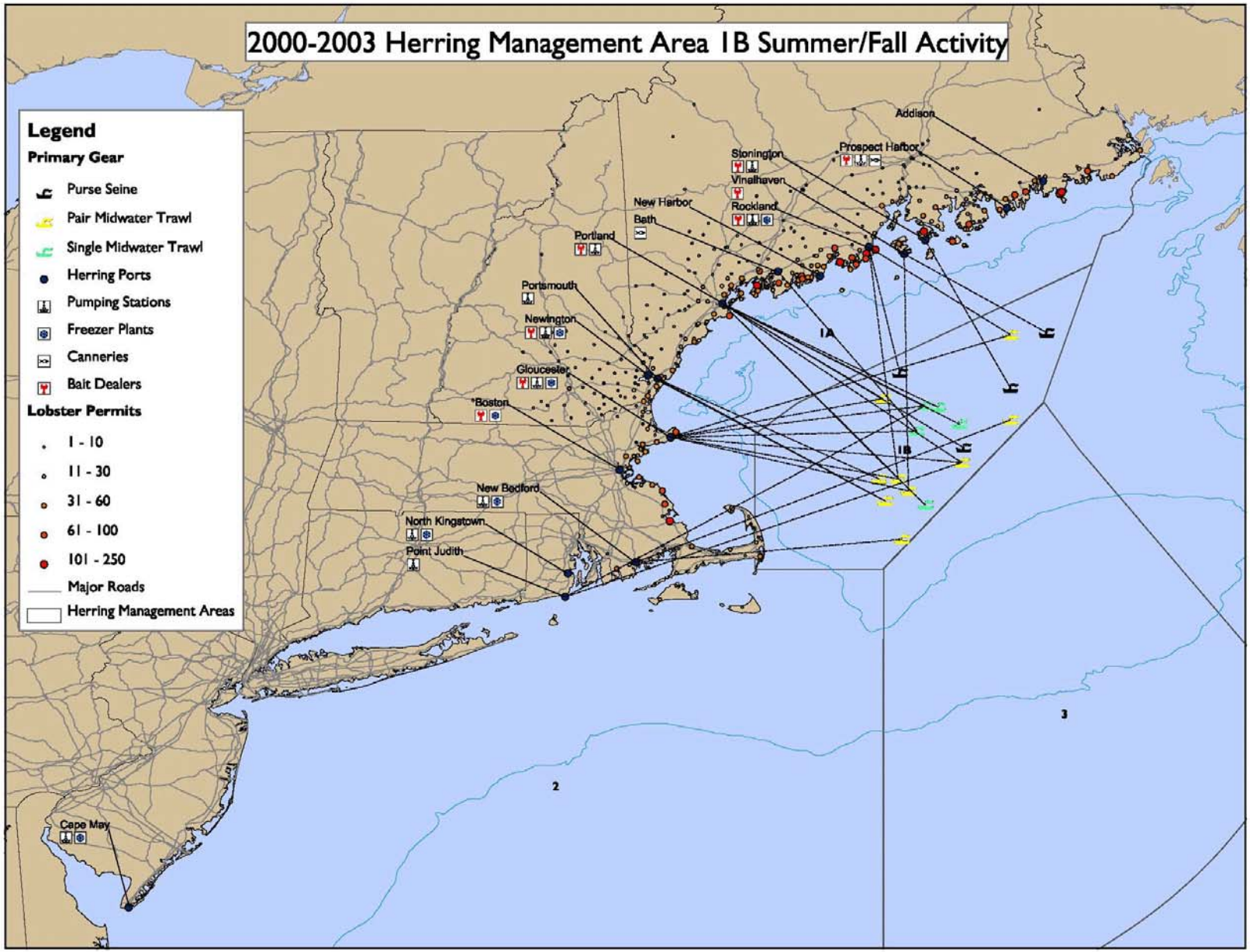
Note: Color copies can be obtained by contacting the Council office or visiting the herring page on the Council's website (www.nefmc.org).

Figure 31 Mapping the Herring Fishery: 2000-2003 Flow of Winter/Spring Fishing Activity in Area 1B (December – May)



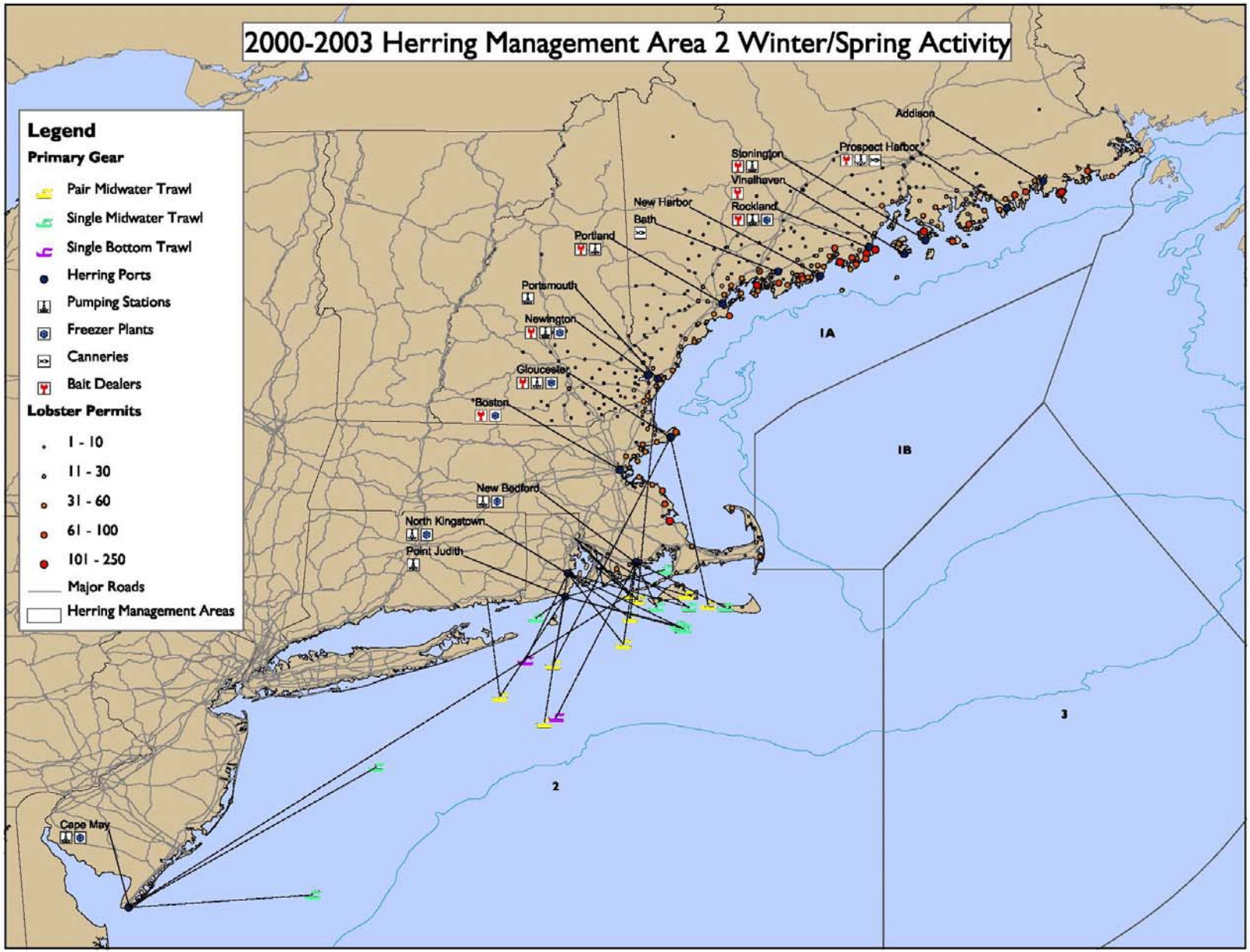
Note: Color copies can be obtained by contacting the Council office or visiting the herring page on the Council's website (www.nefmc.org).

Figure 32 Mapping the Herring Fishery: 2000-2003 Flow of Summer/Fall Fishing Activity in Area 1B (June – November)



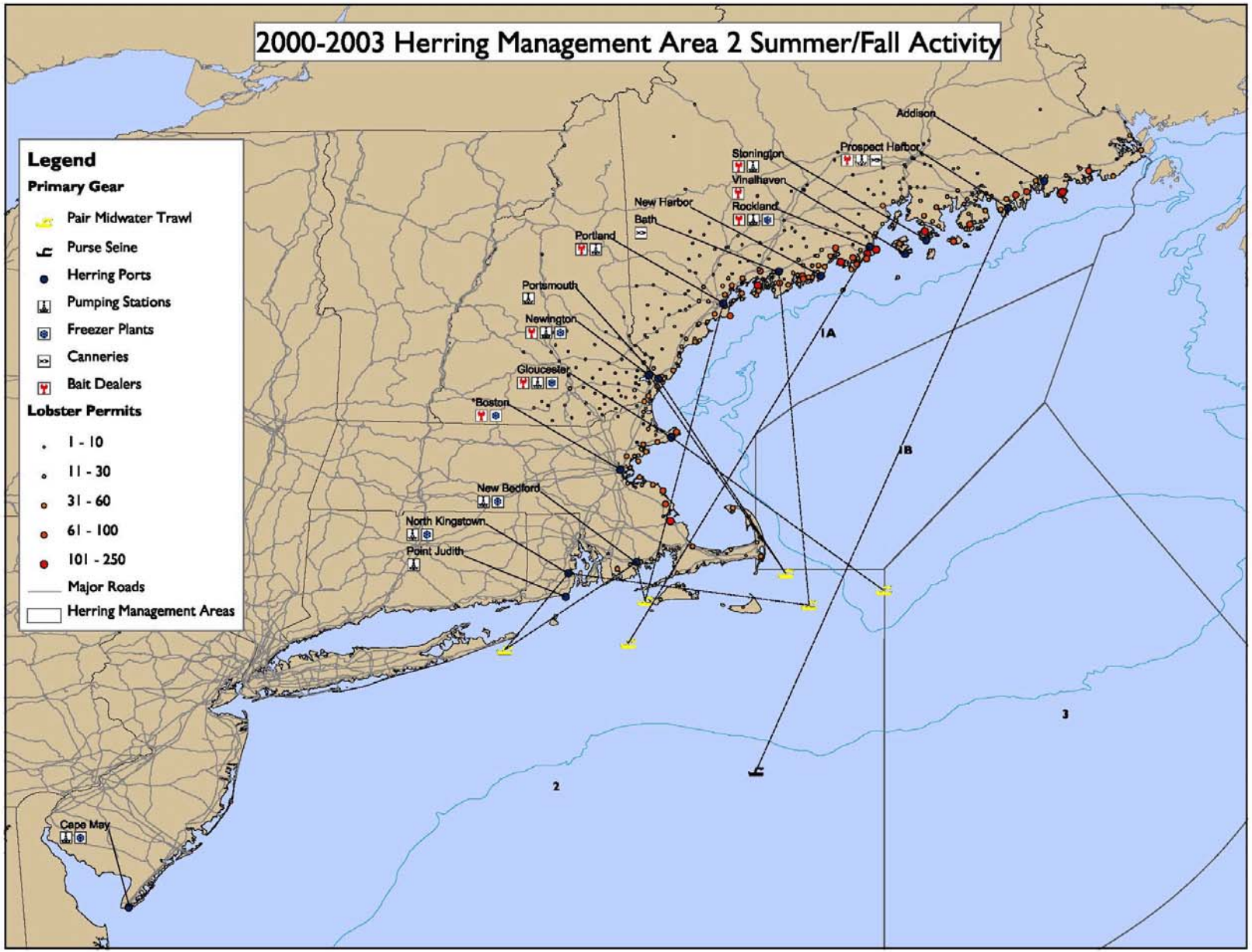
Note: Color copies can be obtained by contacting the Council office or visiting the herring page on the Council's website (www.nefmc.org).

Figure 33 Mapping the Herring Fishery: 2000-2003 Flow of Winter/Spring Fishing Activity in Area 2 (December – May)



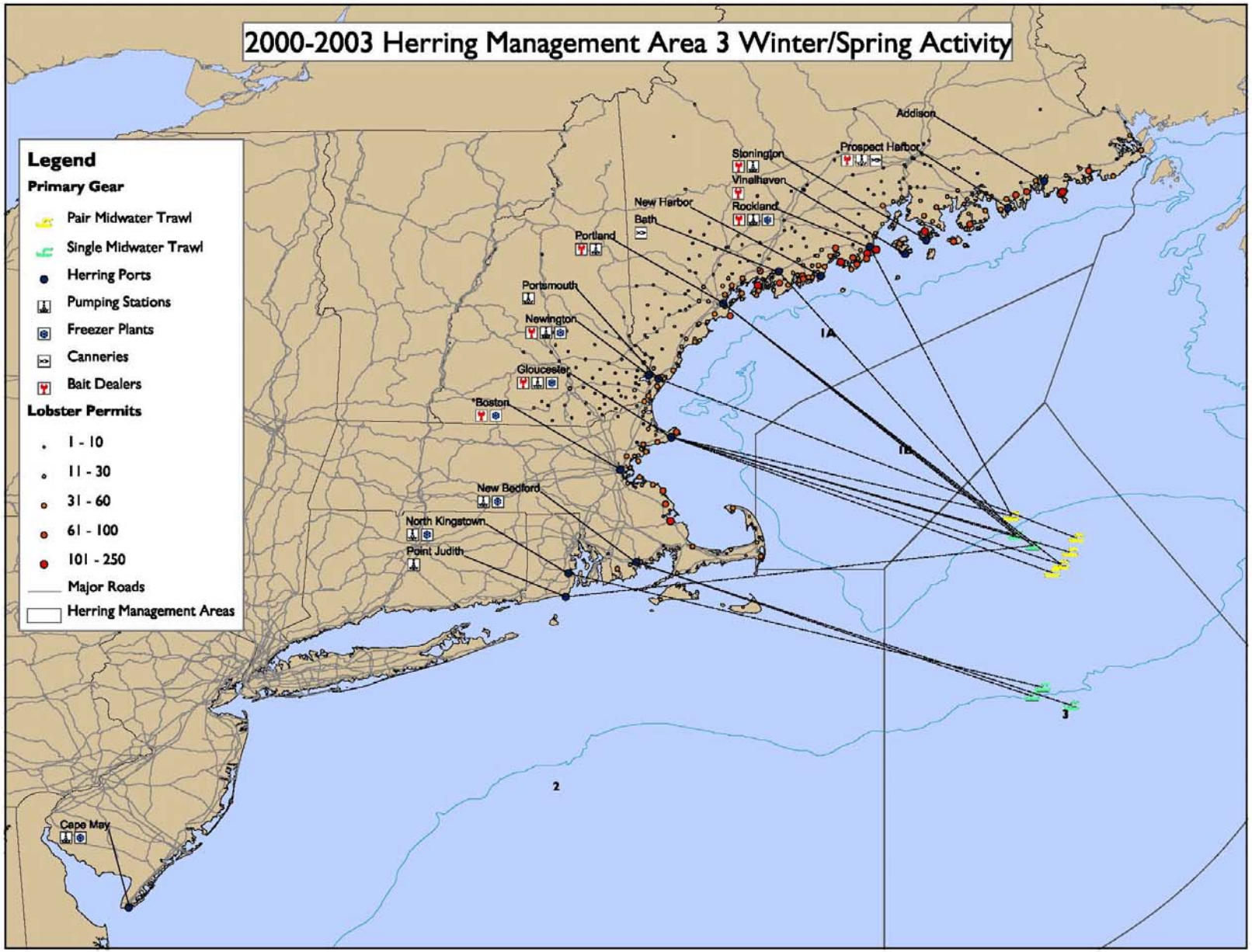
Note: Color copies can be obtained by contacting the Council office or visiting the herring page on the Council's website (www.nefmc.org).

Figure 34 Mapping the Herring Fishery: 2000-2003 Flow of Summer/Fall Fishing Activity in Area 2 (June – November)



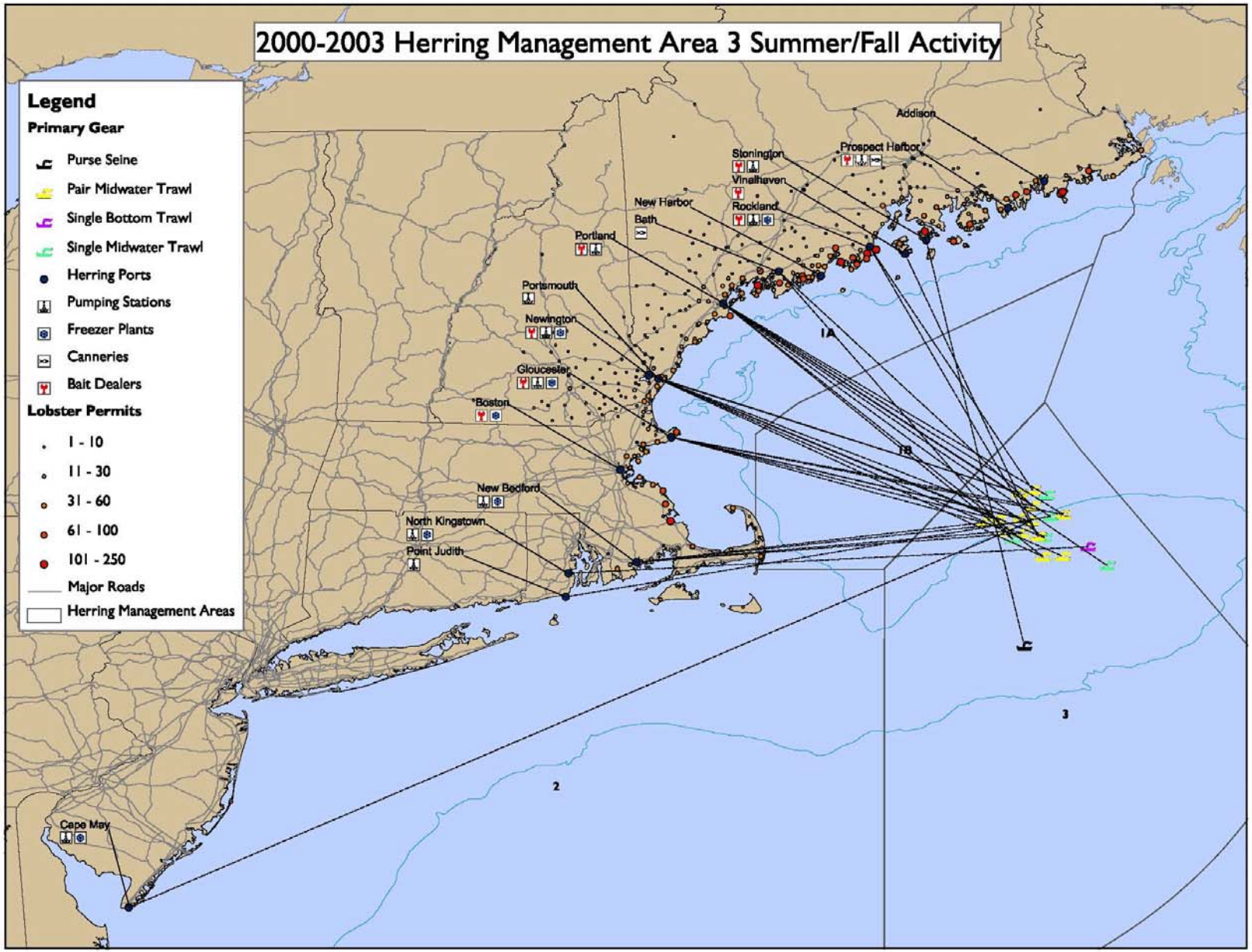
Note: Color copies can be obtained by contacting the Council office or visiting the herring page on the Council's website (www.nefmc.org).

Figure 35 Mapping the Herring Fishery: 2000-2003 Flow of Winter/Spring Fishing Activity in Area 3 (December – May)



Note: Color copies can be obtained by contacting the Council office or visiting the herring page on the Council's website (www.nefmc.org).

Figure 36 Mapping the Herring Fishery: 2000-2003 Flow of Summer/Fall Fishing Activity in Area 3 (June – November)



Note: Color copies can be obtained by contacting the Council office or visiting the herring page on the Council's website (www.nefmc.org).

4.2.5 Bycatch – 2005 Observer Data

Preliminary analysis of the 2005 observer data (Feb 2006) provides information for a total of 172 trips – 41 purse seine trips (one combined trip with midwater trawl gear), 44 midwater trawl trips (one combined trips with purse seine gear), and 88 pair trawl trips. Based on preliminary information about the number of trips taken in the herring fishery during 2005, the current database of observed trips represents **20.3%** of purse seine trips, **15.1%** of midwater trawl trips, and **17%** of pair trawl trips taken in the fishery in 2005. In total, the observer coverage in 2005 represents about 17% of the herring fishery (Note: discussion in the Amendment 1 FSEIS should be referenced for information about how pair trawl trips in the herring fishery are counted).

Total catch on the observed trips in 2005 was 43,579,472 pounds, with 1,171,301 pounds of bycatch (2.688%, see Table 24). Total observed bycatch percentages were lowest for midwater trawl trips (0.972%), followed by purse seine trips (1.864%) and pair trawl trips (3.558%).

Table 24 Total Observed Catch and Bycatch in the Herring Fishery, 2005

	MIDWATER TRAWL	PAIR TRAWL	PURSE SEINE	TOTAL
DISCARD LBS	80,877	909,931	180,492	1,171,301
KEPT LBS	8,241,521	24,665,474	9,501,175	42,408,169
UNKNOWN LBS			2	2
GRAND TOTAL LBS	**8,322,398**	**25,575,405**	**9,681,668**	**43,579,472**
% BYCATCH	**0.972%**	**3.558%**	**1.864%**	**2.688%**

Bycatch is defined in the Magnuson-Stevens Fishery Conservation and Management Act as "fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program." Consistent with the Magnuson-Stevens Act, this document defines ***bycatch*** as any fish which are **discarded**.

Incidental catch is defined in this document as any non-targeted fish which are retained for sale or personal use. Incidental catch is different from bycatch in that it is **not discarded**.

Regulated species (also referred to as regulated multispecies) are defined in the Northeast Multispecies Fishery Management Plan to include: Atlantic cod, witch flounder, American plaice, yellowtail flounder, haddock, pollock, winter flounder, windowpane flounder, redfish, and white hake.

Small-mesh multispecies means the subset of Northeast multispecies that includes silver hake, offshore hake, and red hake.

Table 25 summarizes all catch and bycatch information (sorted by species with highest discard amounts) observed by NMFS sea samplers on 41 purse seine trips during the 2005 fishing year, no matter what species was the primary target of the trip. This represents a significant increase in observer coverage for this gear type, as only 26 purse seine trips were observed in total between 1994-2004. Overall, bycatch amounted to 1.864% of the total catch on the observed purse seine trips in 2005. Regulated species bycatch totaled 2 pounds of redfish on these trips. Atlantic herring and spiny dogfish accounted for the majority of observed purse seine bycatch in 2005; no haddock bycatch was observed on these trips.

Table 25 Catch and Discards (Lbs.) of All Species on 41 Observed Purse Seine Trips in 2005

SPECIES	DISCARD	KEPT	UNKNOWN	TOTAL
HERRING, ATLANTIC	175,304	9,497,993		9,673,297
DOGFISH, SPINY	4,990			4,990
BLUEFISH	90			90
LOBSTER, AMERICAN	46			46
MACKEREL, ATLANTIC	37	2,808		2,845
SCULPIN, LONGHORN	9	83		92
BASS, STRIPED	6			6
SCULPIN, NK	6			6
SKATE, NK	2			2
SQUID, NK	2			2
FLOUNDER, YELLOWTAIL		4		4
HAKE, SILVER (WHITING)		5		5
HERRING, BLUEBACK		8		8
REDFISH, (OCEAN PERCH)			2	2
SHAD, AMERICAN		59		59
SKATE, LITTLE		10		10
SQUID, SHORT-FIN		205		205
GRAND TOTAL	**180,492**	**9,501,175**	**2**	**9,681,669**

Table 26 on the following page summarizes all catch and bycatch information (sorted by species with highest discard amounts) observed by NMFS sea samplers on 44 midwater trawl trips during the 2005 fishing year no matter what species was the primary target of the trip. Overall, bycatch amounted to 0.972% of the total catch on the observed midwater trawl trips in 2005. Regulated species catch (kept and discard) totaled 23,925 pounds and accounted for 0.287% of the total catch observed. Most of the regulated species bycatch consisted of haddock, redfish, and white hake. Spiny dogfish, haddock, herring, whiting, and mackerel accounted for the majority of bycatch on the observed midwater trawl trips during 2005.

Table 26 Catch and Discards (Lbs.) of All Species on 44 Observed Midwater Trawl Trips in 2005

SPECIES	DISCARD	KEPT	TOTAL
DOGFISH, SPINY	21,050	72	21,122
HADDOCK	18,650	1,108	19,758
HERRING, ATLANTIC	15,603	7,127,206	7,142,809
HAKE, SILVER (WHITING)	7,645	955	8,600
MACKEREL, ATLANTIC	7,428	1,089,541	1,096,969
REDFISH, NK (OCEAN PERCH)	2,467	400	2,867
SCUP	2,201	18,000	20,201
FISH, NK	1,000		1,000
HAKE, NK	809	5	814
ALEWIFE	801	2,660	3,461
HAKE, WHITE	698	413	1,111
LUMPFISH	479	32	511
BASS, STRIPED	476	31	507
HAKE, RED (LING)	439		439
DEBRIS, FISHING GEAR	355		355
SHRIMP, NK	201	8	209
SQUID, SHORT-FIN	140	2	142
POLLOCK	102		102
SHAD, AMERICAN	62	56	118
SCULPIN, LONGHORN	51		51
COD, ATLANTIC	33	8	41
DEBRIS, NK	30		30
MONKFISH (ANGLER, GOOSEFISH)	29	51	80
SEAWEED, NK	28		28
FLOUNDER, AMERICAN PLAICE	20		20
FLOUNDER, NK	19		19
FLOUNDER, WINTER (BLACKBACK)	13		13
BLUEFISH	12		12
SQUID, ATL LONG-FIN	9	602	611
FLOUNDER, YELLOWTAIL	8		8
SQUID, NK	8		8
DEBRIS, PLASTIC	5		5
FLOUNDER, WITCH (GREY SOLE)	5		5
BUTTERFISH	1	9	10
SHAD, HICKORY	1	10	11
SKATE, LITTLE	1		1
STARFISH, SEASTAR,NK	1		1
WEAKFISH (SQUETEAGUE SEA TROUT)	1	20	21
FLOUNDER, SUMMER (FLUKE)		100	100
HERRING, BLUEBACK		155	155
MENHADEN, ATLANTIC		20	20
OCEAN POUT		3	3
SEA ROBIN, NORTHERN		50	50
SHRIMP, SCARLET		3	3
WHITING, BLACK (OFFSHORE)		1	1
GRAND TOTAL	**80,881**	**8,241,521**	**8,322,402**

Table 27 summarizes all catch and bycatch information (sorted by species with highest discard amounts) observed by NMFS sea samplers on 88 pair trawl trips during the 2005 fishing year no matter what species was the primary target of the trip. Overall, bycatch amounted to 3.558% of the total catch on the observed pair trawl trips in 2005. Regulated species catch (kept and discard) totaled 11,876 pounds and accounted for 0.046% of the total catch observed. Most regulated species bycatch consisted of haddock and pollock. Atlantic herring, spiny dogfish, Atlantic mackerel, and haddock represented the majority of observed bycatch by pair trawl vessels during the 2005 fishing year.

Table 27 Catch and Discards (Lbs.) of All Species on 88 Observed Pair Trawl Trips in 2005

SPECIES	DISCARD	KEPT	TOTAL
HERRING, ATLANTIC	810,450	22,661,930	23,472,380
DOGFISH, SPINY	55,074	75	55,149
MACKEREL, ATLANTIC	27,689	1,953,141	1,980,830
HADDOCK	8,658	1,475	10,133
LUMPFISH	2,037	20	2,057
BASS, STRIPED	1,867		1,867
POLLOCK	1,108		1,108
HAKE, SILVER (WHITING)	929	788	1,717
SQUID, SHORT-FIN	698	1,736	2,434
REDFISH, NK (OCEAN PERCH)	431		431
BLUEFISH	279	4	283
COD, ATLANTIC	192		192
MONKFISH (ANGLER, GOOSEFISH)	177	6	183
DEBRIS, FISHING GEAR	120		120
HERRING, BLUEBACK	60	10,611	10,671
FISH, NK	45	6	51
ALEWIFE	36	27,127	27,163
SHAD, AMERICAN	27	5,636	5,663
SHAD, HICKORY	15	2,805	2,820
HAKE, RED (LING)	13	30	43
FLOUNDER, AMERICAN PLAICE	6		6
BONE, NK	5		5
HAKE, WHITE	3		3
LAMPREY, NK	3		3
SCULPIN, LONGHORN	3		3
FLOUNDER, YELLOWTAIL	2		2
SKATE, LITTLE	2		2
FLOUNDER, WITCH (GREY SOLE)	1		1
HAGFISH, ATLANTIC	1		1
HAKE, NK	1		1
SEAWEED, NK	1		1
SQUID, NK	1		1
DEBRIS, PLASTIC	0		0
OCTOPUS, NK	0		0
BUTTERFISH		77	77
WOLFFISH, ATLANTIC		7	7
GRAND TOTAL	**909,934**	**24,665,474**	**25,575,408**

4.2.6 Bycatch – 2006 Observer Data

A decline in funding for the NMFS Sea Sampling (Observer) Program has limited coverage in the herring fishery during the 2006 fishing year. As of August 1, 2006, a total of 19 midwater trawl trips and 26 pair trawl trips have been observed in the herring fishery (45 trips total, no trips observed for purse seine gear). According to the Northeast Fisheries Observer Program Sea Day Schedule (August 25, 2006), an additional 32 sea days have been allocated to the NMFS Sea Sampling Program for the Atlantic herring fishery from August – December 2006. Available catch/bycatch data collected on the 2006 observed trips through July 31 are summarized below.

Table 28 summarizes catch and bycatch observed on the midwater trawl trips that were observed by NMFS sea samplers from January – July 2006. The majority of observed midwater trawl trips appear to have been targeting Atlantic mackerel and therefore occurred in the southern New England/Mid-Atlantic region. Spiny dogfish, Atlantic herring, and Atlantic mackerel were the species with the highest amounts of bycatch observed (96.5% of total observed bycatch). Regulated multispecies bycatch that was observed on these trips totaled about 100 pounds. Note that a significant amount of blueback herring was reported as "kept" on these trips (and therefore is not considered bycatch).

Table 28 Catch and Discards (Lbs.) of All Species on Observed Midwater Trawl Trips in 2006 (January – July)

SPECIES	DISCARD	KEPT	TOTAL
DOGFISH, SPINY	13,235	5,000	18,235
HERRING, ATLANTIC	9,851	942,323	952,174
MACKEREL, ATLANTIC	3,175	4,197,641	4,200,816
BASS, STRIPED	570	12	582
ALEWIFE	125	11,059	11,184
FLOUNDER, SAND DAB (WINDOWPANE)	64		64
DEBRIS, FISHING GEAR	50		50
FLOUNDER, WINTER (BLACKBACK)	29		29
MONKFISH (ANGLER, GOOSEFISH)	22	5	27
HAKE, SILVER (WHITING)	21	855	876
DEBRIS, PLASTIC	15		15
DEBRIS, WOOD	15		15
SEAWEED, NK	15		15
SCULPIN, LONGHORN	9		9
SQUID, SHORT-FIN	8	992	1,000
MENHADEN, ATLANTIC	5		5
CRAB, HORSESHOE	2		2
SCULPIN, NK	2		2
HAKE, RED (LING)	1	204	205
SCUP	1		1
SKATE, LITTLE	1		1
SNAPPER, NK	1		1
STARFISH, SEASTAR, NK	1		1
BUTTERFISH		398	398
SQUID, ATLANTIC LONG-FIN		485	485
HERRING, BLUEBACK		56,092	56,092
POLLOCK		10	10
SHAD, AMERICAN		1,075	1,075
SHAD, HICKORY		872	872
GRAND TOTAL	**27,218**	**5,217,023**	**5,244,241**

Table 29 summarizes catch and bycatch observed on the pair trawl trips that were observed by NMFS sea samplers from January – July 2006. The observed pair trawl trips appear to have been targeting both Atlantic herring and mackerel. Atlantic herring, spiny dogfish, and scup were the species with the highest amounts of bycatch observed (about 33% of total bycatch each by species and 99.7% of total observed bycatch collectively). No regulated multispecies bycatch was observed on these trips.

Table 29 Catch and Discards (Lbs.) of All Species on Observed Pair Trawl Trips in 2006 (January–July)

SPECIES	DISCARD	KEPT	TOTAL
HERRING, ATLANTIC	41,697	7,656,850	7,698,547
DOGFISH, SPINY	40,285	500	40,785
SCUP	40,000		40,000
SQUID, SHORT-FIN	170	140	310
BUTTERFISH	98	5,342	5,440
MACKEREL, ATLANTIC	24	2,956,669	2,956,693
DOGFISH, NK	18		18
SHAD, AMERICAN	15	25	40
SQUID, NK	3		3
ALEWIFE		592	592
HERRING, BLUEBACK		2,230	2,230
GRAND TOTAL	**122,310**	**10,622,348**	**10,744,658**

4.2.7 Haddock Incidental Catch

In 2005, the Council requested Emergency Action from NMFS to address emerging bycatch problems on Georges Bank stemming from a record large year class of haddock. Without the Emergency Action, the Council was concerned that, when herring move onto GB during the summer of 2005, vessel operators will decline to fish there for herring due to their concerns about violating the existing prohibition on possession of groundfish. Category 1 vessels accounted for 99.3 percent of the herring landings in 2004.

The Council's formal request for Emergency Action was made at the March 30, 2005, Council meeting and was followed by a written request received by NMFS on April 6, 2005. The Emergency Action was intended to provide an incidental catch allowance for haddock that will allow the herring fishery to operate on GB during 2005 while the Council develops a long-term solution. The Emergency Rule was published by NMFS in the Federal Register on June 13, 2005 and extended for 180 days on December 8, 2005. The current Emergency Rule expired on June 6, 2006, and measures included in Framework 43 to the Multispecies FMP (implemented August 2006) replace it.

The following provisions were implemented through the 2005/2006 Emergency Rule: (1) suspension of the prohibition on the possession of haddock by Category 1 herring vessels using purse seines or midwater trawls (including pair trawls), (2) establishment of a 1,000-lb (454-kg) haddock incidental possession allowance for Category 1 herring vessels, (3) suspension of the haddock minimum fish size for Category 1 herring vessels, (4) prohibition on the purchase and sale of haddock landed by Category 1 herring vessels for human consumption, (5) establishment of a provision to require herring processors to cull landings made by Category 1 herring vessels and to retain haddock for inspection by enforcement officials, (6) establishment of a requirement for all Category 1 herring vessels to provide advance notification of landing via the Vessel Monitoring System (VMS), whether or not such a vessel is carrying

an at-sea observer, and (7) establishment of a cap of 270,000 lb (122,470 kg) on the total amount of observed and reported haddock that could be landed under the haddock incidental possession allowance.

During the year that the NMFS Emergency Action was effective, the haddock landings reported for the herring fleet totaled 32,649 pounds, well below the cap of 270,000 pounds. Of this, 285 pounds were reported by herring dealers, while the balance (32,364 pounds) was documented by NMFS observers. All of the observed haddock landings occurred between July 2005 and December 2005, with the largest amounts of haddock being reported during the weeks ending with the following dates: August 13 (3,171 lb); August 20 (7,225 lb); September 10 (2,085 lb); October 8 (7,265 lb); October 15 (8,980 lb); and November 5 (1,264 lb). In all the other weeks during which haddock landings were reported (7), the amounts were under 1,000 pounds. All of the dealer-reported landings occurred during August 2005.

The measures implemented in Framework 43 to the Multispecies FMP include all of the provisions listed above except for the 1,000-pound incidental catch allowance, and with the addition of a 100-pound incidental catch allowance for regulated multispecies other than haddock. The catch cap for haddock has also been modified to equate to 0.2% of the total combined target TAC for Gulf of Maine and Georges Bank haddock in 2006 and future years until otherwise modified by the Council. With the implementation of this action, herring midwater trawl, pair trawl, and purse seine gear are no longer considered *exempted gear* relative to the multispecies fishery (gear not capable of catching groundfish), and the Atlantic herring fishery is classified as an *exempted fishery* (less than 5% groundfish bycatch). The measures will apply to Category 1 herring permit holders until the implementation of Amendment 1, at which time they will apply to limited access directed fishery permit holders in all management areas.

In addition, establishing and modifying catch caps, including the cap proposed in Framework 43, are identified in Amendment 1 as measures that can be implemented through a framework adjustment to the Herring FMP or through the herring fishery specification process (with concurrent adjustments to regulations in other fisheries, as appropriate), whichever is most expeditious. Measures that could be implemented through a framework adjustment or the herring fishery specification process to address bycatch in the herring fishery also include seasonal and temporal closures in high bycatch areas and catch/bycatch caps.

4.2.8 Canadian Herring Fisheries

Canadian fisheries for herring include the New Brunswick (NB) weir (fixed gear) fishery along the southern coast and a much smaller midwater trawl fishery on Georges Bank. The NB weir fishery is a historical fishery with catches that have been more variable in recent years, but have totaled more than 30,000 mt of herring in past years. It is assumed that fish caught in the NB weir fishery are from the inshore component of the herring resource that U.S. fishermen catch in the Gulf of Maine (and in Area 2 during the winter), and when determining U.S. fishery specifications and TACs, managers incorporate a catch of 20,000 mt from the NB weir fishery. The Canadian midwater trawl fishery on Georges Bank is limited in scope, and permits are generally granted on an experimental basis with high levels of industry-funded observer coverage. Catches from the Georges Bank fishery have been considered insignificant. Updated information about these fisheries is provided in the following subsections.

4.2.8.1 New Brunswick Weir Fishery

Catch of the Atlantic herring stock complex in Canadian waters consists primarily of fish caught in the New Brunswick (NB) weir fishery. Currently, the Herring FMP assumes that 20,000 mt of fish from the inshore component of the Atlantic herring resource will be taken annually in the NB weir fishery. This

assumed catch is subtracted from the available yield from the inshore component of the resource before TACs are determined for management areas in the U.S. Exclusive Economic Zone (EEZ).

Table 30 summarizes landings from the New Brunswick (NB) weir fishery by month from 1978-2005. The fishery is predominantly a late summer/fall fishery, with approximately less then 10% of the landings occurring during October, November, and December (based on 2000-2005 activity). Historical catches in the NB weir fishery were much higher and exceeded the current 20,000 mt assumption in many years prior to 1995. **Total landings of herring in the NB weir fishery averaged 22,475 mt for the entire time series (1978-2005), 16,569 mt for 1996-2005, and 14,910 mt for the most recent five-year time period (2001-2005)**. Landings from the NB weir fishery appear to have been about 13,000 mt during the 2005 fishing year.

Table 30 Herring Landings from the New Brunswick Weir Fishery by Month, 1978-2005

YEAR	NB WEIR LANDINGS BY MONTH (METRIC TONS)												GRAND TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	
1978	3				512	802	5,499	10,275	10,877	4,972	528	132	**33,599**
1979	535	96			25	1,120	7,321	9,846	4,939	5,985	2,638	74	**32,579**
1980					36	119	1,755	5,572	2,352	1,016	216		**11,066**
1981					70	199	4,431	3,911	2,044	2,435	1,686	192	**14,968**
1982		17			132	30	2,871	7,311	7,681	3,204	849	87	**22,181**
1983					65	29	299	2,474	5,382	3,945	375		**12,568**
1984					6	3	230	2,344	2,581	3,045	145		**8,353**
1985					22	89	4,217	8,450	6,910	4,814	2,078	138	**26,718**
1986	43				17		2,480	10,114	5,997	6,233	2,564	67	**27,516**
1987	39	21	6	12	10	168	2,575	10,893	6,711	5,362	703	122	**26,621**
1988		12	1	90	657	287	5,993	11,975	8,375	8,457	2,343	43	**38,235**
1989		24		95	37	385	8,315	15,093	10,156	7,258	2,158		**43,520**
1990					93	20	4,915	14,664	12,207	7,741	168		**39,808**
1991					57	180	4,649	10,319	6,392	2,028	93		**23,717**
1992				15	50	774	5,477	10,989	9,597	4,395	684		**31,981**
1993					14	168	5,561	14,085	8,614	2,406	470	10	**31,328**
1994				18		55	4,529	10,592	3,805	1,589	30		**20,618**
1995					15	244	4,517	8,590	3,956	896	10		**18,228**
1996					19	676	4,819	7,767	1,917	518	65		**15,781**
1997				8	153	1,017	6,506	7,396	5,316				**20,396**
1998					560	713	3,832	8,295	5,604	525			**19,529**
1999					690	805	5,155	9,895	2,469	48			**19,063**
2000					10	7	2,105	7,533	4,940	1,713	69		**16,376**
2001					35	478	3,931	8,627	5,514	1,479			**20,064**
2002					84	20	1,099	6,446	2,878	1,260	20		**11,807**
2003					257	250	1,423	3,554	3,166	344	10		**9,003**
2004					21	336	2,694	8,354	8,298	913	3		**20,620**
2005						213	802	7,264	3,833	759	145	40	**13,055**

Source: Canadian Department of Fisheries and Oceans.

The number of active weirs in the NB weir fishery has declined significantly over time (Table 31). The average number of active weirs in the NB weir fishery was 84 from 2001-2005, down from an average of 98 from 1996-2000. Seventy six weirs were active in the NB fishery during the 2005 fishing year, the lowest on record for the time series. Canadian fishermen attribute declines in this fishery to several factors, including pollution, changes in fish behavior (fish not coming as close to shore), market conditions, conflicts with other resource user groups, expansion of the U.S. herring fishery, and expansion of the aquaculture industry and consequent loss of inshore fishing grounds for weirs to utilize. However, it should be noted that the number of active weirs and subsequent landings from this fishery have been variable over the time series.

Table 31 Number of Active Weirs in New Brunswick Weir Fishery, 1978-2005

Year	No. Active Weirs in NB
1978	208
1979	210
1980	120
1981	147
1982	159
1983	143
1984	116
1985	156
1986	105
1987	123
1988	191
1989	171
1990	154
1991	143
1992	151
1993	145
1994	129
1995	106
1996	101
1997	102
1998	108
1999	100
2000	77
2001	101
2002	83
2003	78
2004	84
2005	76

Source: Canadian Department of Fisheries and Oceans.

In general, it is assumed that juvenile fish (age 1 and 2) caught in the NB weir fishery are from the inshore (GOM) component of the Atlantic herring stock complex, while adult fish (age 3+) caught in the NB weir fishery are from the SW Nova Scotia stock complex (4WX). Figure 37 and Figure 38 compare the age composition of herring caught in the NB weir fishery during 2004 and 2005 respectively.

Based on numbers of fish (older fish are heavier, so characterizing catch composition by weight can be misleading), it appears that over 90% of the landings in the NB weir fishery in 2004 were juvenile fish, ages 1 and 2. Only about 15% of the catch by weight consisted of adult fish during 2004. The age composition of the 2005 catch in the NB weir fishery shows that more adult fish were taken in this fishery. Almost 20% of the catch by number and more than 20% by weight consisted of herring age 3 and older during the 2005 fishing year. A small proportion of the catch consisted of age 4 and 5 fish. This issue should be explored further as more information becomes available, as this may indicate that a greater proportion of the fish caught in this fishery may be from the Nova Scotia stock complex and not from the inshore Gulf of Maine stock complex.

Figure 37 Age Composition of Landings from the NB Weir Fishery, 2004

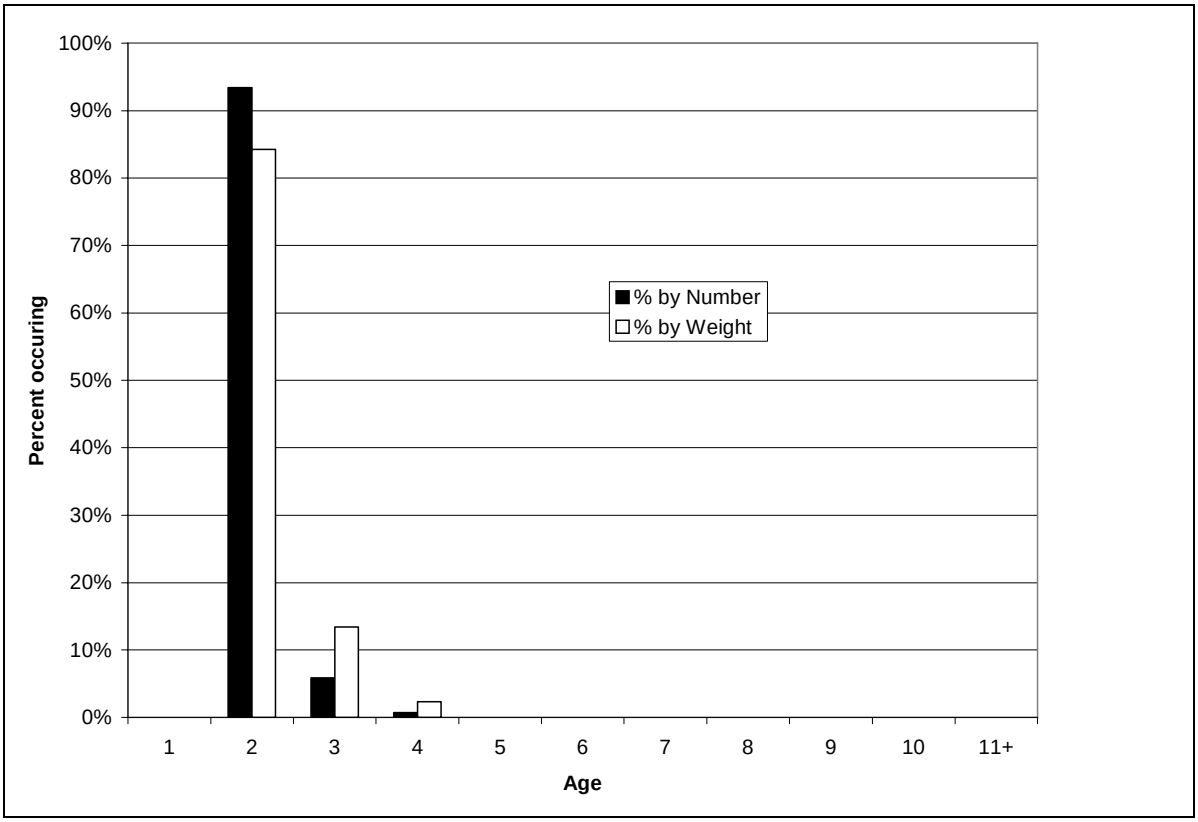
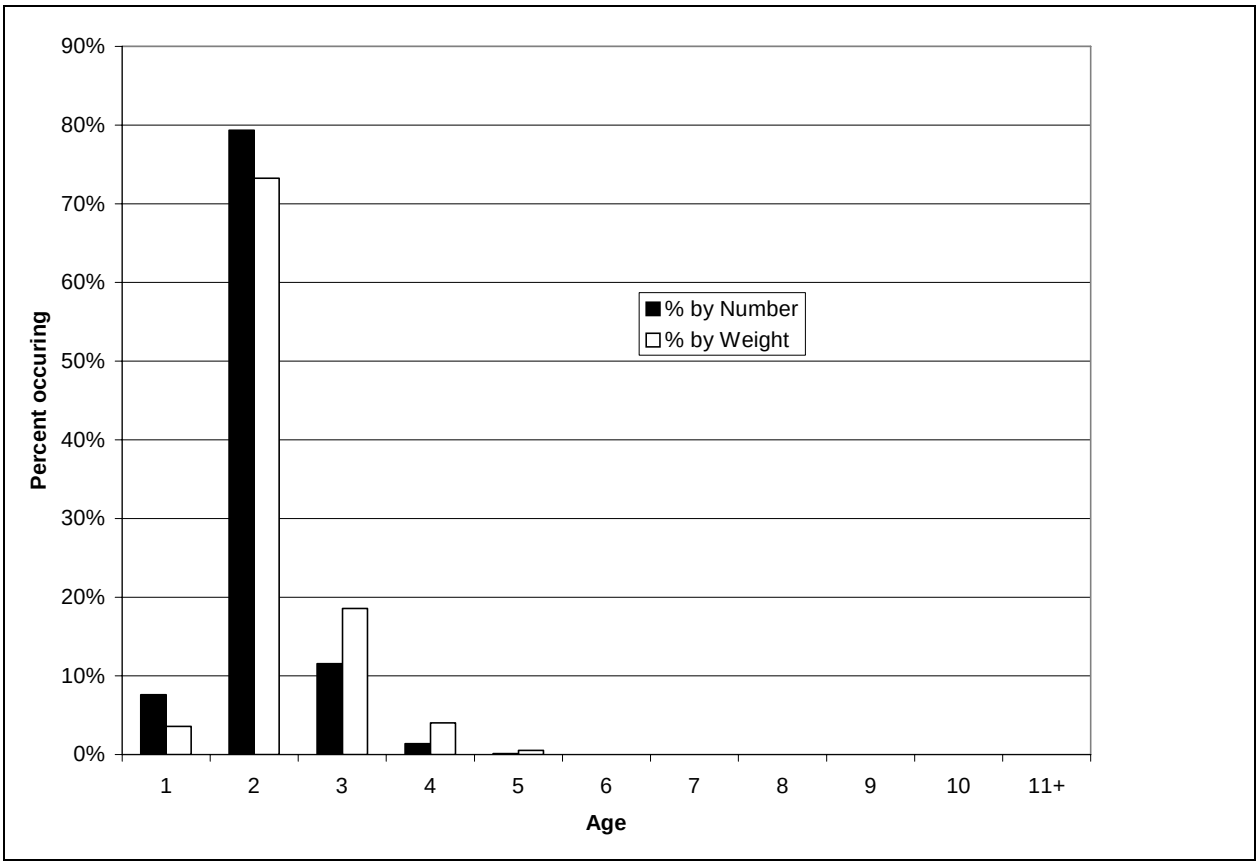


Figure 38 Age Composition of Landings from the NB Weir Fishery, 2005



4.2.8.2 Canadian Georges Bank Herring Fishery

Canadian midwater trawl vessels presumably fish in a manner similar to U.S. midwater trawl vessels in the herring fishery and operate on the Canadian side of Georges Bank (Area 3). The Canadian midwater trawl fishery on Georges Bank is a very small fishery, and permits are granted to a few midwater trawlers on an experimental-fishery basis. One hundred percent observer coverage is usually required in this fishery. One midwater trawl vessel from Canada fished on Georges Bank from 2000-2002; two midwater trawl vessels were permitted to fish on Georges Bank in 2003.

In 2004, two Canadian midwater trawl vessels were permitted to fish on Georges Bank. One of these vessels made ten trips in 2004 but found fish on only three of those trips (9,000, 5,000, and 2,000 kg herring; 16 mt of herring total). Another vessel made five trips and found fish on only one trip. There was no Canadian herring fishing on Georges Bank during the 2005 and 2006 fishing years, to date (*DFO, personal communication*).

4.2.9 Other Fisheries

The overlap between the Atlantic herring fishery and other fisheries is discussed in detail in Section 7.5 of Amendment 1. The most notable overlap occurs between the herring fishery and the fisheries for Atlantic mackerel and American lobster.

The use of herring as bait is a very important aspect of the fishery, and herring bait has been used for at least 200 years in New England. Present uses of bait are for lobstering (regional) and longlining (regional-national-international). In addition, tuna and various recreational fisheries utilize herring for bait. National use of herring for longlining is found on the West Coast, in Alaska, and Florida. International use of herring for bait occurs in Costa Rica. The quantity of herring used as bait is considerable. Figure 74 in Amendment 1 provides the percentage of reported herring landings utilized for bait and food from the dealer weighout database during 1990-2002. According to information in the dealer database, more than 50% of herring landings are sold for bait purposes on an annual basis. Dealer data are considered to represent an underestimate of the utilization of herring for bait because they may not include many smaller transactions like vessel-to-vessel sales of herring for bait. For the year 1996, when 105,000 mt of herring was landed in the U.S., it has been estimated that on the order of 71,000 mt of herring were utilized as bait (Stevenson 1998). This includes bait taken as leftover product from herring processing.

The overlap between the Atlantic herring and mackerel fisheries is important, as many of the same vessels and processing plants participate in both of these fisheries, and many of the participants are primarily or entirely economically dependent on these two fisheries. Table 46 on p. 302 of the final Amendment 1 document reports per vessel average value of herring landings and the average dependence on herring and mackerel by principal gear for vessels that averaged greater than 1 mt of herring per trip. Purse seine vessels do not depend on mackerel for income and are almost entirely dependent on herring. Single midwater trawls get as much as 44% of their revenue from herring and as much as 25% from mackerel, on average. Pair trawl vessels derive as much as 63% of their revenue from herring and as much as 49% of their revenue from mackerel Bottom trawl vessels are not significantly dependent on either herring or mackerel.

The final Amendment 1 document should be referenced for more information about these other fisheries. While impacts to these fisheries are considered in the analyses provided in Section 5.3 of this document, they are not addressed in great detail because of the narrow scope of the proposed action (herring fishery specifications for the 2007-2009 fishing years).

4.3 HABITAT AND EFH

4.3.1 Atlantic Herring

Essential Fish Habitat (EFH) for Atlantic herring is described in NEFMC (1998a) as those areas of the coastal and offshore waters (out to the offshore U.S. boundary of the exclusive economic zone) that are designated in Figure 39 through Figure 42 and meet the following conditions:

Eggs: Bottom habitats with a substrate of gravel, sand, cobble and shell fragments, but also on aquatic macrophytes, in the Gulf of Maine and Georges Bank (Figure 39). Eggs adhere to the bottom, forming extensive egg beds which may be many layers deep. Generally, the following conditions exist where Atlantic herring eggs are found: water temperatures below 15° C, depths from 20 - 80 meters, and a salinity range from 32 - 33‰. Herring eggs are most often found in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots. Atlantic herring eggs are most often observed during the months from July through November.

Larvae: Pelagic waters in the Gulf of Maine, Georges Bank, and southern New England that comprise 90% of the observed range of Atlantic herring larvae (Figure 40). Generally, the following conditions exist where Atlantic herring larvae are found: sea surface temperatures below 16° C, water depths from 50 - 90 meters, and salinities around 32‰. Atlantic herring larvae are observed between August and April, with peaks from September through November.

Juveniles: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras (Figure 41). Generally, the following conditions exist where Atlantic herring juveniles are found: water temperatures below 10° C, water depths from 15 - 135 meters, and a salinity range from 26 - 32‰.

Adults: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras (Figure 42). Generally, the following conditions exist where Atlantic herring adults are found: water temperatures below 10° C, water depths from 20 - 130 meters, and salinities above 28‰.

Spawning Adults: Bottom habitats with a substrate of gravel, sand, cobble and shell fragments, but also on aquatic macrophytes, in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay (Figure 42). Generally, the following conditions exist where spawning Atlantic herring adults are found: water temperatures below 15° C, depths from 20 - 80 meters, and a salinity range from 32 - 33‰. Herring eggs are spawned in areas of well-mixed water, with tidal currents between 1.5 and 3.0 knots. Atlantic herring are most often observed spawning during the months from July through November.

All of the above EFH descriptions include those bays and estuaries listed in Table 32, according to life history stage. The Council acknowledges potential seasonal and spatial variability of the conditions generally associated with this species.

Figure 39 EFH Designation for Atlantic Herring Eggs

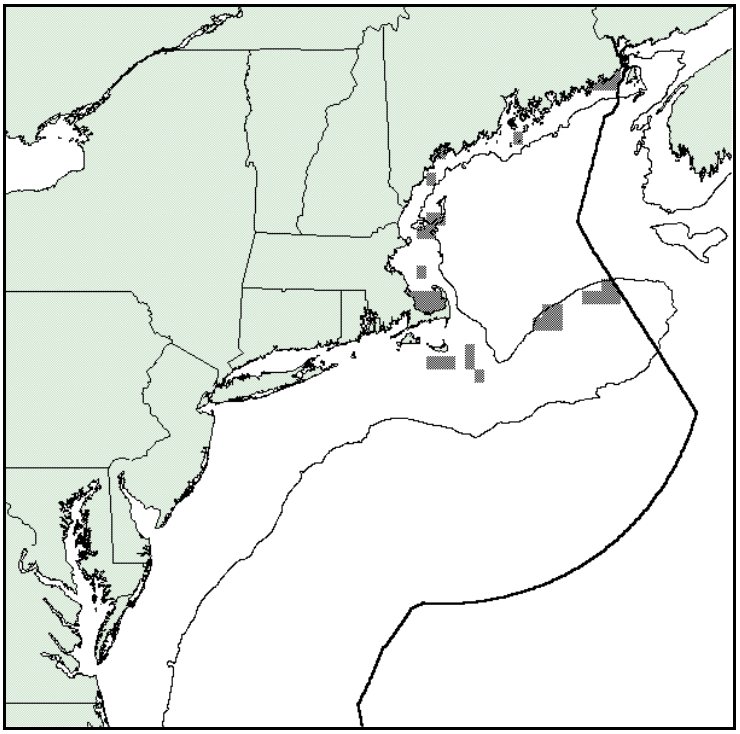


Figure 40 EFH Designation for Atlantic Herring Larvae

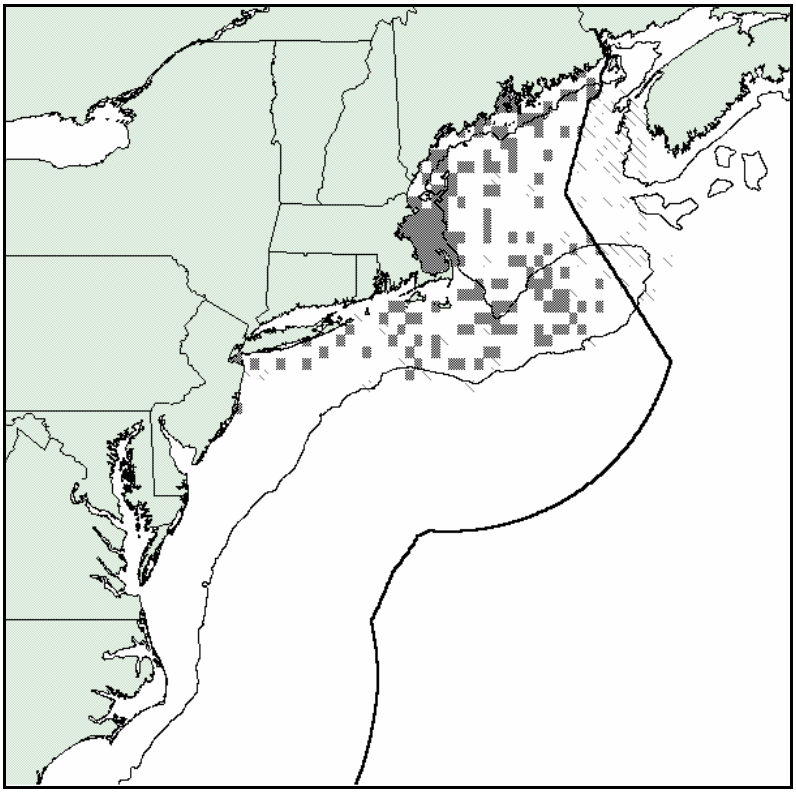


Figure 41 EFH Designation for Juvenile Atlantic Herring

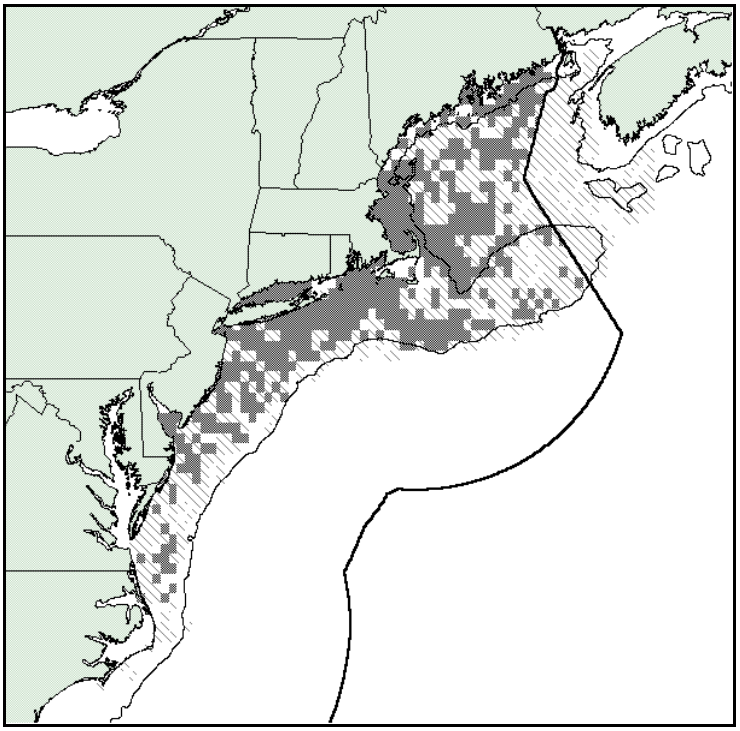
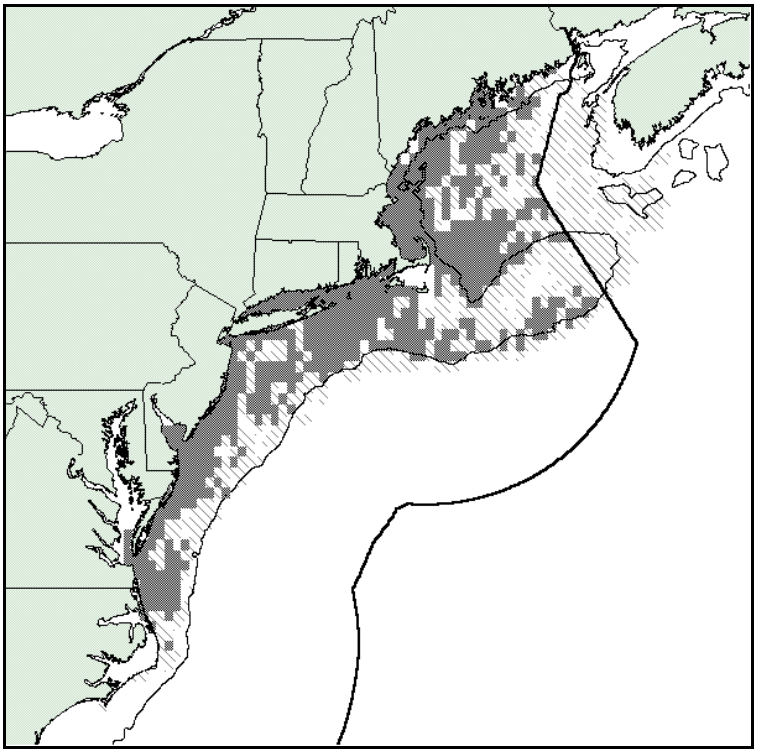


Figure 42 EFH Designation for Adult Atlantic Herring



4.3.2 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 Sea Bass; Squid, Atlantic Mackerel and Butterfish; Atlantic Surf Clam and Ocean Quahog; Atlantic Bluefish; Atlantic Billfish; and Atlantic Tuna, Swordfish and Shark. Text descriptions for all benthic (demersal) life stages for federally-managed species in the Northeast region are shown in Table 4.11 of the NMFS Draft EFH EIS for Atlantic Herring. Maps showing EFH by species and life stage are included in the 1998 Omnibus EFH Amendment (NEFMC 1998) and in various fishery management plans developed by the Mid-Atlantic and South Atlantic Fishery Management Councils during the last five years. All the EFH descriptions and maps can be viewed on the NMFS Northeast Regional Office web site.

Table 32 Essential Fish Habitat Designation of Estuaries and Embayments for Atlantic Herring

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

S ≡ The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > 25.0‰).

M ≡ The EFH designation for this species includes the mixing water / brackish salinity zone of this bay or estuary (0.5 < salinity < 25.0‰).

F ≡ The EFH designation for this species includes the tidal freshwater salinity zone of this bay or estuary (0.0 < salinity < 0.5‰).

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

4.4 PROTECTED RESOURCES (MARINE MAMMALS AND PROTECTED SPECIES)

4.4.1 Description of Protected Species

The following protected species are found in the environment utilized by the herring fishery. A number of them are listed under the Endangered Species Act of 1973 (ESA) as endangered or threatened, while others are identified as protected under the Marine Mammal Protection Act of 1972 (MMPA). Two right whale critical habitat designations are located in the area in which the herring fishery is prosecuted. The information provided here summarizes the more detailed and extensive descriptions and life history information provided in the Final Supplemental Environmental Impact Statement (FSEIS) submitted to NOAA Fisheries as part of Amendment 1 to the Herring Fishery Management Plan. The proposed rule for the amendment was published on September 27, 2006 with implementation is expected early in 2007. The FSEIS is located on the Council's website at http://www.nefmc.org/herring/index.html.

Cetaceans	***Status***
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
Pilot whale (*Globicephala* spp.)	Protected
Spotted dolphin (*Stenella frontalis*)	Protected
Risso's dolphin (*Grampus griseus*)	Protected
White-sided dolphin (*Lagenorhynchus acutus*)	Protected
Common dolphin (*Delphinus delphis*)	Protected
Bottlenose dolphin: coastal stocks (*Tursiops truncatus*)	Protected
Harbor porpoise (*Phocoena phocoena*)	Protected
Seals	
Harbor seal (*Phoca vitulina*)	Protected
Gray seal (*Halichoerus grypus*)	Protected
Harp seal (*Phoca groenlandica*)	Protected
Hooded seal (*Crystophora cristata*)	Protected
Sea Turtles	
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered
Green sea turtle (*Chelonia mydas*)	Threatened/Endangered*
Loggerhead sea turtle (*Caretta caretta*)	Threatened
Fish	
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered
Atlantic salmon (*Salmo salar*)	Endangered

Critical Habitat Designations

Right whale Cape Cod Bay
Great South Channel

* Green turtles in U.S. waters are listed as threatened except for the Florida breeding population which is listed as endangered.

Although salmon belonging to the Gulf of Maine distinct population segment (DPS) of Atlantic salmon occur within the general geographical area covered by the Herring FMP, they are unlikely to occur in the area where the fishery is prosecuted given their numbers and distribution. Therefore, the DPS is not likely to be affected by the herring fishery. As discussed in the original FMP, because of preferred habitat and distribution, there is little overlap between shortnose sturgeon *(Acipenser brevirostrum*) and the herring fishery making the likelihood of encounters relatively rare events.

Similarly, there is no evidence to suggest that operation of the herring fishery has any adverse effects on the habitat features (e.g., copepod abundance) in the specific areas designated as right whale critical habitat. Therefore, operation of the herring fishery is not expected to have effects on critical habitat for right whales that has been designated for Cape Cod Bay and the Great South Channel.

Because they were not discussed in Amendment 1 to the Herring FMP, a note on both harp and hooded seals is provided here. Both species form aggregations for pupping and breeding off of eastern Canada in the late winter/early spring, and travel to more northern latitudes for molting and summer feeding (Waring *et al*. 2005). However, individuals of both species are also known to travel south into U.S. EEZ waters and sightings as well as strandings of each species have been recorded for both New England and Mid-Atlantic waters and all four species of seals are known to be captured in trawl gear (Waring *et al*. 2005).

It is expected that all of the remaining species identified above have the potential to be affected by the operation of the herring fishery. However, given differences in abundance, distribution and migratory patterns, it is likely that effects and the magnitude of those effects will vary amongst the species.

The herring fishery is prosecuted by midwater trawl gear (single), paired midwater trawls, purse seines, stop seines and weirs. A full description of the gear used in the fishery is provided in the Amendment 1 FSEIS. Only the first three referenced above are considered to be primary gears in the Atlantic herring fishery. Weirs and stop seines are responsible for a only a small fraction of herring landings (see Amendment 1 FSEIS), operate exclusively within State waters and are not regulated by the Federal FMP, and therefore will not be discussed further in this document relative to protected species. It should be noted, however, that both gear types have accounted for interactions with protected species, notably right, humpback and minke whales, and harbor porpoise, as well as harbor and gray seals. Animals, particularly pinnipeds, may be released alive. Both fisheries are classified as Category III in the NMFS *List of Fisheries for* 2006 – fisheries with a remote likelihood of incidental mortality and serious injury of marine mammals.

The same *List of Fisheries* places the herring midwater trawl fishery, which includes "pair trawls," in Category II, denoting a fishery that has been determined to have occasional serious injury and mortality of marine mammals. The purse seine fishery is considered to have a remote likelihood of interactions and, similar to stop seines and weirs, is listed in Category III. The Amendment 1 discussion, as well as this discussion will focus on the proposed measures and associated midwater trawl activities, while purse seine fishing will only be discussed as appropriate.

Given the target species of this fishery and because herring is a primary prey species for seals, porpoises and some whales, levels of protected species interactions with fishery are likely. Species with documented interactions in the herring fishery include the long-finned pilot whale, Atlantic white-sided dolphin and harbor porpoise. Short-finned pilot whales may also interact with the fishery, but the possibility is more remote since the fishery occurs from Cape Hatteras north to the Gulf of Maine and the boundary between the two pilot whale species is the New Jersey/Cape Hatteras area. According to Waring *et al.* (2005), pilot whales are distributed along the continental shelf in winter and off the northeast coast in early spring. White-sided dolphins are also distributed offshore on the continental shelf, but seasonally move into the Bay of Fundy and Gulf of Maine. Based on observer data, both species have been taken in the herring midwater trawl fishery. NOAA Fisheries Northeast Fisheries Science Center incidental take reports published on the Northeast Fisheries Science Center website - http://www.nefsc.noaa.gov/femad/fishsamp/fsb/ indicate a number of takes of white-sided dolphins and pilot whales by midwater pair trawls in 2005. Interactions between each of these species and the herring fishery are most likely to occur in Areas 1B, 2 and 3, given their offshore distribution.

Harbor porpoise and both gray and harbor seals are distributed inshore during the period of highest activity in the herring fishery, from May through October. Interactions are most likely to occur in Area 1A, although porpoise are also found in the Bay of Fundy and less frequently on the northern edge of Georges Bank. As mentioned earlier, all three of these species have had documented interactions with the herring purse seine/fixed gear fishery, but animals, if observed, are often released alive. Few instances of documented takes of harbor porpoise in midwater trawl gear exist, possibly an artifact of the low observer coverage in this fishery. Increases in coverage, however, should yield better information on interactions in the future.

4.4.2 Actions to Minimize Interactions with Protected Species

Many of the factors that serve to mitigate the impacts of the herring fishery on protected species are currently being implemented in the Northeast Region under either the Atlantic Large Whale Take Reduction Plan (ALWTRP) or the Harbor Porpoise Take Reduction Plan (HPTRP). In addition, the Herring FMP has undergone repeated consultations pursuant to Section 7 of the Endangered Species Act (ESA), with the most recent Biological Opinion prepared by NOAA Fisheries in 1999. The conclusion in that Opinion states that the herring fishery is not likely to jeopardize the continued existence of threatened or endangered species or critical habitat. The Biological Opinion includes an Incidental Take Statement that provides the fishery with an exemption to the take prohibitions established in Section 9 of the ESA.

4.4.2.1 Harbor Porpoise Take Reduction Plan

NMFS published the rule implementing the Harbor Porpoise Take Reduction Plan on December 1, 1998. The HPTRP includes measures for gear modifications and area closures, based on area, time of year, and gillnet mesh size. In general, the Gulf of Maine component of the HPTRP includes time and area closures, some of which are complete closures; others are closures to gillnet fishing unless pingers (acoustic deterrent devices) are used in the prescribed manner. The Mid-Atlantic component includes time and area closures in which gillnet fishing is prohibited regardless of the gear specifications.

4.4.2.2 Atlantic Large Whale Take Reduction Plan

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

Key regulatory changes implemented in 2002 included: 1) new gear modifications; 2) implementation of a Dynamic Area Management system (DAM) of short-term closures to protect unexpected concentrations of right whales in the Gulf of Maine; and 3) establishment of a Seasonal Area Management system (SAM) of additional gear modifications to protect known seasonal concentrations of right whales in the southern Gulf of Maine and Georges Bank.

On June 21, 2005, NMFS published a proposed rule (70 *Federal Register* 35894) for changes to the ALWTRP. The new ALWTRP measures proposed to be implemented would expand the gear mitigation measures by: (a) including additional trap/pot and net fisheries (*i.e.*, gillnet, driftnet) to those already regulated by the ALWTRP, (b) redefining the areas and seasons within which the measures would apply, (c) changing the buoy line requirements, (d) expanding and modifying the weak link requirements for trap/pot and net gear, and (e) requiring (within a specified timeframe) the use of sinking and/or neutrally buoyant groundline in place of floating line for all fisheries regulated by the ALWTRP on a year-round or seasonal basis. A final rule for this action has not yet been published.

4.4.2.3 Atlantic Trawl Gear Take Reduction Team

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

The Western North Atlantic stocks of pilot whales, common dolphins, and white-sided dolphins were designated as non-strategic in the 2005 Marine Mammal Stock Assessment Report. Therefore, the charge to the ATGTRT is to develop a take reduction plan within 11 months that, once implemented, will achieve the long-term goal of the Marine Mammal Protection Act of reducing serious injury and mortality of affected stocks to a level approaching a zero mortality rate goal (ZMRG) (which is 10% of the Potential Biological Removal (PBR) of each stock).

5.0 ENVIRONMENTAL IMPACTS OF PROPOSED ACTION AND ALTERNATIVES

The impacts of the NMFS-preferred alternative (proposed action) and other alternatives that the Council considered are discussed in the following subsections. Because this document supports fishery specifications for the 2007-2009 fishing years, short-term impacts (three years) are discussed and are evaluated relative to the status quo (2005/2006 specifications) and/or no action alternative.

In considering the impacts presented in this document relative to the NMFS-preferred alternative (the proposed action), it is important to keep in mind that the NMFS-preferred alternative is most similar to alternative 2. Another way of looking at is that the NMFS-preferred alternative, in 2007, will have impacts identical to those projected for the Council-preferred alternative, and in 2008 and 2009, the NMFS-preferred alternative will have impacts virtually identical to those projected for alternative 2.

5.1 GENERAL ANALYSIS AND BACKGROUND INFORMATION TO SUPPORT PROPOSED SPECIFICATIONS

5.1.1 Allowable Biological Catch (ABC) and Optimum Yield (OY)

In general, allowable biological catch (ABC) is specified for the Atlantic herring stock complex (U.S. and Canada) based on the best available scientific information related to herring stock biomass and the application of an appropriate fishing mortality rate (F_{MSY}, for example). In recent years, the Council set ABC with limited scientific information, based primarily on an estimate of maximum sustainable yield (MSY) and/or a proxy value for MSY. The current (2005/2006) value of ABC is 220,000 mt, consistent with the MSY proxy that was proposed in Amendment 1 when the 2005-2006 fishery specifications were established. The 220,000 mt proxy proposed in Amendment 1 was intended to be a temporary and precautionary placeholder for MSY until the next stock assessment for the Atlantic herring stock complex is completed. Similarly, the specification of ABC at this level in 2005 and 2006 was intended to be a placeholder for ABC, to be re-visited through the specification process in future years as problems with the stock assessment are resolved.

As previously noted in this document, scientific consensus was reached at the 2006 TRAC Assessment Meeting for Atlantic herring regarding the status of the stock and appropriate values for biological reference points (see Appendix I for details). The recommended value for MSY resulting from the 2006 TRAC Assessment is **194,000 mt**, and the MSY value proposed in Amendment 1 will be revised to reflect the TRAC consensus without any further Council action. Relative to the 2007-2009 fishery specifications, the no action alternative, which maintains an ABC specification of 220,000 mt, is therefore not consistent with the best available scientific information and National Standard 2 of the MSFCMA.

In response to the 2006 TRAC Assessment, the Herring PDT recommended that ABC for the Atlantic herring fishery be set at 194,000 mt for the 2007-2009 fishing years, and the Herring Committee supported this recommendation at its July 6, 2006 meeting. The Council and NMFS agrees, and all alternatives (except the no action alternative) specify ABC at 194,000 mt for the 2007-2009 fishing years. The proposed ABC value represents total removals from the herring stock complex, including removals from both US and Canada.

Although Amendment 1 provides more flexibility in determining the specifications for the herring fishery, the FMP suggests that OY should be less than or equal to allowable biological catch (ABC) minus the expected Canadian catch (C) from the stock complex. The FMP stated that the estimate of the Canadian

catch deducted from ABC will be no more than 20,000 mt for the New Brunswick weir fishery and 10,000 mt for the Georges Bank Canadian harvest:

OY ≤ ABC-C (C not to exceed 30,000 mt).

For the 2005/2006 specifications, the Canadian harvest was assumed to be 20,000 mt, derived primarily from the New Brunswick weir fishery (the Canadian fishery on Georges Bank lands very small amounts of herring). At its July 6, 2006 meeting, the Herring Committee recommended that the assumed Canadian herring catch for 2007-2009 remain at 20,000 mt, and the Council and NMFS agrees with this recommendation. The fishery information provided in Section 4.2.8 of this document supports this assumption for the purposes of determining the 2007-2009 U.S. herring fishery specifications at this time. Therefore, based on a proposed ABC value of 194,000 mt and an assumed Canadian catch of 20,000 mt, OY is specified less than or equal to 174,000 mt for the 2007-2009 fishing years in all alternatives that were considered during the specification process. The Council and NMFS are proposing a U.S. OY value of 145,000 mt for the 2007-2009 fishing years. The Council will retain the ability to modify fishery specifications during any of the interim years as necessary (for example, if the Canadian catch during 2006 and/or 2007 differs significantly from the 20,000 mt assumption).

Proposed "Buffer" Between ABC and OY

The Herring FMP (as well as the MSFCMA) states that the establishment of optimum yield (OY) will include consideration of relevant economic, social, or ecological factors and that for this reason, OY may be less than ABC – C (174,000 mt for 2007-2009 specifications). The Council may determine that a buffer between ABC and OY still is appropriate because of scientific uncertainty (ex., the status of the inshore component of the resource), the importance of recruitment and ensuring strong year classes in the future, the importance of herring as a forage species, and/or the potential impact of any increase in the Canadian fisheries for herring, particularly the NB weir fishery, which tends to catch more juvenile fish from the inshore component of the resource.

Moreover, the specification of optimum yield for the herring fishery relates to the geographic distribution of the selected total allowable catches (TACs), the relative risk of overfishing individual stock components, and the extent to which development of the offshore herring fishery should be encouraged by the Council. For these reasons, the Council considered a range of alternatives for OY for the 2007-2009 herring fishery specifications. Ultimately, the total value of U.S. OY is determined by the distribution of the area-specific TACs across the entire fishery.

The Council and NMFS are proposing a U.S. OY value of **145,000 mt**, which is 5,000 mt less than the current value and provides a 29,000 mt buffer between ABC and OY (including 20,000 mt Canadian catch). The Council and NMFS are proposing a buffer between ABC and OY for several reasons:

- At the 2006 TRAC Assessment Meeting, scientists identified a significant **retrospective pattern** in the model utilized to estimate Atlantic herring biomass and fishing mortality. The retrospective pattern overestimates SSB (averaging + 14.5%/year, and ranging between 1-24%) and underestimates fishing mortality; this is a concern that should be considered in the context of allowing the herring fishery to expand significantly and/or rapidly above current levels. It is clear that current levels of removals from the stock complex (around 100,000 mt for the last 15 years) are sustainable and should not cause concern relative to the health of the resource. The retrospective pattern in the assessment model suggests that the Council may want to be cautious about allowing removals to increase rapidly to levels significantly above what has been observed in the fishery over the last 15 years. While a buffer still provides opportunities to expand the fishery in the appropriate areas, allowing removals from the fishery to increase all the way to ABC may be detrimental to the stock complex over the long-term, given the retrospective pattern.

- **Recruitment** for Atlantic herring is highly dependent on favorable environmental conditions. While recruitment in 1994, 1998, and 2001 appears to have been stronger than average, it is noted that other years, particularly the 1999 and 2003 year classes, have produced year classes weaker than expected. Recent strong year classes should not be considered the "norm" for this stock. Variability around the stock-recruitment relationship is common for many clupeids (other examples include menhaden and river herring). A buffer between ABC and OY may help to ensure that adequate SSB is available to produce strong and healthy recruitment in fluctuating and unpredictable environmental conditions.
- The **importance of herring as a forage species** for other Northeast region fish, mammals, and birds is another reason that a buffer between ABC and OY may be appropriate at this time. One of the objectives of Amendment 1 to the Herring FMP is to "provide for long-term, efficient, and full utilization of the optimum yield from the herring fishery...this includes recognition of the importance of Atlantic herring as one of many forage species of fish, marine mammals, and birds in the Northeast Region." Consequently, OY should be specified such that the Council remains confident in the fishery's ability to fully utilize the yield while continuing to address the needs of the ecosystem in which herring is an important component.

5.1.2 Considerations Related to DAH, TALFF, DAP, JVPt, and USAP

The Herring FMP specifies that domestic annual harvest (DAH) will be set less than or equal to OY and will be composed of domestic annual processing (DAP), the total amount allocated to processing by foreign ships (JVPt), and the amount of herring that can be taken in U.S. waters and transferred to Canadian herring carriers for transshipment to Canada (BT). DAH was specified at 150,000 mt for the 2005 and 2006 fishing years.

DAH = DAP + JVPt + BT

Border Transfer (BT)

Specification of BT has remained at 4,000 mt since the implementation of the Herring FMP, and there does not appear to be a need to change this for the 2007-2009 fishing years (therefore, DAH = DAP + JVPt +4,000 mt).

According to NMFS, none of the 4,000 mt BT allowance was utilized during the 2004 and 2005 fishing years. At the time of this writing, about 323 mt of herring has been transferred to permitted Canadian herring carriers under the BT specification during the 2006 fishing year.

5.1.2.1 DAH and TALFF Considerations

Section 201(d) of the MSFCMA defines total allowable level of foreign fishing (TALFF) as the portion of OY which will not be harvested by vessels of the United States. Therefore, if domestic annual harvest (DAH) for the herring fishery is set at a value less than OY, then the Council should consider an allocation for TALFF to provide an opportunity to fully utilize OY. When specifying DAH for the herring fishery, important considerations relate to the actual and potential capacity of the U.S. harvesting fleet. Recent fishery performance (landings) is also an important factor in this fishery, which has consistently under-utilized the total available OY.

The Council and NMFS are proposing to specify DAH as 145,000 mt and maintain the current (2005/2006) specification for TALFF at 0 mt. The primary reason for a 0 mt allocation to TALFF relates to the potential of the U.S. harvesting fleet to utilize the available yield from the resource under current levels of effort and especially under increased levels of effort. The analyses in the 2005/2006 specifications document suggested that the U.S. fleet, fishing under levels of effort similar to current

levels, is capable of harvesting all of the available yield from the herring resource. This analysis has been updated to support a 0 mt TALFF allocation for the 2007-2009 fishing years. Allowing any level of foreign fishing in U.S. waters could reduce opportunities for the U.S. harvesting fleet to maximize benefits from the available yield, especially in a market-driven fishery like the herring fishery. Consequently, an allocation of TALFF could compromise the ability of the U.S. fleet to supply domestic markets that depend on herring (bait, for example) as well as the competitiveness of U.S. exported herring on world markets.

When some of the available optimum yield for the U.S. fishery has been allocated to TALFF in the past, much of the reason for the allocation was to provide incentives for foreign vessels to engage in joint venture processing (JVP) operations with U.S. vessels. TALFF was allocated to promote the utilization of any JVP operation and ensure that processing vessels participating in JVP operations could obtain fish when U.S. harvesting vessels may not be able to supply them for various reasons. This may no longer be the case, as the specification of 0 mt for TALFF was consistent with the specification of 0 mt for JVP in 2005 and 2006. The Council and NMFS determined that both TALFF and JVP should be set at 0 mt for 2005 and 2006 primarily due to the potential for DAH and DAP to be realized by the domestic fishery, therefore maximizing benefits to the U.S. harvesting and shoreside processing sectors. There has been no JVP activity for herring in recent years, so TALFF allocations to support these operations may no longer be necessary. Throughout the 1990s and into the 2000s, the domestic herring fishery has evolved and expanded to levels sufficient to better (and perhaps fully) utilize the U.S. OY, both in terms of harvesting and processing. The same rationale applies to the 0 mt specification proposed for the 2007-2009 fishing years.

5.1.2.1.1 DAH Considerations – Potential Herring Catch for Amendment 1 Limited Access Directed Fishery Fleet

The analysis of potential catch under the limited access program proposed in Amendment 1 to the Herring FMP provides some information that supports the proposed DAH specification for the 2007-2009 fishing years. This analysis is based on the vessels that are predicted to qualify for a limited access directed herring fishery permit under the limited access program proposed in Amendment 1.

To evaluate the implications each limited access alternative considered in Amendment 1 has on the potential for various mixes of vessels to catch the area TACs, **two measures of potential landings** were used that consider the average number of days-at-sea and the average metric tons of herring landed per day-at-sea.

The first measure multiplies a vessel's highest number of days-at-sea per year observed from 2002 through 2004 by their average metric tons landed per day-at-sea over the same time period. The sum of the products are reported to provide a first level estimation of what the group of vessels which qualify for limited access directed fishery permits are likely to land.

The second measure is similar to the first except that days-at-sea are multiplied by the highest yearly average metric tons per day-at-sea observed over the 2002 to 2004 time period. The sum of these vessel level products represents a second level estimation of potential catch. This second measure provides an estimate of potential landings under the assumption that vessels produce at their highest average catch rates and at their highest level of effort observed in recent years.

The above measures produce a range that helps to characterize the potential harvest/catch of the limited access fleet under the management measures proposed in Amendment 1 based on recent observed patterns of fishing effort by the active vessels that qualify for the limited access directed fishery. The analysis is based on active limited access qualifiers from 2002-2004 and does not include any qualifying vessels that

did not average more than 1 mt of herring per trip during this time period. The years chosen for this analysis represent a recent time frame, and current market and stock conditions suggest that the current fishery is similar to the fishery observed during 2002-2004.

Under the Amendment 1 limited access program, **29** active vessels qualify for limited access directed fishery permits; **28** of these vessels qualify for directed fishery permits to fish in Area 1 (Gulf of Maine). With stock, market, and fishery conditions similar to those observed from 2002-2004, the potential catch of herring by the limited access directed fishery fleet in Area 1 (28 vessels) under the Amendment 1 proposed measures ranges from **161,030 mt to 198,710 mt**. Confidentiality restrictions prevent the addition of the potential herring catch for the one vessel that qualifies for a limited access directed permit in Areas 2/3 only.

While the estimates of potential catch provide some perspective about the harvesting capacity of the limited access herring fleet, they are not intended to be absolute estimates of harvesting capacity; they represent a range of estimates of the potential herring catch by a group of vessels based on recent observations in the fishery. These estimates were provided in Amendment 1 as a way to compare limited access alternatives to each other and understand the potential implications of qualifying vessels for the limited access fisheries in various management areas. They are provided in this document for perspective regarding DAH and the proposed TALFF specification of 0 mt.

It is important to understand that the estimates provided above may be minimum estimates of potential catch in the herring fishery because:

- The estimates include only active vessels (2002-2004) that qualify for limited access directed fishery permits in all management areas, and confidentiality rules prevent the inclusion of potential catch for the one additional active vessel that qualifies to fish in Areas 2 and 3 only. Several additional vessels that were not active in the fishery from 2002-2004 (and therefore were not included in the catch estimates) also qualified for limited access directed fishery permits and will have the opportunity to target herring in the upcoming fishing years.
- Vessels that qualify for limited access incidental catch permits are not included in the analysis of potential herring catch. These vessels also may have the ability to participate in the fishery and land up to 25 mt of herring per calendar day; these vessels may choose to participate in the fishery and/or increase their effort depending on market and fishery conditions, and the potential catch of these vessels is not included in the estimates provided above.

The Amendment 1 FSEIS can be referenced for additional discussion regarding this analysis.

5.1.2.1.2 DAH Considerations – Recent Herring Fishery Performance (Landings)

Another important consideration relative to specifying DAH is the recent level of catch from the U.S. Atlantic herring fishery and the potential for the fishery to expand in the short-term. The U.S. herring fishery landed an average **107,018 mt of herring from 1995-2005** (Table 33). Herring landings from the most recent five-year period (2001-2005) averaged 100,370 mt.

Table 33 Total U.S. Atlantic Herring Landings, 1995-2005

YEAR	TOTAL U.S. Herring Landings (MT)
1995	106,185
1996	117,275
1997	123,845
1998	108,428
1999	110,800
2000	108,818
2001	120,025
2002 35 vessels, 1,245 trips	93,157
2003 39 vessels, 1,337 trips	100,836
2004 40 vessels, 1,203 trips	94,440
2005 33 vessels, 1,062 trips	93,390

Source: Vessel Trip Reports (VTRs), Herring SAFE Reports.

Table 34 summarizes a simple projection of landings that could be expected based on the average landings from 1995-2005 – 107,018 mt. The proposed specification for DAH (145,000 mt) was considered by the Council in terms of allowing the herring fishery to further expand as appropriate and what may be realistic to expect in terms of growth in the fishery during the 2007-2009 fishing years.

Table 34 Potential Herring Landings Under Various Scenarios of Market/Fishery Expansion

AVERAGE LANDINGS 1995-2005 = 107,018 MT	
MARKET/FISHERY EXPANSION	**POTENTIAL HARVEST (MT)**
0 – status quo	107,018
+10%	117,720
+20%	128,422
+30%	139,123
+40%	149,825
+50%	160,527
+60%	171,229
+70%	181,931
+80%	192,632
+100%	214,036

Note: ABC for 2007-2009 is proposed to be set at 194,000 mt, with a U.S. OY value of 145,000 mt. This would allow the fishery to expand about 35% more than the recent (1995-2005) levels of landings.

The analysis of potential catch presented above suggests that the assumed limited access directed fishery fleet under Amendment 1, fishing at levels of effort similar to current/recent levels, is capable of harvesting all of the available yield from the resource. The herring fishery is a high-volume, market-driven fishery. Depending on market and fishery conditions, it is possible that the U.S. limited access herring fleet could increase its catch to a level consistent with OY and the proposed DAH.

The objectives of the Herring FMP, modified in Amendment 1, include: provide for the orderly development of the herring fishery in inshore and offshore areas, taking into account the viability of current and historical participants in the fishery; provide for long-term, efficient, and full utilization of the optimum yield from the herring fishery while minimizing waste from discards in the fishery; and provide, to the extent practicable, controlled opportunities for fishermen and vessels in other mid-Atlantic and New England fisheries. The specification of DAH at 145,000 mt and TALFF at 0 mt is consistent with these objectives.

5.1.2.2 DAP Considerations (Including USAP and JVP)

Domestic Annual Processing (DAP) is defined in the Herring FMP as the amount of U.S. harvest that domestic processors will use, combined with the amount of the resource that will be sold as fresh fish (including bait). The Herring FMP specifies that DAP is a subset of DAH and is composed of estimates of production from U.S. shoreside and at-sea processors. The ability to estimate DAP is complicated by poor information about the amount of herring being sold as bait and a lack of detailed information on current and future capacity of domestic processors, as well as any plans for new processing plants to be established.

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

As background information to consider when establishing a DAP specification for the 2007-2009 fishing years, the Herring PDT has provided updated information about processing facilities and general production estimates in this document. The production estimates are not intended to be absolute and/or representative of processing "capacity" per se, but they provide additional perspective on how this sector of the fishery has developed in recent years and continues to evolve. The production estimates are based primarily on past fishery performance as well as personal communication with shoreside processing facilities and estimates of production that those facilities provided. Some Herring PDT members visited processing facilities and conducted interviews as part of ongoing research related to Amendment 1 to the Herring FMP. To the extent possible, the information provided below has been updated since its inclusion in Amendment 1.

At the July 6, 2006 Herring Committee/Advisory Panel meeting, several herring processing facilities that have recently emerged (since the development of information for Amendment 1) were identified. Council staff contacted these facilities following the meeting to obtain general information and production estimates for consideration during the 2007-2009 specification process. Council staff also contacted other existing facilities to update the production information that was provided for the 2005/2006 specifications. Table 35 summarizes information provided by processors and includes estimates of current herring production. Newer plants (post-Amendment 1) are also included in the table, based on information and estimates provided by the facilities. Additional discussion is provided below.

Marr Pelagics (New, New Bedford, Massachusetts)

Marr Pelagics USA LLC is a new shoreside pelagic processing plant based in New Bedford, Massachusetts. The company began operations in late 2005 and is currently operating in its first full fishing year as part of the Atlantic herring and mackerel fisheries. Its principal activities include the processing of Atlantic herring and mackerel for food export. The product provided by Marr Pelagics is whole round frozen herring, packaged and exported primarily to markets in Europe, the Middle East, Africa, and the Far East. Several vessels from various New England ports supply herring to this plant, and the herring utilized at this plant is expected to come primarily from Areas 2 and 3. The plant also unloads some sea scallops and may be interested in expanding its processing operations to the squid fishery.

In general, the Marr Pelagics plant is capable of processing 300 mt of pelagic fish per day. At the time of this writing, there has been no herring production by this plant during the 2006 fishing year. Under ideal conditions (consistent supply of fish, strong market factors, etc.), however, the plant has the capability of processing about 15,000 mt of herring and 10,000-20,000 mt of mackerel. While these are Marr's target production levels in the upcoming years, market conditions (supply/demand) will continue to influence the volume of herring and other species that the plant handles.

Marr Pelagics has made considerable investments in local goods and services and currently employs 5 five-time staff and 40 part-time workers. Some fresh bait may be supplied by the plant, in relatively limited amounts, as culls off the food production lines, with possible seasonal expansion in the future, depending on market conditions.

Atlantic Frost (New, Fall River, Massachusetts)

The Atlantic Frost Seafood LLC (AFS) is a new pelagic floating processing facility moored/based in Fall River, Massachusetts that started operation in December 2004, approximately 2 months after conversion began. Business planning for the facility started in January/February 2004. Prior to becoming a pelagic processing facility, the vessel was a herring processing facility located in Bath, Maine. Approximately $2.5 million was invested to convert the vessel from its previous layout to a current state of the art pelagic processing facility.

In general, AFS's processing operations are composed of about 50% mackerel and 50% other species. The other species include squid, herring, menhaden, groundfish and shellfish. It is understood that processing herring can be a year-round business, while processing mackerel occurs primarily during the peak season, December – April. The other species are processed throughout the calendar year.

AFS processes herring for both the food and bait markets. While the food grade markets are very attractive and allow for future value added production, the bait markets are an essential market component to any facilities operations. The lobster and crab fisheries are an integral foundation to the New England fish structure, and AFS is working with local fishermen to provide bait at fair pricing as well as in forms that the fishermen need. While AFS is capable of processing herring on a year-round basis, there is some seasonality associated with obtaining a food-grade product. In the spring, when the fish are "feedy," the product is less desirable. The feed tends to react in the stomachs of the fish, causing the stomach linings to burst when they defrost. May is a relatively slow month in terms of processing herring for the food market.

AFS estimates that with the influence of seasonality and market conditions, the plant could process fish about 200 of 365 days in a year. The plant is designed to run 24 hours a day so that it can operate in conjunction with the cyclical nature of the fishery. The processing capacity of the plant is about 250 tons per day. AFS estimates that it will process about 15,000-20,000 mt of herring when operations are in full

production. AFS is increasing and expanding its products of herring with the goal to be about 35% of its total operations.

Committing vessels to serve the plant is an element of AFS's long-term business strategy. AFS has agreements with existing fishing vessels of a variety of sizes and locations to service the volume needs of the operation. AFS has its own tender fleet as well to take fish from other small vessels and place the fish in to refrigerated salt water (RSW) to help ensure quality rather than depend on trucking of product.

The plant supplements its purchases of product with fish primarily from overages on other vessels (extra fish for which other vessels cannot find a market), which AFS sees as advantageous to everyone involved because the fish are not dumped without being sold. Most herring that the plant purchases is caught in Areas 2 and 3 because these areas are closer to the facility, reducing the time that the fish spend out of the water before being processed.

Atlantic Frost – Processing Operations

Vessels that catch herring for food markets hold the fish in RSW tanks (30-31°) until the fish can be offloaded at the AFS facility. RSW tanks are critical to ensure a food-grade product. If the fish are considered to be acceptable for the food market, then AFS purchases them, grades them to size, packs them into boxes and freezes them. Once frozen the product is placed in containers for shipment or goes directly to commercial cold storage.

Atlantic Frost – Markets

AFS processes herring and mackerel for food markets worldwide. Current exports are being made to clients in Canada, Egypt, China, South Africa, Nigeria, Trinidad, Korea, Turkey, Australia, Singapore, Fiji, St. Petersburg, Denmark, and other countries around the globe. AFS is also undertaking efforts to develop business relationships with Baltic area sardine canneries. On a global basis, the U.S. fisheries for pelagic species like herring and mackerel are very small. AFS is competing for market share with plants that are supplied by enormous pelagic fisheries (West Africa, for example).

Atlantic Frost – Employment And Economy

AFS has provided a boost to the economy in Fall River, Massachusetts, which has traditionally been a limited fishing community. AFS employs 50-60 individuals over the course of a year, the majority of whom live in or near the community. AFS maintains a full time administrative staff as well as a full time engineering staff to maintain the vessel. AFS tries to pay its employees competitively and well enough for them to support their families. AFS is not unionized.

Atlantic Frost – Future Plans

AFS's future plans include adding value-added equipment to expand the product lines for mackerel, herring, and specialty products. AFS hopes to continue to expand its processing of herring to a year-round basis and expand its markets to match the current processing capabilities of the plant.

Atlantic Frost – Summary Information

Processing Operations:	Approximately 55% herring and other species, 50% mackerel
Plant Capacity:	Approximately 250 tons per day, 200 days per year (50,000 tons)
Herring Capacity:	15,000 – 20,000 MT
Plant Employment:	45-55 individuals, 8 full-time

U.S. Sardine Canneries (Updated)

On April 30, 2004, Bumble Bee Foods LLC merged with Connors Bros. Ltd., the largest sardine producer in the world that owned and operated sardine plants in Canada and the U.S. The San Diego, CA based Bumble Bee Foods now owns and operates the last remaining Stinson Seafood sardine cannery located in Prospect Harbor ME. The cannery in Bath was the oldest of the existing plants (in terms of modernization) and closed effective May 3, 2005. The Prospect Harbor Plant has completed a $12 million renovation project that makes it one of the most modern sardine plants in the world.

When the Bath cannery closed, the automatic packing line and a portion of the cutting equipment was moved to Prospect Harbor, giving the Prospect Harbor plant a major boost in its production capabilities. For 2006, the Prospect Harbor plant expects to utilize at least 20,000 mt of whole round fish, given an average pack and average fish supply. If fish supply is above average, the plant could easily utilize 25,000 mt in 2006, and under ideal circumstances (year-round and consistent supply), the cannery's production capability could be 30,000 mt for one shift.

All of the herring purchased for the cannery is reported in the dealer database as whole fish used in food production. However, a proportion of the whole fish purchased for canning is sold as bait or fish meal (cuttings, for example) and is not reported again in the dealer database since the whole fish weight is already reported. This eliminates double-counting in the dealer database. In terms of the 20,000 mt whole herring that Bumble Bee expects to purchase for the Prospect Harbor cannery in 2006, it is estimated that 40% is sold as bait and/or fish meal.

At-Sea Freezer Vessels (Updated)

There are several at-sea catcher/processor vessels participating in the Atlantic herring fishery. These vessels harvest and process herring (frozen at-sea) and represent at-sea processing capacity in the fishery that is outside of USAP (discussed below – USAP vessels do not harvest fish). They fish primarily in southern New England and the Mid-Atlantic and target pelagic species in addition to herring. A detailed description of SeaFreeze Ltd (Rhode Island at-sea processing company) is provided in Amendment 1 to the Herring FMP. The following information was obtained from a SeaFreeze representative to provide more perspective on the processing capabilities of at-sea freezer vessels engaged in the herring fishery at this time.

While the production of at-sea frozen herring has fluctuated quite a bit, SeaFreeze has been producing sea frozen herring since 1986. Herring has historically been the lowest-valued species that these vessels target, so herring production often occurs when market opportunities for other species decline during the fishing year. However, at-sea herring production has recently increased and may continue to do so in the future as opportunities for frozen product increase in niche and other markets.

In 2005, Seafreeze total production of herring was 681 mt. To date during 2006 (through July), total herring production has been 1,213 mt with an anticipated total of 2,500 mt for 2006.

In total, there are currently four medium-sized freezer trawlers fishing on the east coast, as well as approximately one dozen smaller freezer trawlers. The four medium-sized freezer trawlers are estimated to have the capacity to freeze about 60 mt per 24 hours. If these four boats processed herring year-round, they could be capable of processing 60,000 mt or more annually. While herring market and fishery conditions will likely preclude this level of activity, there is certainly interest in continuing to increase herring production as the market value of herring increases.

M/V American Freedom (New – USAP)

At the July 6, 2006 Herring Committee/Advisory Panel meeting, representatives from Atlantic Pelagic Seafood, a new at-sea herring/mackerel freezing venture, expressed support for a continued USAP specification and informed the Committee of intentions to utilize the 2006 USAP allowance with a newly-refurbished at-sea freezing vessel, the M/V American Freedom. The M/V American Freedom is a 400 foot U.S.-flag mothership that does not have the capacity to harvest fish, but intends to freeze herring and mackerel predominantly from vessels that are either not directly affiliated with shoreside processing plants or not capable of transporting large quantities of herring to shore for processing. This vessel intends to freeze herring in 2006 and future years under the current USAP allocation of 20,000 mt and should be considered in the context of DAP and USAP for 2007-2009.

Representatives for this vessel maintain that this venture will enable smaller and mid-sized vessels without refrigerated seawater systems to deliver herring for food purposes, providing an opportunity that is currently unavailable to these vessels and possibly shifting some herring fishing effort into offshore areas. The intent of this operation is to conduct value-added freezing operations at-sea and assist the New England and Mid-Atlantic herring fleets in finding new markets for the resource in Areas 2 and 3, where the TACs are far from fully utilized at this time and where expansion of the fishery has been encouraged. Supporters argue that this venture may help to meet the Amendment 1 objective of achieving long-term, efficient, and full utilization of OY from the herring fishery without adding harvesting capacity. It also may increase the amount of herring and other pelagic species utilized domestically for food purposes, providing greater net benefits to the harvesting sector and the Nation.

The M/V American Freedom will be homeported in Portland, Maine, providing up to 60 jobs at-sea and further bolstering the economy through purchases of food and supplies. This vessel is U.S.-built and U.S.-owned. It will employ licensed U.S. officers and is subject to U.S. crew limits. Its principals, including a Portland, Maine native, have invested more than $20 million to enhance Portland's fishing economy through the addition of this vessel. The introduction of the M/V American Freedom and its expressed intent to utilize the 2006 specification for USAP should be considered by the Council when selecting specifications for the 2007-2009 fishing years.

Table 35: DAP Supporting Information

It is important to remember that the estimates provided in Table 35 are not intended to be absolute estimates, but they are based on the best available information, provided for the most part by the processing facilities themselves. Many factors affect the ability of plants to maximize production of herring, as discussed below. Moreover, future expansion of the fishery is difficult to predict. The Herring PDT applied a 20% increase to production estimates provided by the processing facilities to account for any expansion of the fishery or markets that may occur during the 2007-2009 fishing years; however, it is unclear whether or not this increase will be realized.

In addition, the ability of the herring fleet to access specific markets may affect the true value of DAP. For example, some processing plants have dedicated fishing vessels that offload the vast majority of their catch directly to the processing facilities. While other vessels land fish at these plants as well, much of the estimated production from these plants comes from their own vessels. Markets are also limited during the winter when demand for bait is at its lowest and the mackerel fishery season is in full-swing. During the winter, supplying the sardine canneries may be one of the few viable opportunities for vessels that fish for herring full-time (and not for mackerel).

The information presented in Table 35 suggests that the current composition of the domestic processing sector, which continues to grow, would be capable of processing herring consistent with landings at the proposed DAH level.

Table 35 Information for Consideration Relative to Domestic Annual Processing (DAP) for 2007-2009

DOMESTIC PROCESSOR	POTENTIAL HERRING PRODUCTION 2007-2009	SOURCE OF INFORMATION AND ADDITIONAL COMMENTS
Lobster Bait	64,200 mt	• 60% of average annual landings 1995-2005 (107,018 mt)
Sardine Canneries	25,000 mt	• Personal communication –based on 2006 production estimate of 20,000 mt for Prospect Harbor cannery, max capability 30,000 mt • Added 20% to account for potential increase in production during 2007-2009 • Includes fish trucked to the U.S. cannery, but not fish trucked to Canadian canneries • All fish reported in dealer database as whole fish for food production (does not double-count for cuttings sold as bait) – about 40% of product sold as bait/meal (10,000 mt)
Cape Seafoods, Gloucester MA	27,600 mt	• Personal communication – based on total 42,000 mt current production estimate provided by Cape Seafoods, of which herring is 20,000 – 26,000 mt (mean 23,000 mt) • Added 20% to account for potential increase in production during 2007-2009 • Expansion of herring production beyond current levels will depend on conditions in mackerel fishery
NORPEL, New Bedford MA	30,000 mt	• Personal communication–based on 20,000-30,000 mt production estimate provided by NORPEL (mean 25,000) • Added 20% to account for potential increase in production during 2007-2009
Lund's Fisheries, Cape May NJ	4,300 mt	• Personal communication – based on highest year of herring production from 2000-2005 (2000: 1,900 mt; 2005 herring production 870 mt; 2006 production to date 1,150 mt) • Added 20% to account for potential increase in production during 2007-2009 • Added another 2,000 mt to account for increased herring incidental catch in expanding mackerel fishery • Production capacity about 500 mt/day; could process 20,000 mt herring under ideal market/fishery conditions, especially if mackerel production slows considerably
Marr Pelagics	15,000	• Personal communication – based on estimated production capability for upcoming years, if market and fishery conditions allow • Processing capacity of plan about 300 tons/day • No herring production yet in 2006, estimate already accounts for significant increase from current levels during 2007-2009 (no need to add 20% to account for expansion)
Atlantic Frost	17,500 mt	• Based on 15,000 – 20,000 mt herring production estimate (mean value) when operations are in full swing • Estimate already accounts for significant increase from current levels during 2007-2009 (no need to add 20%) • Processing capacity of plant about 250 tons/day • Total estimated plant production 50,000 mt, of which herring targeted to be about 35% (17,500 mt)
At-Sea Catcher/Processor Vessels (SeaFreeze Ltd., etc.)	3,000 mt	• Based on expected 2006 production (2,500 mt) • Added 20% to account for potential increase during 2007-2009 (any additional increase is accounted for in the "Other" category) • Four medium-sized freezer trawlers produce about 60 mt/day and could process 60,000 mt or more if they worked on herring year-round (not likely)
U.S. At-Sea Processing (USAP)	20,000 mt	• Current allocation for USAP – domestic processing vessels that exceed vessel size limits • M/V American Freedom intends to utilize 2006 allocation and expressed interest in future allocations
Other	10,000 mt	• Accounts for potential increase in demand for herring as lobster bait • Accounts for potential increase in at-sea freezing by catcher/processor vessels • Accounts for small amounts of herring that may be packed at other facilities (RI ports, for example)
TOTAL	**216,600**	• Based on current/near future production capabilities with an additional 20% to account for potential increase during 2007-2009 • Some production for lobster bait may be double-counted in this table (sardine cuttings, culls from processing plants) • Over-estimates near-term production based on current conditions, as some plants are just commencing operations; production may be variable in the future and will continue to depend on market/fishery conditions, esp. trends in the mackerel and lobster fisheries

Note: This table does not represent an estimate of DAP for the 2007-2009 fishing years; the table was developed by Council staff based on information about 2006 production, provided by the various processing facilities. The table is provided as additional information to support the Council's DAP specification for the 2007-2009 fishing years.

While it is difficult to predict whether or not the U.S. processing sector will utilize all of the available DAP in 2007-2009, it is certainly possible given the capacity of the domestic processing sector, the potential for market expansion to occur, and the expressed intent of the U.S. industry to increase its participation in the Atlantic herring fishery. The Council believes that domestic processing capacity should continue to expand to meet market and fishery conditions while remaining consistent with the biological capacity of the herring resource and the harvesting capacity of the domestic fleet. Given the potential of the domestic processing sector, the Council does not believe that there are additional opportunities in this fishery for foreign processing operations (JVP) at this time (see Section 5.1.2.2.2 of this document for additional discussion).

5.1.2.2.1 U.S. At-Sea Processing (USAP)

The Herring FMP states that "part of DAP may be allocated for at-sea processing by domestic vessels that exceed the vessel size limits (see section 3.6.6 of the Herring FMP). This allocation will be called the 'U.S. at-sea processing' (USAP) allocation. The term 'at-sea processing' refers to processing activities that occur in the Exclusive Economic Zone outside State waters. When determining this specification, the Council will consider the availability of other processing capacity, development of the fishery, status of the resource, and opportunities for vessels to enter the herring fishery."

The Council supports maintaining the current USAP specification of 20,000 mt (Areas 2/3 only) for the 2007-2009 fishing years. This serves as a cap for USAP activities and is not a specific allocation to this processing sector. Landings from Areas 2 and 3 – where USAP is authorized – have been considerably lower than allocated TACs for each of the past several years. USAP could provide an additional outlet for U.S. harvesters, particularly those who operate vessels that do not have refrigerated saltwater (RSW) systems to maintain catch quality for delivery to shoreside processors. Such vessels could offload product to USAP vessels near the fishing areas, increasing the benefits to the U.S. industry. This is consistent with one of the objectives of the Atlantic Herring FMP, as modified in Amendment 1: provide, to the extent practicable, controlled opportunities for fishermen and vessels in other mid-Atlantic and New England fisheries. Moreover, the specification of 20,000 mt for USAP should not restrict either the operation or the expansion of the shoreside processing facilities during the 2007-2009 fishing years.

At the July 6, 2006 Herring Committee/Advisory Panel meeting, industry members and representatives provided more specific information about a new U.S. at-sea processing vessel, the **M/V American Freedom**, that is scheduled to begin at-sea processing operations sometime during the fall of 2006 (under the current specification of 20,000 mt max from Areas 2/3 only). The operation may increase the fishery's ability to fully utilize OY without adding harvesting capacity and may provide benefits to a greater number of U.S. vessels in the fishery. More information about the M/V American Freedom is provided in the previous discussion related to DAP (Section 5.1.2.2).

The Herring Committee and Council agreed that the new, detailed information about this processing vessel represents something more substantial than a simple expression of intent to utilize the USAP allocation sometime in the future, as was the case in previous years. If the USAP allocation is in fact utilized during 2006 and can provide benefits to U.S. harvesting vessels and fishery-related communities without compromising opportunities for domestic shoreside processors, then the Council believes that this opportunity should be maintained for the 2007-2009 fishing years as well.

5.1.2.2.2 Joint Venture Processing (JVP)

The Council supports maintaining a 0 mt specification for joint venture processing during the 2007-2009 fishing years.

The Council specified an allocation of 0 mt for joint venture processing during the 2005 and 2006 fishing years, which includes both internal waters processing (IWP) and joint ventures in the exclusive economic zone (EEZ). The ASMFC specification of 0 mt for IWP for these years was consistent with these recommendations, and the ASMFC has again specified IWP at 0 mt for the 2007-2009 fishing years. The Council recommended the 0 mt specification for JVP because assuming that market and fishery conditions are such that the OY for the herring fishery can be fully utilized, the Council believes that processing capacity in the U.S. fishery is adequate to utilize the available yield. This rationale applies to maintaining the JVP specification at 0 mt for the upcoming fishing years.

In a market-driven fishery like the herring fishery, processing capacity can determine the utilization of the available harvesting capacity. Estimates of potential processing capabilities provided in this document suggest that U.S. shoreside processing capacity would be sufficient to fully utilize the available yield from the fishery depending on market and fishery conditions. This was the case in 2004 when the Council determined the 2005/2006 specifications, and the additional processing capacity that has entered the fishery since 2004 (see previous discussion of DAP) strengthens the Council's continued support for the recommendation that JVP be set at 0 mt for the 2007-2009 fishing years. Additional processing by foreign operations could increase competition for product and consequently impact U.S. processing facilities.

In past years, the Council encouraged the development of the domestic processing sector of the herring fishery but authorized JVP operations to better ensure the availability of a market for harvesting vessels. Now that additional processing facilities have developed and some have even expanded in recent years, specifications for the herring fishery should promote opportunities for these facilities and, to the extent possible, protect the economic investment that has been made in the U.S. herring fishery. The Herring FMP specifically states that "the underlying concept is that JV activity is only allowed until adequate U.S. processing capacity is developed."

Information presented in this document suggests that substantial U.S. processing capacity has developed and continues to develop. New processing facilities in communities like Gloucester and New Bedford have increased shoreside employment opportunities and provide other economic benefits to the communities that should be maintained to the extent possible. Future JV operations would likely compete with U.S. processing facilities for product, which could have a substantial negative impact on U.S. processors and the communities in which processing plants are located, especially in such a market-driven fishery like the herring fishery.

5.2 IMPACTS ON THE HERRING RESOURCE

5.2.1 Impacts of ABC and OY on the Herring Resource

To characterize the potential impacts of the proposed specifications on the Atlantic herring resource, the Herring PDT ran short-term (three year) projections of fishing mortality and total stock biomass based on the following levels of total removals: (1) **194,000 mt**, consistent with the proposed ABC value, which includes both U.S. and Canadian herring removals; (2) **165,000 mt**, consistent with the proposed U.S. OY value of 145,000 mt and 20,000 mt removals from the Canadian fishery; and (3) **170,000 mt**, consistent with the current U.S. OY of 150,000 mt and 20,000 mt removals from the Canadian fishery.

Alternatives considered by the Council for the 2007-2009 fishery specifications included U.S. OY values that range from 145,000 mt to 170,000 mt, corresponding to a range for total removals from 165,000 mt to 190,000 mt. The projections provided in this analysis capture the range of potential impacts of the alternatives under consideration in this document. Specific projections for the no action alternative, which includes an ABC specification of 220,000 mt, are not provided in this analysis because the no action alternative is not consistent with the best available scientific information (National Standard 2 of the MSFCMA). Projections for 170,000 mt, however, relate to the no action alternative in that they characterize the impacts of maintaining the current (2005/2006) TACs and U.S. OY value of 150,000 mt. The no action alternative is also discussed further below.

Proposed ABC 194,000 mt (Total Removals)

Allowable biological catch (ABC) – total removals from the Atlantic herring stock complex – is proposed to be set at 194,000 mt for the 2007-2009 fishing years, consistent with the MSY value resulting from the most recent stock assessment (TRAC 2006, Appendix I). The specification of OY for the herring fishery relates to the geographic distribution of the selected total allowable catches (TACs), the relative risk of overfishing individual stock components, and the extent to which development of the offshore fishery should be encouraged. Hence, there may be important reasons to consider specifying OY at a level less than ABC, as the Council is proposing. The risk of overfishing individual stock components is addressed through the risk assessment analysis described in Section 5.2.2 of this document; the three-year projections provided below focus on the impacts of total removals from the herring stock complex, regardless of the management area from which the fish are harvested.

Alternatives 3 and 4 (non-preferred alternatives, described in Section 3.2) propose that U.S. OY be set at 170,000 mt for the 2007-2009 fishing years, allowing total removals from the fishery to be 190,000 mt when Canadian catch is included. To bound the range of potential impacts of the specifications on the Atlantic herring stock complex, the following fishing mortality and stock biomass projection assumes that all 194,000 mt of ABC is harvested (U.S. and Canada combined) during each of the 2007-2009 fishing years (Table 36). The projection utilizes the terminal year stock biomass estimate resulting from the 2006 TRAC Assessment. There is no significant difference between the impacts of the proposed ABC value of 194,000 mt and total removals of 190,000 mt assumed under Alternatives 3 and 4.

Under this scenario, total herring stock biomass is projected to decline **33.5%** over the three-year time period to a level slightly above B_{MSY} (i.e., considered "rebuilt") by 2009. Fishing mortality on herring increases to about three times the current level, but remains at a level below F_{MSY} during all three years. Both the fishing mortality and biomass are projected to be very close to their respective MSY reference points from the 2006 TRAC Assessment by the start of the 2009 fishing year.

For the reasons discussed in Section 5.1.1 of this document, the Council does not support an approach that would allow removals from the fishery to increase all the way to the proposed ABC level during the 2007-2009 fishing years. Such an approach does not appear to be prudent or precautionary at this time, given the retrospective pattern in the TRAC assessment model and other ecological considerations. The proposed action, which would instead establish a total U.S. OY of 145,000 mt, still allows expansion of the fishery while providing an adequate buffer between ABC and OY. The potential impacts of removals at this level (145,000 mt from U.S. fishery and 20,000 mt from Canadian fishery) are discussed below.

Table 36 Biomass and Fishing Mortality Projections Based on 194,000 mt Total Removals from Stock Complex During 2007-2009 (Proposed ABC)

TRAC MSY = 194,000 mt; B MSY ("rebuilt") = 629,000 mt; F MSY = 0.31 "Overfished" Threshold ½ B MSY= 314,500 mt				
FISHING YEAR	**2006**	**2007**	**2008**	**2009**
Total Removals (mt)	107,443	194,000	194,000	194,000
Fishing Mortality Projection	0.11	0.22	0.25	0.29
Biomass Projection at Start of Next Fishing Year (mt)	1,008,700	902,207	776,021	670,519
Percent Decline from 2006 Biomass Estimate	N/A	-10.6%	-23.1%	-33.5%

Proposed Action – U.S. OY 145,000 mt, Total Removals 165,000 mt

Both the Council-preferred and the NMFS-preferred alternative (proposed action) set OY at 145,000 mt for the 2007-2009 fishing years, which is 49,000 mt less than the proposed ABC value (194,000 mt) and provides a buffer of 29,000 mt (once Canadian landings of 20,000 mt are included) to account for the retrospective pattern in the stock assessment, uncertainty about the status of the inshore stock component, and the important role of herring in the ecosystem. The specification of OY for the herring fishery relates to the geographic distribution of the selected total allowable catches (TACs), the relative risk of overfishing individual stock components, and the extent to which development of the offshore fishery should be encouraged. The risk of overfishing individual stock components is addressed through the risk assessment analysis described in Section 5.2.2 of this document; the three-year projections provided below focus on the impacts of total removals from the stock complex, regardless of the management area from which the fish are harvested.

To characterize the potential impacts of the proposed specification of OY, the Herring PDT ran three-year projections of fishing mortality and stock biomass based on 145,000 mt of removals from the U.S. fishery and the terminal year stock biomass resulting from the 2006 TRAC Assessment (Table 37). To better characterize the impacts of total removals from the fishery, this analysis also assumes a Canadian fishery harvest of 20,000 mt from the Atlantic herring resource. The total removals from the herring stock complex in this projection, therefore, are **165,000 mt**, which is 14.9% less than the proposed ABC value (Table 38).

Under this scenario, total herring stock biomass is projected to decline **25.3%** over the three-year time period but remain at a level above B_{MSY} (i.e., considered "rebuilt"). Fishing mortality on herring increases to twice the current level, but remains at a level below F_{MSY} during all three years. The Council-preferred and NMFS-preferred (proposed) action is more conservative than the no action

alternative (below), Alternative 1 (below), and any approach that would allow removals to increase to the proposed ABC level (above). The Council supports this approach, relative to total removals, because the buffer between ABC and OY accounts for the retrospective pattern in the stock assessment.

Table 37 Biomass and Fishing Mortality Projections Based on 165,000 mt Total Removals from Stock Complex During 2007-2009 (Council-preferred and NMFS-preferred action)

TRAC MSY = 194,000 mt; B MSY ("rebuilt") = 629,000 mt; F MSY = 0.31 "Overfished" Threshold ½ B MSY= 314,500 mt				
FISHING YEAR	**2006**	**2007**	**2008**	**2009**
Total Removals (mt)	107,443	165,000	165,000	165,000
Fishing Mortality Projection	0.11	0.18	0.197	0.221
Biomass Projection at Start of Next Fishing Year (mt)	1,008,700	931,720	832,830	753,200
Percent Decline from 2006 Biomass Estimate	N/A	-7.6%	-17.4%	-25.3%

2005/2006 U.S. OY 150,000 mt, Total Removals 170,000 mt

OY is currently set at 150,000 mt (2005/2006), which is 70,000 mt less than the 2006 ABC value (220,000 mt) and provides a buffer of 50,000 mt (once Canadian landings of 20,000 mt are included) to account for scientific uncertainty and the important role of herring in the ecosystem.

To characterize the potential impacts of taking no action relative to the management area TACs (Alternative 1, non-preferred), the Herring PDT ran three-year projections of fishing mortality and stock biomass based on 150,000 mt of removals from the U.S. fishery and the terminal year stock biomass resulting from the 2006 TRAC Assessment. This analysis also assumes a Canadian fishery harvest of 20,000 mt from the Atlantic herring resource. The total removals from the herring stock complex in this projection, therefore, are 170,000 mt, which is 12.4% less than the proposed ABC value (Table 38).

Under this scenario, total herring stock biomass is projected to decline **26.7%** over the three-year time period but remain at a level above B_{MSY} (i.e., considered "rebuilt"). Fishing mortality on herring increases to twice the current level, but remains at a level below F_{MSY} during all three years.

Table 38 Biomass and Fishing Mortality Projections Based on 170,000 mt Total Removals from Stock Complex During 2007-2009 (U.S. OY 150,000 mt)

TRAC MSY = 194,000 mt; B MSY ("rebuilt") = 629,000 mt; F MSY = 0.31 "Overfished" Threshold ½ B MSY= 314,500 mt				
FISHING YEAR	**2006**	**2007**	**2008**	**2009**
Total Removals (mt)	107,443	170,000	170,000	170,000
Fishing Mortality Projection	0.11	0.19	0.21	0.23
Biomass Projection at Start of Next Fishing Year (mt)	1,008,700	926,600	823,000	739,200
Percent Decline from 2006 Biomass Estimate	N/A	-8.1%	-18.4%	-26.7%

For the most part, the previous projection characterizes the impacts of the **no action alternative** on the herring resource, as the no action alternative maintains the current TACs and U.S. OY specification for the herring fishery. The exception to this is the ABC specification associated with the no action alternative – 220,000 mt. Specifying ABC at 220,000 mt is not consistent with the best available scientific information and the new, scientifically-accepted estimate of MSY for the herring stock complex of 194,000 mt that resulted from the 2006 TRAC Assessment for Atlantic herring (Appendix I). Based on information from the 2006 TRAC Assessment, the no action alternative would be expected to result in overfishing of the Atlantic herring stock complex (i.e., fishing at a level above the TRAC MSY estimate). Over the long-term, this could reduce biomass to levels below B_{MSY}, and possibly below the biomass threshold, causing the resource to be considered overfished. Given the potential for over-estimating biomass and under-estimating fishing mortality associated with the current assessment model, this outcome is very likely if the no action alternative is selected and the ABC value remains at 220,000 mt.

5.2.2 Impacts of Area-Specific TACs on the Herring Stock Components – Risk Assessment

To further analyze the impacts of the proposed action and non-preferred alternatives for 2007-2009 fishery specifications, especially the geographic distribution of TACs, the Herring PDT updated the "catch scenario analysis" that was utilized for the 2005/2006 fishery specifications. This analysis focuses on the impacts of the proposed TAC distributions on the individual spawning components of the herring stock complex, with particular attention to the inshore (Gulf of Maine) spawning component. The inshore component is considered to be the smaller stock component and is the focus of more fishing effort and concerns related to localized depletion (see Amendment 1 for more discussion). Therefore, the inshore component is characterized, for the purposes of analysis, as the "limiting factor" in terms of allocating herring TACs to management areas such that the risk of overfishing individual stock components can be minimized.

The PDT did not specifically analyze the NMFS-preferred alternative (proposed action) because it was not known at the time of the assessment. However, the NMFS-preferred alternative is almost identical to alternative 2, which the risk assessment did analyze. The only difference between the NMFS-preferred alternative and alternative 2 is that during the first year the Area 1A TAC is 45,000 mt, and the first half of the seasonal TAC split in Area 1A is 5,000 mt instead of 6,000 mt. Thus, the impacts of the NMFS-preferred alternative, relative to the risk assessment, fall in between the impacts projected for the Council-preferred action and Alternative 2. More specifically, since the NMFS-preferred alternative is more

similar to Alternative 2 than to the Council-preferred alternative, the impacts of the NMFS-preferred alternative are expected to be very similar to the impacts projected for alternative 2 in the risk assessment.

Since the development of the 2005/2006 herring fishery specifications, the catch scenario analysis has been revised to analyze the potential removals of the inshore component and compare them to historical (1995-2005) removals under a range of TAC options and mixing scenarios. Removals from the offshore component are of less concern and are addressed in Section 5.2.1 as part of total removals from the fishery. The risk-based analysis of the proposed action and other alternatives under consideration in this document are described below.

Although the Atlantic herring stock is assessed as one meta-complex, most scientists recognize two sub-components; the inshore Gulf of Maine (GOM) and offshore Georges Bank/Nantucket Shoals component. Both of these components are separated during spawning, but mix while on feeding (Area 1A and 1B) and over-wintering grounds (Area 2). Evidence of mixing either in Area 3 or during spawning season in any location other than 1B (August- November) is lacking and herring caught in Area 3 are assumed to come entirely from the offshore component of the resource. The herring management area boundaries are proposed to be modified in Amendment 1 to better reflect the distribution of the offshore component in Area 3. Mixing of both stock components occurs in other management areas, and uncertainty still remains regarding the mixing ratios. Ongoing tagging and morphometric studies will help to address this uncertainty in the future.

Uncertainty associated with the mixing of herring stock components is a critical scientific issue that has been addressed in the relative risk assessment of the TAC options by considering removals of the inshore component across the entire range of mixing scenarios instead of relying on a few specific mixing rate combinations. In 2004, the Herring PDT identified three primary uncertainties associated with mixing ratios:

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

Although a range of mixing ratios have been incorporated into the risk assessment, the best available scientific information suggests that the ratio provided in the Herring FMP (winter=0.2, summer=0.5)and described below represents a reasonable scenario for analysis at this time. Outcomes associated with these mixing rates have been "bounded" by lines representing a winter mixing rate of 0.1 and 0.3, and a summer rate=0.5 delineate the more likely/realistic mixing rates in the figures provided in this assessment.

Herring FMP Mixing 0.5 Summer/0.2 Winter – In the summer, 50% of the catch from Areas 1A is assumed to come from the inshore component. In the winter, 100% of the catch in Area 1A and 20% of the catch in Area 2 is assumed to come from the inshore component of the resource. Removals from 1B are assumed to be composed of 30% of the inshore component at all times of the year.

Sampling from ongoing morphometric studies suggests that the mixing ratio for the winter fishery in Area 2 may be closer to 0.1 or 0.15, so this risk assessment bounds the outcomes across a winter range of **0.1-0.3** (10%-30% of the winter catch in Area 2 is assumed to come from the inshore component of the resource, see figures below).

Factors that the Herring PDT considered when developing a risk assessment approach to determining specifications and options for area-specific TACs/OY include:

- the current seasonal mixing formula in the Herring FMP;
- other possible mixing formulas;
- the recent average 11-year removals for the stock complex (1995-2005);
- landings from the New Brunswick (NB) weir fishery;
- all other relevant biological and fishery information; and
- the 2003 SSC recommendation to evaluate the risk of overfishing individual stock components under different TAC options so that areas can be identified where expansion of the fishery is appropriate.

This analysis was conducted by averaging monthly landings by management area over the most recent eleven-year period (1995-2005) as a basis for comparison of TAC distributions relative to potential removals of the inshore component of the resource. The inshore component is the one of greatest concern and is the focus of this risk assessment; removals of the offshore component are not considered in this analysis.

In all TAC scenarios considered in the risk assessment, the following applies:

- "Historical" removals for the purposes of analysis are the actual removals of the inshore component of the resource from all management areas during 1995-2005. The Herring FMP and the area-specific TACs became effective during the 2000 fishing year.
- Area 1B mixing rates are assumed to be 0.3 (30% inshore and 70% offshore) throughout the year;
- All catch from Area 3 is assumed to come from the offshore component of the resource;
- Catch from the New Brunswick weir fishery is assumed to be 20,000 mt (see Section 4.2.8.1) and come 100% from the inshore stock component.
- Each option accounts for seasonal and yearly TACs for each management area as currently implemented and assumes that the TACs are fully utilized in all management areas.

The seasonal mixing rates applied in this assessment by management area are shown in Table 39. As previously noted, the most likely value for the summer mixing rate in Area 1A is 0.5. The range for most likely value of winter mixing rates in Area 2 is 0.1 to 0.3.

Table 39 Seasonal Distribution of Mixing Rates by Management Area

Season	Month	Area				
		1A	1B	2	3	NB Weir
Winter	January-March,	100%	30%	0-100%	0%	100%
	August-December	100%	30%	0-100%	0%	100%
Summer	April-July	0-100%	30%	0%	0%	100%

Mixing rates are applied to monthly landings within an area to disaggregate landings into inshore and offshore components in the risk analysis.

The risk assessment evaluates relative risk associated with the proposed action and other TAC alternatives by estimating removals from the inshore component across all possible mixing rate combinations, which can then be compared to "historical" removals (1995-2005) under the same mixing ratios. More risk is associated with TAC alternatives that project higher removals from the inshore component than the historical average.

The proposed action and other alternatives that were considered in this document are described in detail in Sections 2.0 and 3.0 respectively. The TACs associated with the proposed action and non-preferred alternatives are summarized in Table 40. The no action alternative, Alternative 1, and Alternative 3 result in the same amount of removals from the inshore area for each winter-summer mixing rate combinations in the risk assessment because these alternatives include the same TACs for all management areas where the inshore component is caught. The no action alternative and Alternative 1 only differ in their specification of ABC. Alternative 3 differs by allowing removals from Area 3 (offshore component only) to increase to 70,000 mt, resulting in a higher OY.

Table 40 Proposed Action and Other TACs Considered for 2007-2009 Herring Fishery Specifications

ALTERNATIVE	REMOVALS (MT)					
	1A	1B	2	3	New Brunswick	Total Removals
Council-Preferred Action (and NMFS-preferred Action for 2007)	50,000 (5,000 available Jan-May)	10,000	30,000	55,000	20,000	165,000
NMFS-Preferred (proposed) Action for 2008 and 2009	45,000 (5,000 available Jan-May)	10,000	30,000	60,000	20,000	165,000
No Action	60,000	10,000	30,000	50,000	20,000	170,000
Alternative 1	60,000	10,000	30,000	50,000	20,000	170,000
Alternative 2	45,000 (6,000 available Jan-May)	10,000	30,000	60,000	20,000	165,000
Alternative 3	60,000	10,000	30,000	70,000	20,000	190,000
Alternative 4	45,000	10,000	45,000	70,000	20,000	190,000

Note: For the purposes of this analysis, the shaded alternatives are equivalent in terms of removals of the inshore component of the resource.

In this analysis:

- Summer mixing rates were applied to Area 1A for the months of April – July.
- A mixing rate of 0.30 (30%) was applied to Area 1B for all months.
- Winter mixing rates were applied to Area 2 for January – March and August – December. The Area 2 mixing rate was assumed to be zero from April – July in all runs.
- Based on catch rates observed from 1995-2005, the 50,000 mt TAC for Area 1A in the proposed action is assumed to be taken by October, and the 45,000 mt TAC for Area 1A in Alternatives 2 and 4 is assumed to be taken by September. For Alternative 4, the 45,000 mt TAC in Area 2 was distributed across the fishing year based on the historic monthly proportion of total catch in the area.

This risk assessment compares the various alternatives using the assessment's terminal year point estimate for biomass and point estimates of mixing rates. The lack of probability distributions around either the biomass or mixing rates preclude comparing the probability of outcomes from the various alternatives. For instance, the PDT can compare the impact of the no action and the proposed alternatives on point estimates of exploitation rate given a combination of summer and winter mixing rate (the proposed action has exploitation rates that are always lower than the No Action for any value of summer and mixing rates). However, because the probability density distribution of terminal stock size was not available at the time of the risk assessment, we can not calculate the probability distribution of exploitation rates for a given point estimate of landings arising from a specific combination of summer and winter mixing rates. This prevents describing the probability of distribution of relative exploitation given uncertainty in stock size for each alternative. Similarly, the lack of probability distributions for summer and winter mixing rates means that a probability distribution of landings arising from uncertainty in mixing rates can not developed. Without these probability distributions, the overall distribution of exploitation rates can not be determined for the various alternatives. The results from this analysis can be thought of as average for each combination of winter and summer mixing rates and comparisons across Alternatives should be made within specific winter and summer mixing rates. More weight should be placed on winter mixing rates within 0.1 and 0.3, and summer mixing rates near 0.5, for these are more likely values than others outside this range.

5.2.2.1 Comparison with Historical (1995-2005) Removals From Inshore Component

Risk to the inshore component of the resource was assessed by calculating total removals from the inshore stock as the percent difference from average removals (1995-2005) under each winter-summer mixing rate combination. Results are shown in Figure 43. Note that the no action alternative, Alternative 1, and Alternative 3 are all equivalent with respect to removals from the inshore stock component.

Figure 43 illustrates potential removals from the inshore component as a percentage of historic removals (average 1995-2005) under various assumptions about proportion of inshore component fish in winter and summer fisheries. For the panels with the winter mix on the x (horizontal) axis, each dot within a column represents landings from the inshore stock under summer mixing rates ranging from 0.0 to 1.0 (100%) in increments of 0.1 (10%). Vertical lines in Figure 43 bound the range of reasonable values for the winter mix (0.1-0.3, see above discussion). For the panels in Figure 43 with the summer mix on the x (horizontal) axis, each line represents an isopleths (a line drawn to connect points having the same numerical value) of winter mixing rates ranging from 0 to 1.0 (100%), in increments of 0.1 (10%). The vertical line in these panels represents the outcomes under an assumed summer mix of 0.5 (50%, Herring FMP).

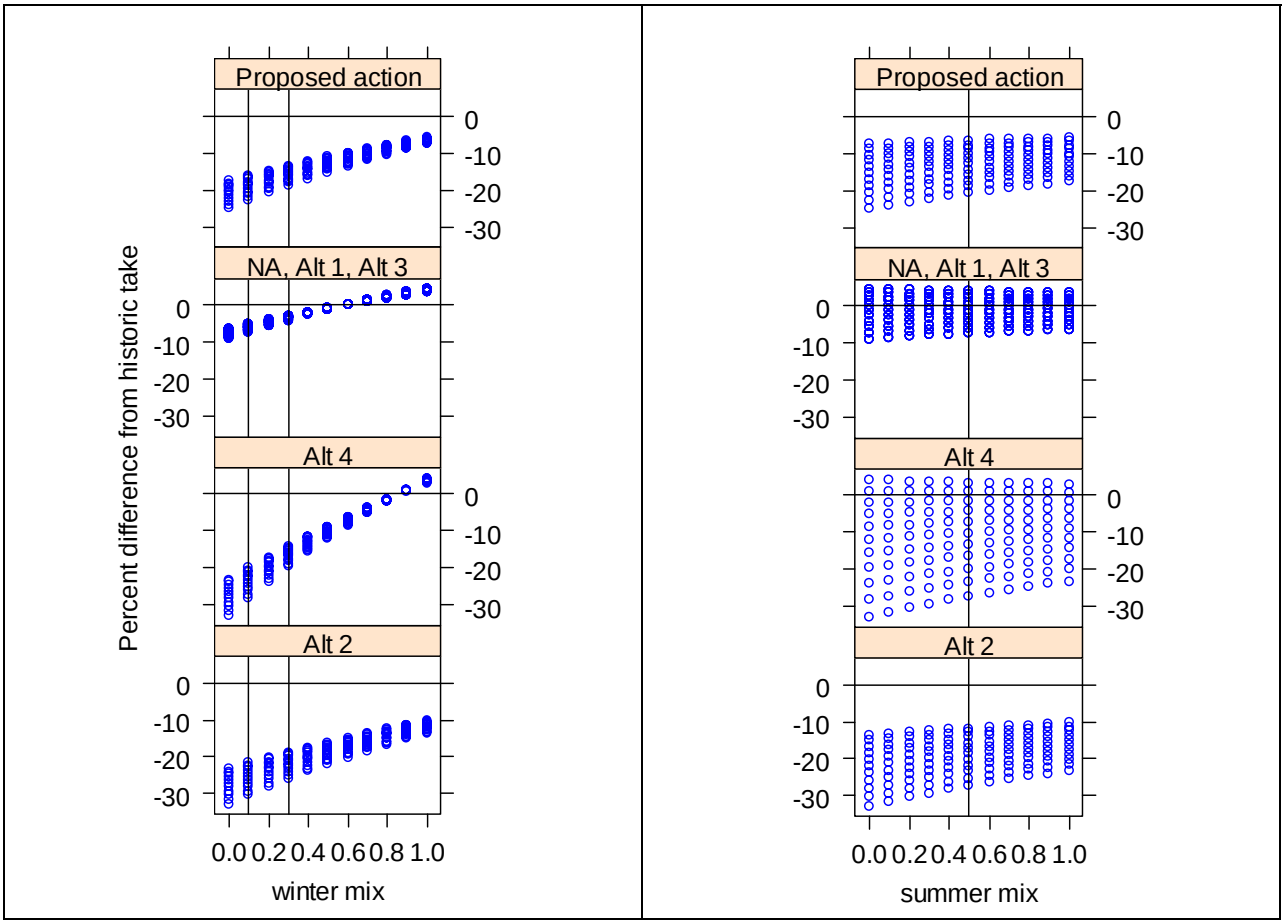
Figure 43 provides some perspective on the relative risk associated with various TAC options in terms of removals of the inshore component of the resource. This is a relative and comparative analysis, so absolute values are less important than the overall trend and the possible outcomes given the likely stock mixing scenario. Positive values of percent difference means that removals of the inshore stock are projected to be larger than historic (1995-2005) landings at a given mixing rate; negative values mean that removals of the inshore stock are projected to be less than historic landings at a given mixing rate. Larger (positive) values of percent differences from historical removals represent a greater risk to the inshore stock component than smaller values.

All the TAC alternatives considered are projected to result in removals of the inshore component that are less than historical (1995-2005) removals within the reasonable range of winter mixing (0.1-0.3, left panel in Figure 43). The Council-preferred alternative (proposed action) and Alternative 2 are the only two alternatives that produce removals that are less than historical removals under all possible winter and

summer mixing scenarios. The Council-preferred alternative is very similar to Alternative 2 and is expected to result in inshore removals that are 10-20% less than historical removals under the reasonable summer and winter mixing scenarios. Because the impacts of the NMFS-preferred alternative are more similar to Alternative 2 than to the Council-preferred alternative, the impacts of the NMFS-preferred alternative are expected to be very similar to, although not quite as large as the impacts projected for alternative 2. If all of the TACs are fully utilized, the Council-preferred alternative, the NMFS-preferred alternative, and alternative 2 are all more conservative than the no action alternative, and the risk of overfishing the inshore component is smaller.

Under the reasonable estimate of summer mixing (0.5, right panel in Figure 43), the no action alternative, Alternative 1, and Alternative 3 generate removals that are expected to be at or below historical removals in about 50% of the possible scenarios (depending on what the winter mix is assumed to be). Alternative 4 is more risk-averse for the inshore component, as it only projects that removals will be greater than historical removals if the winter mixing ratio is assumed to be 0.9 or 1.0, which is not likely. Alternative 2 represents the most risk-averse alternative considered in this analysis; the impacts of the Council-preferred alternative and the NMFS-preferred alternative appear to be most similar to those associated with Alternative 2, although the NMFS-preferred alternative would be more similar to alternative 2 than the Council-preferred alternative.

Figure 43 Relative Risk Assessment – Potential Removals of Inshore Stock as a Percentage of Historical (1995-2005) Removals Under All Possible Mixing Scenarios (in this table, the "Proposed Action" is the Council-preferred alternative. The NMFS-preferred alternative is most similar to Alt 2)



For panels with winter mix on x axis, each dot within a column represents landings from the inshore stock summer mixing rates ranging from 0.0 to 1.0 in increments of 0.1. Vertical lines bound the region of most likely values of the winter mix (0.1 and 0.3). For panels with summer mix on x axis, each line is an isopleth of winter mixing rates ranging from 0 to 1, in increments of 0.1. Vertical line is a summer mix of 0.5.

Larger values of percent difference represent more risk to inshore stock component than smaller values. Positive values of percent difference means that landings are larger than historic landings at a given mixing rate, negative values means that landings are less than historic landings at a given mixing rate.

Proposed Action is 50K Area 1A, 10K Area 1B, 30K Area 2, 55K Area 3. No action and Alternative 1 are 60K Area 1A, 10K Area 1B, 30K Area 2 and 50K Area 3. Alternative 2 is 45K Area 1A, 10K Area 1B, 30K Area 2, and 60K Area 3. Alternative 3 is 60K Area 1A, 10K Area 1B, 30K Area 2, and 70K Area 3. Alternative 4 is 45K Area 1A, 10K Area 1B, 45K Area 2, and 60K Area 3.

5.2.2.2 Comparison with Relative Exploitation Reference Point (Based on Stock Complex F_{MSY})

Figure 44 illustrates projected relative exploitation rates (catch/biomass) for the inshore component under various assumptions about the proportion of inshore component fish in winter and summer fisheries. For the risk assessment, inshore stock biomass is assumed to be **180,000 m**t, based on an overall stock biomass of 1 million mt, 18% of which comes from the inshore component (TRAC 2006). (Note: Changing the assumed stock size for the inshore component would not change the shape or slope of the graphs in Figure 44, only the scale.) This analysis uses the point estimate of the terminal year biomass from the VPA. The analysis does not include the PDT's projected decline in biomass nor the retrospective pattern.

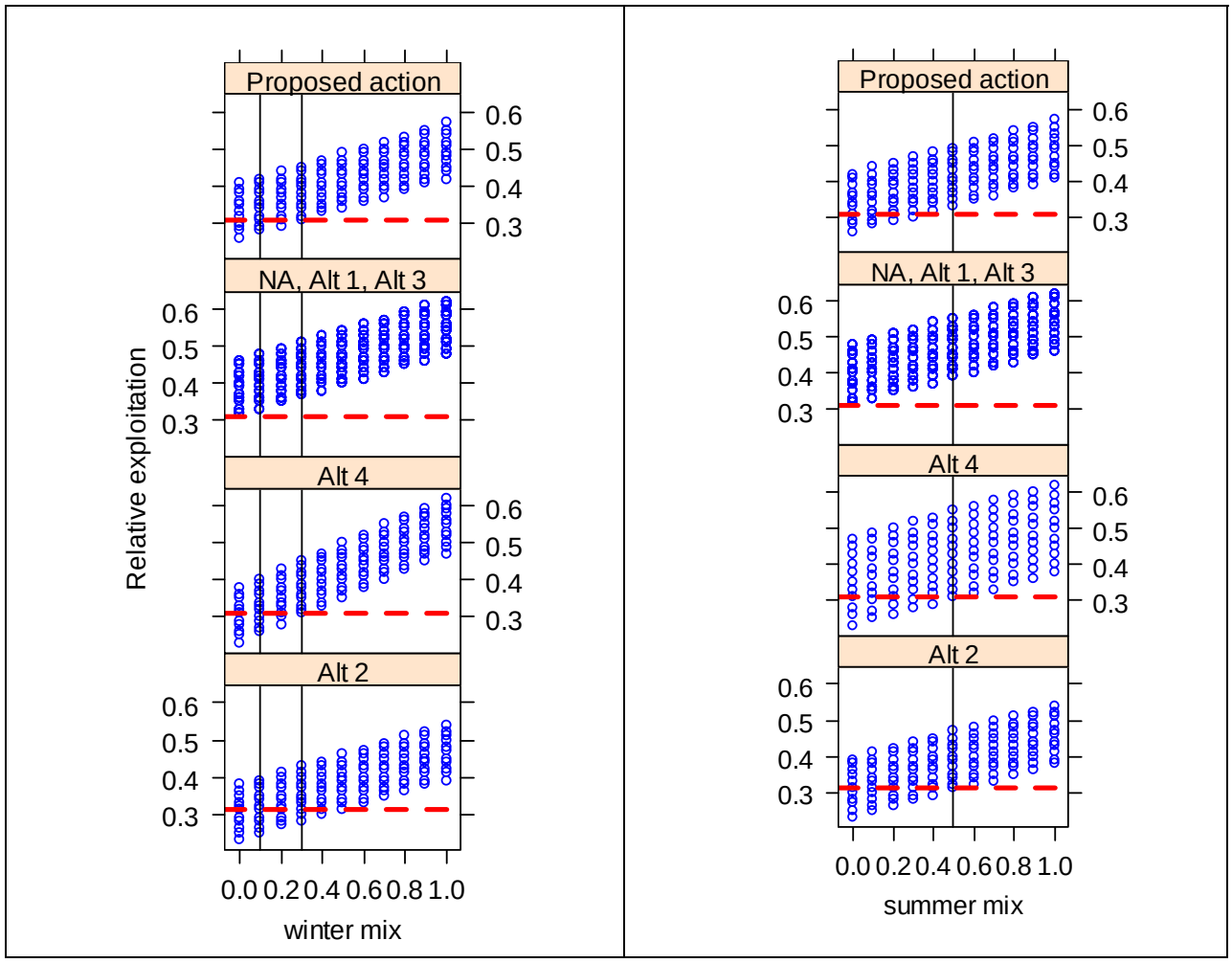
For the panels with the winter mix on the x (horizontal) axis, each point represents relative exploitation for a combination of summer mixing rates ranging from 0.0 to 1.0 (100%) in increments of 0.1 (10%). For the panels with the summer mix on the x (horizontal) axis, each point represents relative exploitation for a combination of winter mixing rates ranging from 0 to 1 (100%), in increments of 0.1 (10%). Vertical lines in Figure 44 bound the range of likely mixing scenarios (0.5 for summer and 0.1-0.3 for winter, as previously discussed).

The horizontal line in both the left and right panels of Figure 44 is a **reference exploitation rate for comparison purposes** based on a ratio of 2+ catch biomass per recruit to January 1 biomass per recruit at a 2+ biomass weighted F= 0.31. This is a reference exploitation rate that equates to the F_{MSY} value for the herring stock complex from the surplus production model (TRAC 2006) and therefore does not represent a formal benchmark for the inshore component at this time. This reference point is provided as a basis for comparison and evaluating the relative risk of overfishing the inshore component of the resource associated with the alternatives under consideration.

Without a separate stock assessment for the inshore stock component, the appropriate target and threshold fishing mortality rates remain unknown. The relative exploitation rates for the inshore stock that are illustrated in Figure 44 are based on an assumed stock size of 180,000 mt (2006 TRAC Assessment information – total biomass estimate of 1 million mt with 18% average estimated proportion of inshore component applied to it), while the actual biomass of the inshore component remains unknown and is likely to be more variable over time. However, for the purposes of this analysis, the F_{MSY} estimate for the stock complex, converted to a relative exploitation rate (catch/biomass) appears to be a reasonable basis for comparing the impacts of the various TAC alternatives on the inshore component of the stock complex. It also enables the Herring PDT and Council to utilize the best information available about the stock complex and the fraction that is composed of the inshore component (18%). Sensitivity runs for both the retrospective pattern in the stock assessment and the 18% stock size assumption are provided in subsequent sections of this analysis.

The information in Figure 44 suggests that the no action alternative, Alternative 1, and Alternative 3 are likely to result in exploitation rates for the inshore component that are higher than the F_{MSY} exploitation rate for the stock complex. The no action alternative, Alternative 1, and Alternative 3 result in exploitation rates for the inshore component that are higher than F_{MSY} for the stock complex under all possible winter and summer mixing combinations. The Council-preferred alternative as well as Alternatives 2 and 4 appear to be marginally successful in that they produce exploitation rates that are more consistent with F_{MSY} for the stock complex within the range of what is considered to be realistic mixing ratios. Alternative 2, which is most similar to the NMFS-preferred alternative, is marginally more successful than the Council-preferred alternative in that it would produce exploitation rates that are more consistent with F_{MSY} for the stock complex within the range of what is considered to be realistic mixing ratios.

Figure 44 Relative Risk Assessment – Relative Exploitation Rates Projected for Inshore Component Under Various TAC Alternatives and Mixing Ratios (in this table, the "Proposed Action" is the Council-preferred alternative. The NMFS-preferred alternative is most similar to Alt 2)



Inshore stock biomass is assumed to be 180,000 mt.

For panels with winter mix on x axis, each point represents the exploitation rate for a combination of summer mixing rates ranging from 0.0 to 1.0 in increments of 0.1 and the winter mixing rate on the x-axis. For panels with summer mix on the x-axis, each point represents the exploitation rate for a combination of winter mixing rates ranging from 0 to 1, in increments of 0.1 and a summer mixing rate on the x-axis.

The horizontal line is a reference exploitation rate based on ratio of 2+ catch biomass per recruit to Jan 1 biomass per recruit at a 2+ biomass weighted F= 0.31. This is equivalent to the F_{msy} from the surplus production model. Vertical lines for the winter mix bound region of most likely values for winter mix (0.1 to 0.3). The vertical line for the summer mix is set at 0.5.

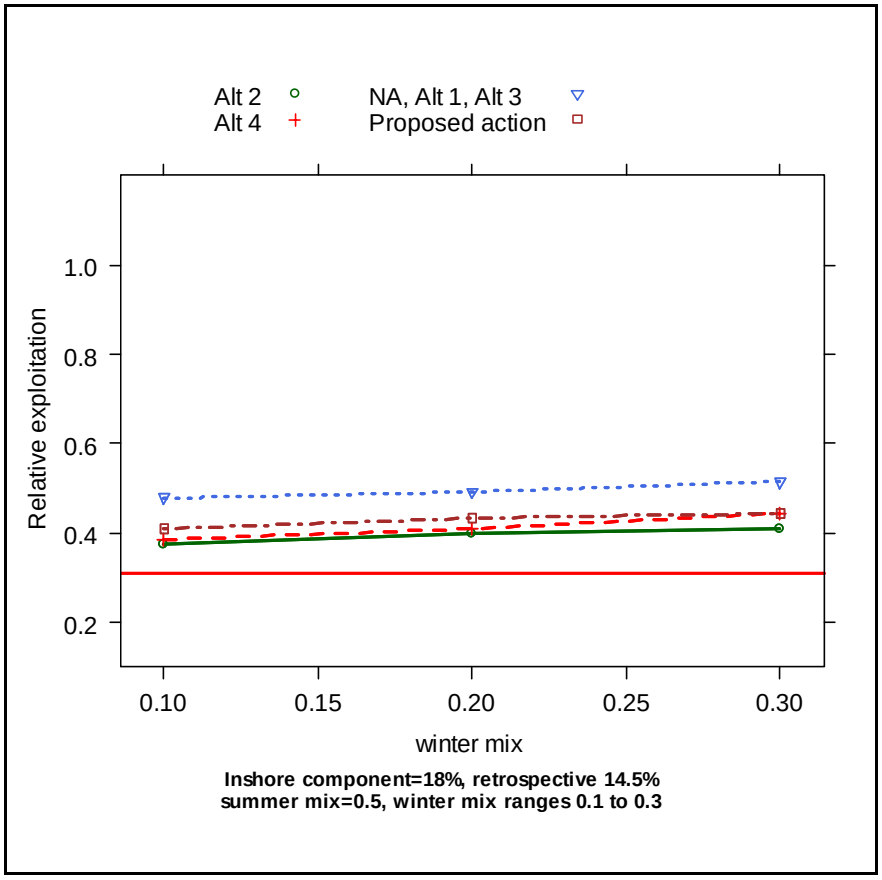
Council-proposed alternative is 50K Area 1A, 10K Area 1B, 30K Area 2, 55K Area 3. No action and Alternative 1 are 60K Area 1A, 10K Area 1B, 30K Area 2 and 50K Area 3. Alternative 2 is 45K Area 1A, 10K Area 1B, 30K Area 2, and 60K Area 3. Alternative 3 is 60K Area 1A, 10K Area 1B, 30K Area 2, and 70K Area 3. Alternative 4 is 45K Area 1A, 10K Area 1B, 45K Area 2, and 60K Area 3.

5.2.2.3 Effect of Retrospective Pattern on Risk Assessment

As discussed in Section 4.1.4.3 of this document, a significant retrospective pattern was detected in the 2006 TRAC Assessment in overestimating SSB (averaging + 14.5%/year, and ranging between 1-24%). This produces an over-estimate for stock biomass and an under-estimate for fishing mortality in the stock assessment model. The pattern has persisted for several years and is expected to continue in the future (see Figure 25). The Herring PDT investigated the effect that this retrospective pattern may have on the risk assessment, since the risk assessment is based on the terminal year estimate of biomass and F_{MSY} estimate from the TRAC Assessment.

Stock biomass was reduced by 14.5% and projections were re-run in the risk assessment to illustrate the influence of the retrospective pattern. This analysis adjusted the terminal year stock sizes for a 1 year retrospective pattern. The inshore component was set at 18% of the terminal stock size. Projected declines in stock size was not addressed in this analysis. The summer mix was assumed to be 0.5, which was analyzed across the most realistic range of winter mixes, 0.1-0.3. The results of this analysis are shown in Figure 45. Decreasing the stock size essentially re-scales the relative exploitation rates upwards. The outcome is that all alternatives will result in exploitation rates that are higher than the one associated with F_{MSY} for the stock complex. This supports a more risk-averse approach in the short term, until the problems in the stock assessment model can be further resolved. The no action alternative, Alternative 1, and Alternative 3 are clearly the least risk-averse approaches that were considered in this analysis. Results under the proposed action, Alternative 2, and Alternative 4 are very similar. The proposed action and Alternative 4 are slightly more risk prone than Alternative 2. Note that this risk assessment only evaluated the retrospective pattern for one year. The pernicious property of a continuing retrospective pattern is that the full effects are not known for several years. The impact of retrospective pattern observed in herring assessment (14.5% per year) is that the exploitation rate would be higher than that shown in Figure 45.

Figure 45 Comparison of Relative Exploitation Rates for the Council-preferred, No Action, and Alternatives 1-4 With Inshore Component Consisting of 18% of Total Stock Size and a Retrospective Bias of -14.5% (in this table, the "Proposed Action" is the Council-preferred alternative. The NMFS-preferred alternative is most similar to Alt 2)



Solid line is relative exploitation rate equivalent to F_{MSY} for stock complex.

Results are the same for Alternatives 1, 3, and no action alternative.

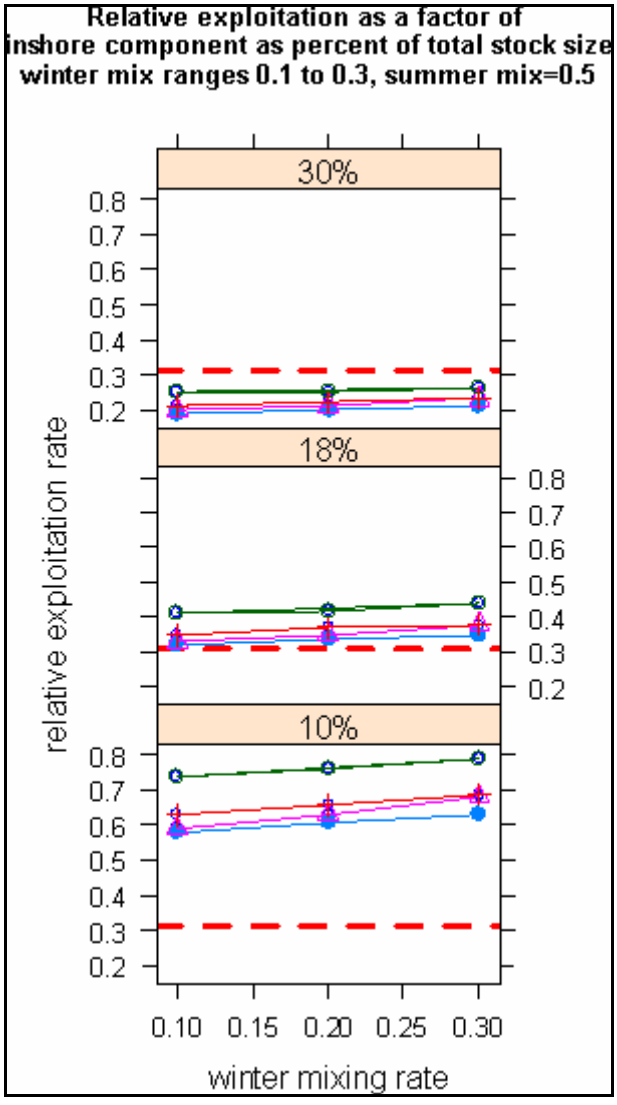
5.2.2.4 Effect of Inshore Stock Size on Risk Assessment

As discussed in Section 4.1.4.4 of this document, TRAC assessment scientists estimated that the inshore component of the resource represents 18% of the total stock biomass, an average based on three sources of information (range 10%-30%). Results from the commercial acoustics (10%), morphometric analysis (18%), and the NMFS Autumn bottom trawl survey (30%) were used in the TRAC analysis. The estimates from each analysis were averaged, producing an estimate of 18%. The TRAC decided that all three analyses should be equally weighted in the results. The Herring PDT investigated the effect of this estimate on the risk assessment with particular attention to the impact of the estimated inshore stock contribution on relative exploitation rates.

Inshore stock biomass was changed to 10% and 30% of total stock size, and projections were re-run in the risk assessment to illustrate the influence of the inshore stock size on relative exploitation rates. The summer mix was assumed to be 0.5, which was analyzed across the most realistic range of winter mixes, 0.1-0.3. The results of this analysis are shown in Figure 46. This analysis used the terminal year stock biomass and did not incorporate retrospective analysis nor projected stock declines.

Decreasing the inshore stock size essentially re-scales the relative exploitation rates upwards (catch stays the same, and biomass decreases). The outcome is that all alternatives will result in exploitation rates that are much higher than the one associated with F_{MSY} for the stock complex if the inshore stock size is only 10% of the total stock size. Increasing the inshore stock size produces the opposite effect – the relative exploitation rates scale downwards. If the inshore stock size is assumed to be 30% of the total, all of the alternatives produce exploitation rates that are lower than the one associated with F_{MSY} for the stock complex under all of the realistic mixing scenarios. This supports a more risk-averse approach until more certainty exists about the actual inshore stock size; the no action alternative, Alternative 1, and Alternative 3 are clearly the least risk-averse approaches that were considered in this analysis. Results under the Council-preferred alternative, Alternative 2, and Alternative 4 are very similar, with the NMFS-preferred alternative being most similar to Alternative 2.

Figure 46 Comparison of Relative Exploitation Rates for Proposed Action, No Action, and Alternatives 1- 4 With Inshore Component Consisting of 10% (Bottom Panel), 18% (Middle Panel), and 30% (Top Panel) of Total Stock Size



5.3 IMPACTS ON THE HERRING FISHERY (INCLUDING ECONOMIC AND SOCIAL IMPACTS)

Of the alternatives considered for the 2007-2009 herring fishery specifications, four (the NMFS-preferred (proposed action), the Council-preferred action, and Alternatives 2 and 4) are of particular concern in terms of their potential fishery impacts, as they involve a substantial (up to 25%) reduction in the TAC for Area 1A (from 60,000 mt to 50,000 mt under the proposed action and to 45,000 mt under the NMFS-preferred alternative, and Alternatives 2 and 4), which is the only management area where the TAC is consistently reached and the focus of the summer fishery for herring. The following discussion pays particular attention to this feature of the proposed action as well as the Council-preferred alternative, and Alternatives 2 and 4, as they are likely to result in the greatest negative social and economic impacts relative to the other alternatives that were considered. While this assessment focuses primarily on these negative impacts, longer-term positive impacts that result from minimizing the risk of overfishing the resource as well as improvements in stock health/size should be acknowledged. Supporting information and rationale for all of the specifications (DAH, DAP, JVP, TALFF, USAP) are provided in Section 5.1 of this document.

In considering the impacts presented in the following sections relative to the NMFS-preferred alternative (the proposed action), it is important to keep in mind that the NMFS-preferred alternative is most similar to alternative 2. Another way of looking at is that the NMFS-preferred alternative, in 2007, will have impacts identical to those projected for the Council-preferred alternative, and in 2008 and 2009, the NMFS-preferred alternative will have impacts virtually identical to those projected for alternative 2.

The figures provided in Section 4.2.4 of this document (p. 61, “Mapping the Herring Fishery”) should be referenced for additional perspective on the businesses and communities affected by the Atlantic herring fishery.

5.3.1 Economic Impacts

5.3.1.1 Economic Impacts of the Council-preferred alternative, the NMFS-preferred alternative (proposed action), and Alternatives 2 and 4

The Council-preferred alternative, and Alternatives 2and 4 propose to reduce the Area 1A TAC from 60,000 mt to 50,000 mt and 45,000 mt, respectively. The NMFS-preferred alternative would reduce the Area 1A TAC to 50,000 mt in 2007, and to 45,000 mt in 2008 and 2009. All four alternatives maintain the Area 1B TAC at 10,000 mt. The Council-preferred alternative and Alternative 2 maintain the 2005/2006 Area 2 TAC at 30,000 mt, and Alternative 4 would increase it to 45,000 mt. The Area 3 TAC is increased from 50,000 mt to 55,000 mt under the Council-preferred alternative, and to 60,000 mt under the NMFS-preferred alternative and alternative 2, and to 70,000 mt under alternative 4 (Table 41).

Table 41 Summary of TACs in the Council-preferred alternative, the NMFS-proposed alternative (Shaded), and Alternatives 2 and 4

	TACs (MT)				
ALTERNATIVE	**1A**	**1B**	**2**	**3**	**U.S. OY**
Status Quo (No Action, Alt 1)	60,000	10,000	30,000	50,000	150,000
Council-preferred alternative and NMFS-preferred alternative in 2007	50,000 (5,000 Jan-May 45,000 Jun-Dec)	10,000	30,000	55,000	145,000
NMFS-preferred alternative for 2008 and 2009	45,000 (5,000 Jan-May 45,000 Jun-Dec)	10,000	30,000	60,000	145,000
Alternative 2	45,000	10,000	30,000	60,000	145,000
Alternative 4	45,000	10,000	45,000	70,000	170,000

Alternatives 1 and 3 are not expected to produce substantial negative impacts and are addressed separately in a subsequent section of this analysis.

Under the Council-preferred alternative and the NMFS-preferred alternative, the Area 1A TAC would be split seasonally with January through May landings from 1A capped at 5,000 mt. The remaining 45,000 mt would be reserved for June through December until the trigger is reached (95% in 2007, 92% in years with RSAs) and the directed fishery in the area closes.

With recent and historical landings well below the current TACs for Areas 1B, 2 and 3, significant expansion in these areas is not anticipated in the short-term. However, if the Area 1A TAC is reached earlier in the fishing year due to a reduction in the TAC, larger vessels may look to other management areas to meet harvesting needs. Landings in 2005 were 60%, 50%, and 28% of the Area 1B, Area 2, and Area 3 TACs, respectively. Therefore, these areas could absorb the 10,000 mt to 15,000 mt reduction in Area 1A.

Among the four alternatives that lower the Area 1A TAC, all propose to increase the Area 3 TAC. The Council-preferred alternative increases the Area 3 TAC from 50,000 mt to 55,000 mt, and the NMFS-preferred alternative increases it to 60,000 mt in 2008 and 2009. Alternative 2 increases the Area 3 TAC to 60,000, and Alternative 4 to 70,000 mt. Since this area is currently under-utilized, increasing the overall TAC may only be marginally beneficial in terms of mitigating the impacts of the reduction in the Area 1A TAC; any benefit would be limited to vessels that are able to access the offshore areas in a safe manner. If the offshore fishery expands in the long-term, positive benefits may be realized by increasing the Area 3 TAC.

Given the relative importance of Area 1A, the focus of the following analyses will be on the reduction of the Area 1A TAC under the Council-preferred alternative, the NMFS-preferred alternative (proposed action), and Alternatives 2 and 4. Since it is expected that Amendment 1 will be implemented in conjunction with the 2007-2009 specifications, only the impacts to vessels identified in the Final Environmental Impact Statement for Amendment 1 as qualifying for Area 1 limited access permits (under Amendment 1's proposed action) will be considered. Of the 90 vessels that qualify for limited access permits to fish in Area 1, 31 qualify for limited access directed fishery permits. Of these qualifying vessels, only 20 had landings from Area 1A from 2003 through 2005. These **20 recently-active limited access directed fishery permit vessels** will be the focus of the following discussion of impacts.

Of the 20 recently-active limited access directed fishery permit vessels, six vessels have landings **only** from Area 1A (and not Area 3) during 2003 through 2005. Some of these vessels may have had landings from Area 1B as well, but this dis-aggregation is used to better understand dependency on the offshore area and ability to harvest resources from this area in the future. The remaining 14 recently-active qualifying vessels reported significant landings from both Area 1A and Area 3, indicating their ability to fish offshore. A comparison of the vessel characteristics of these two groups of vessels shows that inshore vessels are smaller than offshore vessels. Of the six exclusively inshore vessels, four are purse seine vessels and two are single midwater trawl vessels (see figures provided in Section 4.2.4 of this document). Of the 14 vessels that appear to be capable of fishing offshore, 12 are paired midwater trawl vessels and two are single midwater trawl vessels.

Given the variability between vessels, vessels that are larger and have a greater capacity to reach outer management areas may be impacted less (and/or somewhat differently) than smaller inshore vessels with less flexibility and a higher dependency on inshore management areas (1A and, to a lesser degree, 1B). It is important to note, however, that even larger vessels will be impacted by a lower TAC in Area 1A. With fuel costs at historical highs, fishing in offshore areas will not only involve increased steaming time but higher fuel costs. Additionally, fishing in more distant areas will likely involve longer trips, requiring captain and crew to be away from shore for longer periods of time.

5.3.1.1.1 Overall Impacts

While the mix of vessels harvesting the resource within each management area may change (producing some negative impacts at the vessel level), the overall level of herring landings is not expected to decline as a result of the proposed TAC distributions for 2007-2009. However, changes in the timing of landings and the quality of fish landed may still impact primary consumers of herring (processors, canneries, lobstermen).

Currently, agreements between harvesters and processors exist, and, to the extent that reducing the TAC in Area 1A affects the ability of a harvester to maintain a traditional supply schedule, processors may need to seek supplies of herring from other vessels they may not have purchased from extensively. This may mean that the price of herring rises in a given region or market segment for a short time to attract needed supplies.

Dealer data from 2001 through 2005 was used to determine if a relationship could be observed between the monthly average ex-vessel price of northeast herring (for all product forms: bait, canned, whole frozen) and monthly quantities. Due to limitations in the data, similar management area level analyses are not possible. The purpose for doing such an analysis for Area 1A would be to predict how a reduction in the TAC might affect prices. Since markets for herring and management areas are interrelated, it is not expected that an inshore level analysis would show a relationship between ex-vessel price monthly Area 1A landings since landings from other areas could fill any voids in Area 1A landing. This is not to say that a reduction in the Area 1A TAC would not result in some localized and periodic increases in price, particularly in periods of high demand for lobster bait.

Overall herring prices are not expected to change from the implementation of the proposed action or any of the other alternatives considered in this document. This is due to the fact that overall landings are expected to remain at a level that is under the total TAC for the herring resource. Also, the processing sector that caters to more global markets (primarily freezer plants) are serviced by larger vessels (single and paired midwater trawlers). To the extent that overall landings from these vessels stay the same (because they can fish in offshore areas, where TAC is likely to be available year-round), the overall average price for herring is not expected to change as a result of the reduction in the Area 1A TAC. For these reasons, major shortages of herring across the various market segments are not anticipated in the short-term, and normal price signals in the market are expected to serve the function of allocating herring supplies.

There are two primary ways in which reducing the Area 1A TAC may economically impact herring vessels. The first is **increased vessel operating costs** (primarily increased fuel costs), related to longer steam times if a vessel's optimal fishing location would be in Area 1 (1A) and the vessel must choose a second best location because Area 1A is closed, that requires a longer steam time. The second is the cost of **decreased net revenues** (revenues less the cost of items that vary directly with the quantity of fish caught such as pumping, refrigeration, and packaging costs) from choosing a second-best fishing location. These two impacts are related in that the choice of fishing location depends on the cost of reaching a location and the expected abundance and quality of fish at that location. These choice factors, and others including business relationships with buyers (choice of market), the vessel's homeport, and the status of the TAC in a management area, determine the selection of fishing locations.

If the best fishing location happens to be in Area 1A, then the vessel captain is faced with balancing the additional costs of choosing a more distant location with the expected catch from the alternative area. Given that the second-best choice involves increased operating costs, the total impacts would include the increased vessel operating costs and the decreased net revenue. Circumstances may dictate that the second best fishing location choice may be a location which is closer to port and results in a cost savings.

The net impact in this situation is the loss of net revenue as offset by the decreased steaming costs. Presumably, the loss of net revenue is greater than the cost savings in this case, or the fishing captain would have chosen the alternative location in the first place.

The discussion above assumes that a single fishing location is chosen. In many cases, a fishing trip may include several different fishing locations. Each location choice then depends on the success of the previous choice and the interplay of the decision points described for the single location would occur as the trip unfolds.

Observer data from 2003 and 2004 were used to calculate the average gallons of fuel used by herring vessels of various gear types and vessel sizes. These figures will be used to provide an indication of the increased cost of additional steaming time for vessels that must fish outside of a closed Area 1A due to the TAC being reached. The fuel usage reported in Table 42 comprises both steaming and trawling time for the single and pair midwater trawl vessels. Since fuel usage rates are higher when trawling, these average rates are an over-estimate of the fuel use rate when steaming. For purse seine vessels, the rate is an under-estimate since fuel usage is lower while the vessel is seining herring.

To estimate the per trip increase in fuel costs from additional steaming time, an hourly fuel cost rate is determined using a price of $2.50 per gallon. This is multiplied by the average difference in steaming times to Areas 2 and 3 versus Area 1. This figure is then doubled to account for the return trip. Fuel is not the only cost that would increase with greater steaming times. Repair and maintenance and lubrication costs would also increase.

The following example is provided to help understand the information provided in Table 42. For medium-sized midwater trawl vessels, the average gallons of fuel used per hour is multiplied by $2.50 to get a cost per hour of $100. If such a vessel from ME, MA, or RI was precluded from fishing in Area 1, it would take that vessel about 15 hours to steam to Area 2 or 3. At $100 per hour, it would cost the vessel an additional $1,500 to reach the area. Since another 15 hours is required to return to Area 1A, the figure is doubled. The last column in Table 42 reports this final calculation ($3,000 in this example), which is an estimate of the increased cost per trip, by gear type and vessel size, from being precluded from fishing in Area 1A. The increased operating costs will be borne at the individual vessel level for any vessels that have the ability to fish in offshore areas.

Table 42 Average Fuel Usage by Gear Type and Vessel Size

Gear Type/Vessel Size	Average Gallons of Fuel Used per Day-at-sea	Average Gallons of Fuel Used per Hour	Average Difference in Steam Time from Area 1A to Areas 2 and 3 for Vessels from ME, MA, and RI	Average Increased Fuel Cost Per Trip
Midwater Trawl Vessels (medium - 40 to 80 feet)	960	40	15 hours (Area 3 only)	$3,000
Midwater Trawl Vessels (large - greater than 80 feet)	2,100	88		$6,600
Pair Trawl Vessels (medium - 40 to 80 feet)	625	26		$1,950
Pair Trawl Vessels (large - greater than 80 feet)	1,460	61		$4,575
Purse Seine Vessels	500	21	30 hours (Area 2 only)	$3,150

5.3.1.1.2 Impacts on the Purse Seine Fleet

With a 10,000 to 15,000 metric ton decrease in the combined Area 1 TAC, the impact of the Council-preferred alternative, the NMFS-preferred alternative, and alternatives 2 and 4 on this fleet could be large. It is difficult to predict what the impact will be on the purse seine fleet because at the time the proposed reduction in the Area 1A TAC would be implemented, the purse seine/fixed gear (PS/FG) only area may be in effect. Without knowing what portion of an Area 1A TAC of 60,000 mt (no action) the purse seine fleet might land with the implementation of a PS/FG only area, it is difficult to know what a reduction of 10,000 to 15,000 mt might mean for that fleet.

The PS/FG only area would eliminate competing midwater trawl vessels from Area 1A during the most productive part of the Area 1A fishery (June – September). Given this, it is likely that the existing purse seine fleet would increase its landings from the area. On the other hand, establishing a PS/FG only area may intensify the race to fish in Area 1A as midwater trawl vessels try to catch more herring from the area prior to June 1. If herring are plentiful in Area 1A during the spring (1A catches increase in May, historically), the proportion left for purse seiners during June through September could be reduced. However, it is likely that purse seine vessels would also participate in the pre-June race in order to keep their landings on par with previous years. See Section 5.3.1.1.6.1 of this document for additional discussion about impacts associated with increasing the race to fish in any management area.

The change to the split season in Area 1A, As described in the Council-preferred alternative and the NMFS-preferred alternative (proposed action), may help minimize the pre-June race if the purse seine/fixed gear area is implemented; the Council may modify the seasonal split (amount, timing) as part of this specification process to further address concerns about derby fishing, if necessary. If a race to fish in Area 1A is minimized, the traditional purse seine fleet may actually increase its catch under a 45,000 mt or 50,000 mt TAC, when combined with a purse seine/fixed gear area. However, it is uncertain how many midwater trawl vessels would convert to purse seine gear in order to fish in Area 1A during the summer months. To the extent that affected midwater trawl vessels convert to purse seining, benefits from increasing catch may be reduced for the traditional purse seine fleet (four vessels), but negative impacts of the reduced TAC in Area 1A would likely be mitigated for trawl vessels that convert.

If the PS/FG only area is not approved/implemented as part of Amendment 1, a reduction in the Area 1A TAC would exacerbate existing levels of competition for the inshore quota and may result in an even earlier closure of the fishery. This could impact bait supply given that purse seine vessels are important suppliers of bait to Downeast Maine and that the lobster bait market is at its peak during the summer months. Purse seine vessels would be particularly disadvantaged if this were to occur, as they have fewer options available to them and are entirely dependent on herring.

In 2005, the purse seine fleet caught 27% of the Area 1A TAC. If the proportion of the herring catch by the purse seine fleet remains the same and the decrease in the Area 1A TAC cannot be made up from fishing in other areas, there would be a **2,700 mt loss in catch under the** Council-preferred alternative **and a 4,050 mt loss in catch under the NMFS-preferred alternative, and alternatives 2 and 4. Using the 2005 average price of herring of $202 per metric ton, this catch is worth $545,400 and $818,000, respectively, across the sector** (there are four vessels in the limited access purse seine fleet).

Purse seine vessels would have to either increase their proportion of the herring catch in Area 1A relative to midwater trawlers (which may be achieved by implementing the PS/FG only area) or move to other areas. Moving to offshore areas may be problematic due to the size of the vessels (see Table 43) and the schooling behavior of the fish in offshore areas. There were no landings from Area 3 by the purse seine fleet in 2005.

It also may be impractical to move to Area 2 since the markets these vessels primarily serve are during the summer and fall in Maine and herring are not in Area 2 at that time. There was no catch from Area 2 by the purse seine fleet in 2005. If the purse seine vessels move to Areas 2 and 3, the cost to harvest the fish will increase due to increased steaming costs (see discussion of increased costs due to longer steam times). The safety of smaller purse seine vessels in offshore areas is an important concern as well. It is possible that the price of herring might increase under these conditions, thereby offsetting the increased operating costs.

Since the 10,000 mt to 15,000 mt reduction in TAC is proposed in Area 1A, the purse seine fleet may have to rely more on Area 1B. The Area 1B TAC has historically not been reached every year (60% was utilized in 2005). Since Area 1B is farther from shore than Area 1A, the cost of harvesting herring will increase (see the discussion of increased costs due to longer steam times). Area 1B will only be able to provide limited relief for vessels impacted by the reduction in the Area 1A TAC since it is limited to 10,000 mt and recent landings have been as high as 6,000 mt. Since a shortfall of 10,000 mt to 15,000 mt in Area 1A could not be made up in Area 1B, the Area 1B season would likely be shortened (see general discussion of shorter fishing seasons below).

Table 43 Herring Vessel Characteristics by Principal Gear

	Purse Seine	Single Midwater Trawl	Pair Trawl
Number of Vessels	4	4	12
Average Length (ft) (min, max)	63 (46, 79)	78 (63, 101)	110 (78, 149)
Average Gross Ton (min, max)	100 (5, 170)	214 (105, 476)	200 (152, 394)
Average Horse Power (min, max)	468 (333, 580)	1,133 (370, 2,985)	1,323 (765, 2,000)

5.3.1.1.3 Impacts on Single Midwater Trawl Vessels

With proposed decreases in the Area 1 TAC of 10,000 mt and 15,000 mt under the Council-preferred alternative, the NMFS-preferred alternative, and alternatives 2/4, the impact on the midwater trawl fleet could also be large. It is difficult to predict what the impact will be on the single midwater trawl fleet because at the time the new Area 1A TAC would be implemented, the PS/FG only area that may be established under Amendment 1 would also be in effect. Without knowing what portion of an Area 1A TAC of 60,000 mt the single midwater fleet might land with the implementation of a PS/FG only area, it is difficult to know what a reduction of 10,000 mt to 15,000 mt might mean to this fleet.

The PS/FG only area would eliminate single midwater trawl vessels from Area 1A during the most productive part of the Area 1A fishery (June through September), so if this measure is implemented, some of the existing single midwater trawl fleet may already be experiencing a reduction in landings from the area. Also, the establishment of a PS/FG only area may intensify the race to fish in Area 1A as all midwater trawl vessels (single and paired) try to catch fish from the area prior to the closure on June 1.

If herring are plentiful in Area 1A during the spring (1A catches increase in May, historically), the single midwater trawlers may be able to maintain their historical proportion of a 60,000 mt TAC. However, it is likely that purse seine vessels and midwater pair trawl vessels would also participate in the pre-June race in order to keep their landings on par with previous years. It is also uncertain how many single midwater trawl vessels might convert to purse seine gear in order to fish in Area 1A in the summer, although it is likely that some portion of those trawlers will choose to do so. If a PS/FG only area is not established, competition in this fishery may continue to intensify and will not be stopped/constrained by the PS/FG only area. Instead of seeing an initial rush to capture the quota before June 1, competition could continue unabated until the Area 1A TAC is reached.

In 2005, the single midwater trawl fleet caught 18% of the Area 1A TAC. If the proportion of the herring catch by the single midwater trawl fleet remains the same and the decrease in the Area 1A TAC cannot be made up from fishing in other areas, there would be a **1,800 mt loss in catch under the** Council-preferred alternative **and a 2,700 mt loss in catch under the NMFS-preferred alternative, and alternatives 2 and 4. Using the 2005 average price of herring of $202 per metric ton, this catch is worth $363,600 and $545,400, respectively, across the sector** (there are four vessels that were active in Area 1A from 2003-2005 in the single midwater trawl fleet).

Single midwater trawl vessels would have to either increase their proportion of the herring catch in Area 1A relative to purse seine vessels (which will be unlikely if the PS/FG only area is implemented) or move to other areas. Moving to offshore areas may be problematic for two of the four single midwater trawl vessels since these two are relatively smaller vessels and have only landed herring from Area 1A during 2003 through 2005, indicating an inability to fish offshore. The other two vessels are somewhat larger and have Area 3 catch history so their loss of Area 1A catch may be mitigated by their ability to fish in Area 3. If the single midwater trawl vessels make up their catch in Areas 2 and 3, the cost to harvest the fish will increase (depending on their home port with respect to Area 2) due to increased steaming costs (see following discussion of increased costs due to longer steam times). It is possible that the price of herring might increase under these conditions, thereby offsetting the increased operating costs. The safety of the two smaller single midwater trawl vessels in offshore areas is an important concern as well.

Since the 10,000 mt to 15,000 mt reduction in TAC is proposed in Area 1A, the single midwater trawl fleet may have to rely more on Area 1B. The Area 1B TAC has historically not been reached every year (60% was utilized in 2005). Since Area 1B is farther from shore than Area 1A, the cost of harvesting herring will increase (see the discussion of increased costs due to longer steam times). Area 1B will only be able to provide limited relief for vessels impacted by the reduction in the Area 1A TAC since it is

limited to 10,000 mt and recent landings have been as high as 6,000 mt. Since a shortfall of 10,000 mt to 15,000 mt in Area 1A could not be made up entirely in Area 1B, the Area 1B season may be shortened (see following discussion of shorter fishing seasons).

5.3.1.1.4 Impacts on Pair Trawl Vessels

With proposed decreases in the Area 1 TAC of 10,000 mt to 15,000 mt under the Council-preferred alternative, the NMFS-preferred alternative, and alternatives 2/4, the impact on the midwater trawl fleet could also be large. It is difficult to predict what the impact will be on the midwater pair trawl fleet because at the time the new Area 1A TAC would be implemented the PS/FG only area may be established under Amendment 1 and would also be in effect. Without knowing what portion of an Area 1A TAC of 60,000 mt the pair trawl fleet might land with the implementation of a PS/FG only area, it is difficult to know what a reduction of 10,000 mt to 15,000 mt might mean under the same conditions.

The PS/FG only area would eliminate pair trawl vessels from Area 1A during the most productive part of the Area 1A fishery (June through September), so it is possible that the existing pair trawl fleet will already be experiencing a reduction in landings from the area. Also, the establishment of a PS/FG only area is likely to intensify the race to fish in Area 1A as all midwater trawl vessels (single and paired) try to catch fish from the area prior to the closure on June 1. If fish are plentiful in Area 1A in the spring (1A catches significantly increase in May, historically), the pair trawlers may be able to maintain their historical proportion of a 60,000 mt TAC. However, it is likely that purse seine and single midwater trawl vessels would also participate in the pre-June race in order to keep their landings on par with previous years. It is also uncertain how many pair trawl vessels might convert to purse seine gear in order to fish in Area 1A in the summer, although it is likely that some portion of those trawlers will choose to do so. If the PS/FG only area is not implemented, the race to fish could be even more intense as it could continue until the Area 1A TAC is reached.

In 2005, the pair trawl fleet caught 55% of the Area 1A TAC. If the proportion of the herring catch by the pair trawl fleet remains the same and the decrease in the Area 1A TAC cannot be made up from fishing in other areas, there would be a **5,500 mt loss in catch under the** Council-preferred alternative **and a 8,250 mt loss in catch under the NMFS-preferred alternative, and alternatives 2 and 4. Using the 2005 average price of herring of $202 per metric ton, this catch is worth $1,111,000 and $1,666,500 respectively, across the sector** (there are 12 vessels in the pair trawl fleet that were active from 2003-2005).

Pair trawl vessels would have to either increase their proportion of the herring catch in Area 1A relative to purse seine vessels (which will be unlikely if the purse seine/fixed gear-only area is implemented) or move to other areas. All pair trawl vessels have Area 3 catch history, so their loss of Area 1A catch may be mitigated by their ability to fish in Area 3. If the pair trawl vessels make up their catch in Areas 2 and 3, the cost to harvest the fish will increase (depending on their home port with respect to Area 2) due to increased steaming costs (see following discussion of increased costs due to longer steam times).

Since the 10,000 mt to 15,000 mt reduction in TAC is proposed in Area 1A, the pair trawl fleet may also have to rely more on Area 1B. The Area 1B TAC has historically not been reached every year (60% was utilized in 2005). Since Area 1B is farther from shore than Area 1A, the cost of harvesting herring will increase (see following discussion of increased costs due to longer steam times). It is possible that the price of herring might increase under these conditions, thereby offsetting the increased operating costs. Area 1B will only be able to provide limited relief for vessels impacted by the reduction in the Area 1A TAC since it is limited to 10,000 mt and recent landings have been as high as 6,000 mt. Since a shortfall

of 10,000 mt to 15,000 mt in Area 1A could not be made up in Area 1B, the Area 1B season could be shortened (see following discussion of shorter fishing seasons).

5.3.1.1.5 Impacts on Processors

The following discussion describes the potential indirect impacts of the Council-preferred alternative, the NMFS-preferred alternative (proposed action), and alternatives 2 and 4 on herring processors. The term "indirect" is used because processors are not directly regulated by the FMP and because processors represent secondary stakeholders as they are first line consumers of harvested herring. Impacts to processors result from regulations that are directly applied to businesses in the harvesting sector.

The remaining sardine cannery in Prospect Harbor requires the herring they purchase to be as fresh as possible. This makes this plant reliant primarily on fish from Area 1A since vessels fishing in that area can deliver fish to the plant soon after they are caught. Also, given that herring is canned immediately after it is landed, it is important that the cannery receive a steady flow of fish – at a pace that can be handled by the plant. The alternatives which propose to reduce the Area 1A TAC in the 2007-2009 fishing years may impact the sardine cannery in a number of ways. The first impact may be a decrease in the quality of the fish that is delivered to the plant. As the Area 1A TAC is used and vessels must fish farther from shore, the time between harvest and delivery may increase, and product quality may suffer.

The second impact relates to the potential for inconsistent supply of fish to the cannery, particularly if the 1A TAC is reached earlier during the fishing year; it may be difficult for the cannery to adjust to irregular deliveries of product. The cannery may experience difficulty planning production if there is a pattern of gluts and shortages in product. Product flow fluctuations impact market timing and scheduling the appropriate number of plant workers. Canneries have some ability to smooth these fluctuations on the retail side by carrying inventory. However, there are costs associated with carrying higher levels of inventory.

The third impact is potential price distortions from fluctuating supplies. With periods of shortages and an overall increase in harvest costs, there may be pressure to increase the price paid to harvesters.

The impacts on freezer plants are similar to those on the sardine cannery, but they are likely to be less severe because freezer plants are not as dependent on herring from Area 1A. Particularly, the issue of freshness is not as significant if the freezer plants can receive a consistent supply of product from vessels fishing offshore with RSW tanks. Also, the supply fluctuations should be less for freezer plants since the vessels which supply them are able to move to offshore areas where there is ample TAC. Some freezer plants have dedicated vessels that are large in size and designed to fish offshore in order to provide the plants with fish on a year-round basis.

5.3.1.1.6 Other Impacts

The following subsections generally discuss other short-term impacts on fishing-related businesses that could be expected from the Council-preferred alternative, the NMFS-preferred alternative (proposed action), and alternatives 2 and 4. It should be noted that in general, the impacts on fishery participants resulting from the Council-preferred alternative are expected to be less severe in nature relative to impacts expected from the NMFS-preferred alternative, and alternatives 2 and 4 because the Council-preferred alternative reduces the Area 1A TAC by a lesser amount (10,000 mt reduction versus 15,000 mt reduction).

5.3.1.1.6.1 Impacts from Intensifying the Race to Fish (Derby Fishing)

At its current level of 60,000 mt, the TAC in Area 1A is fully utilized and has been since the implementation of the Herring FMP. This is the management area in which the majority of the herring fishery currently occurs. Any reduction in the Area 1A TAC could intensify the "race to fish" in this area (also referred to as derby fishing). The extent of the derby in Area 1A will depend on market conditions, competition to catch herring for food (sardines, frozen export) or for bait (primarily lobster), and the impacts of the limited access program implemented in Amendment 1 to the Herring FMP.

Recently, the Area 1A TAC has been reached and the area closes around November of each fishing year. While recent patterns in the fishery may not suggest that the fishery in Area 1A is a derby (the split season implemented in Framework 1 also helped to address this issue), the TAC is still fully utilized before the end of the fishing year, and the fleet of vessels that qualified for limited access fishing Area 1 under Amendment 1 is capable of catching more than the Area 1A TAC.

Whether or not the race for fish shortens the season or increases the number of days out per week while the season is open, the overall result is fewer fishing days per year. Reductions in the choice of fishing days can lead to disruptions in the market and safety concerns. In a market-driven fishery such as herring, vessel owners ideally plan their fishing days around the quantities the market requires, the price, and the location and condition of the fish. Removing potential fishing days in the week disrupts the flow of product to the processing plants and the bait dealers. This can lead to overages and shortages that may affect the price. These effects are amplified if an area is closed because the TAC is reached. Not only does it affect the price to vessels, it may also influence the price to processors if they inefficiently supply the market and if product quality declines.

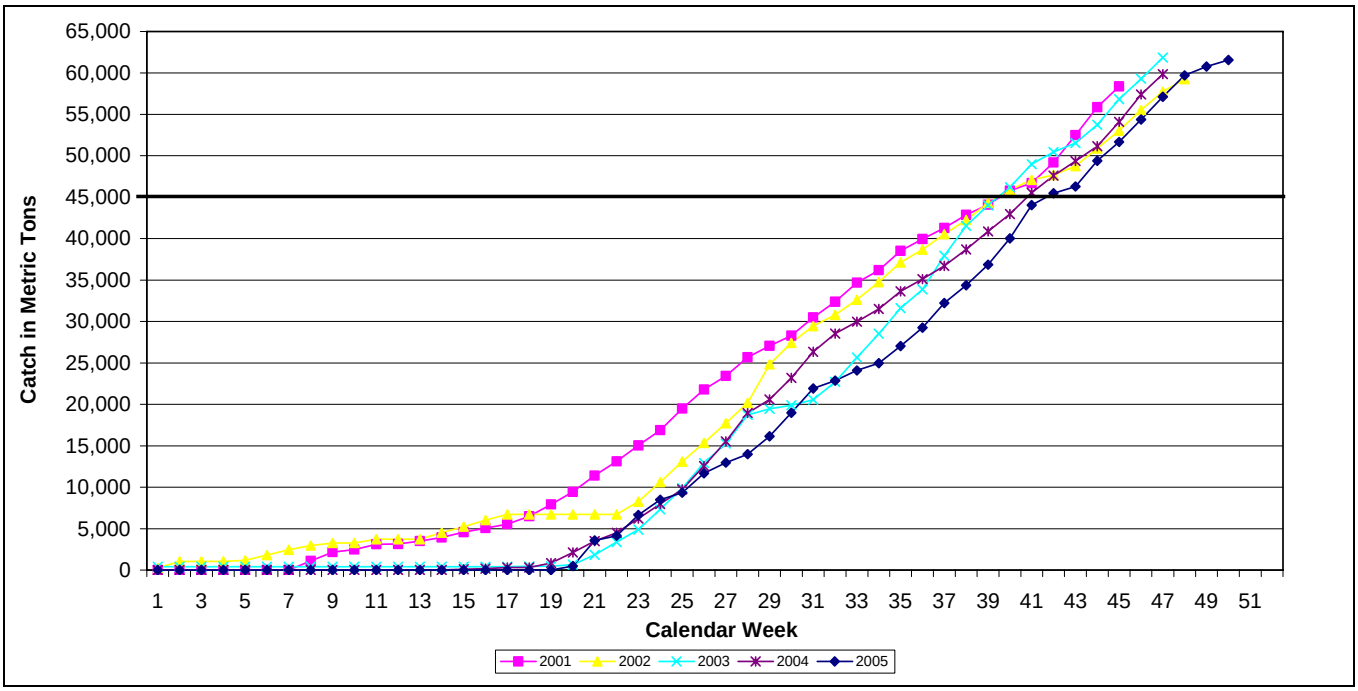
Reductions in the choice of fishing days may also lead to safety risks. If a vessel owner has limited flexibility in choosing fishing days, he may choose to fish in poor weather or take his vessel farther from shore than he would normally. The safety of fishermen and fishing operations at sea is an extremely important social impact factor, as decreased safety often increases stress at the individual and family level, which can exacerbate many other family and societal problems. In addition, the impacts of fishing-related casualties can be felt throughout fishing communities, many of which are close-knit groups with longstanding family and social networks.

Based on recent patterns of all vessels in the pre-Amendment 1 fishery (Figure 47), it appears that an Area 1A TAC of 50,000 mt could be reached around weeks 41-44 (mid- to late-October) and a TAC of 45,000 mt could be reached around weeks 38-40 (late September). Upon examining the landings patterns of only the 20 vessels that qualify for a limited access directed fishery permit for Area 1A and were recently active in Area 1A, it appears that their season would have lasted until about the first week of November. However, this does not consider the other 11 vessels with an Area 1 limited access directed fishery permits under Amendment 1, the 59 vessels with limited access incidental catch permits, or the possibility for research set-asides up to 3% of the TAC as proposed in Amendment 1. The combination of all these factors could result in the Area 1A TAC being reached in the fall, or sooner, which could affect the supply of herring for lobster bait, as the peak season for bait demand in the Gulf of Maine usually extends through September and October. Also unclear are the impacts of the recently-implemented ASMFC spawning restrictions, which include a "zero tolerance" provision and essentially render the spawning areas "closed" to fishing during spawning times; the spawning restrictions could slow effort in Area 1A during the late summer/early fall and may extend the season longer than it otherwise would have been.

Bait dealers may be able to develop strategies to offset shortages later in the season by freezing/storing bait earlier in the season and/or purchasing bait from vessels fishing in offshore areas. However, storing bait earlier in the season, combined with the shorter fishing season in Area 1A that could be expected under a 45,000 mt or 50,000 mt TAC, may produce negative impacts associated with derby fishing, in addition to the overall negative impacts associated with bait shortages and any loss of revenues.

Some of the impacts associated with shorter seasons and derby fishing may be minimized through either the split season in Area 1A under the proposed action or the ASMFC days out measure, or both, to the extent that they extend the fishing season beyond what can be expected based on current fishing patterns. The ASMFC will consider measures for days out of the Area 1A fishery during the 2007-2009 fishing years once the TACs for the management areas are established. Additional days out of the fishery may be required to extend the season if the TAC in Area 1A is reduced by a substantial amount and the fishery is projected to close earlier. It is also important to note that it remains unclear whether or not the purse seine/fixed gear area, proposed in NEFMC Amendment 1 (pending approval), will affect fishing patterns in Area 1A such that the derby effects associated with a lower TAC would be reduced. If the purse seine/fixed gear-only area is implemented by NMFS (all of Area 1A June – September), the impacts of this measure on fishing patterns could be considered by the States when they meet to determine the number of days out that will be required in Area 1A for the remainder of the fishing year.

Figure 47 Cumulative Area 1A Catch by Week, 2001-2005



Council-preferred and NMFS-preferred alternative –Area 1A Seasonal Split of TAC

The Council-preferred alternative and the NMFS-preferred alternative specifies that Area 1A landings from January – May be capped at 5,000 mt, while the remainder of the TAC would be available from June through December. This measure was inititally implemented in Framework 1 to the Herring FMP and is being modified through this specification process, as allowed by Amendment 1. The purpose for splitting the Area 1A TAC into seasons is to help spread the TAC over the entire fishing year and reduce the incentive for vessels to race for fish. Since the implementation of Framework 1, January through May landings have been capped at 10% of the Area 1A TAC. Therefore, splitting the TAC by the same proportion (10% of 50,000 mt) under the proposed action does not represent a change in regulation from status quo conditions. Nevertheless, landings data from 2003 – 2005 for the 20 recently-active vessels which qualify for an Area 1 limited access directed fishery permit under Amendment 1 are explored to see when they have collectively reached 5,000 mt of landings from Area 1A.

For all three of the major herring gear types, particularly purse seiners, Area 1A fishing does not begin in earnest until May of each year. In 2003, the 20 active limited access vessels did not land 5,000 mt until June 9. In 2004, 5,000 mt was reached by May 28, and in 2005, 5,000 mt was reached by May 30. Given that these 20 vessels alone are capable of reaching 5,000 mt before the end of May, if the other 11 vessels (qualify for limited access permit but have been recently inactive in Area 1A) become active, and if the other 59 limited access incidental catch permit vessel are considered, it is likely that the 5,000 mt cap could be reached well before May 31. However, it is difficult to predict when the 5,000 mt cap may be reached, as fishing patterns in Area 1A during 2007-2009 will be influenced largely by the Amendment 1 limited access program, anticipation of the purse seine/fixed gear area closure on June 1 (if approved), and ASMFC days out of the fishery, among others.

The ASMFC days out provisions and the gentlemen's agreement to take additional days out will help to extend the season but they still represent a decline in the total fishing days. Without individual quotas or enforceable agreements among groups of herring vessel owners that are allocated a portion of the TAC (sectors), the problem of racing for a TAC is very difficult to avoid. Further subdividing the TAC seasonally only creates smaller derbies. While this and increasing the number of days out may help avoid prolonged supply shortages during critical times, even small derbies lead to spikes ands dips in supply that are not a result of market signals.

5.3.1.1.6.2 Impacts from Increased Steam Time

There are two primary ways an alternative which causes vessels to fish in locations farther than their principal port may impact vessels. The first is increased vessel operating costs, primarily increased fuel costs, related to longer steaming times if a vessel's optimal fishing location is in an area in which the TAC has been reached and the vessel must choose the second-best location in an open area. The second is the cost of decreased net revenues (revenues minus the cost of items that vary directly with the quantity of fish caught such as pumping, refrigeration, and packaging costs) from choosing the second-best fishing location. These two impacts are related in that the choice of fishing location depends on the cost of reaching a location and the expected abundance and quality of fish at that location. These choice factors, and others including business relationships with buyers (choice of market); the vessel's homeport; and the status of the TAC in a management area, influence the selection of fishing locations.

If an area is closed because the TAC is reached and the best fishing location happens to be in that area, then the captain is faced with balancing the additional costs of choosing a more distant location with the expected catch from the alternative area. Given that the second-best choice involves increased operating costs, the total impacts would include the increased vessel operating costs and the decreased net revenues, if any.

5.3.1.2 Economic Impacts of No Action, Alternative 1, and Alternative 3

Since the TACs in all management areas are not ***reduced*** from 2005/2006 levels under the no action alternative and Alternatives 1 and 3, there are no negative economic impacts expected if any of these are implemented for the 2007 – 2009 fishing years. The proposed TACs in these alternatives are not expected to negatively impact any of the various herring fleet sectors or any of the processing plants participating in the herring fishery. Long-term positive benefits may be realized by increasing the Area 3 TAC from 50,000 mt to 70,000 mt, as proposed in Alternative 3, if the herring fishery expands significantly in this area. However, with historic landings at 9,000 mt to 21,000 mt from Area 3, such an expansion is not expected in the short-term.

5.3.1.3 Economic Impacts of Zero JVPt and TALFF Recommendations (Common to All Alternatives)

For the 2007 – 2009 fishing years, the Council and NMFS proposes to maintain the JVPt and TALFF allocations for the herring fishery at 0 mt. While this does not represent a change from the current (2005/2006) specifications and therefore does not result in new or additional impacts, the following discussion describes the impacts of remaining at this level. Further discussion of the Council's and NMFS's rationale for these recommendations is provided in Section 5.1 of this document.

The range of proposed OY values for the U.S. herring fishery start at 145,000 mt under the proposed action and Alternative 2 and are as high as 170,000 mt under Alternatives 3 and 4. With catches averaging a little more than 100,000 mt since 1999 and never exceeding 122,000 mt in any recent year, there could be economic consequences of maintaining JVPt at zero from 2007-2009.

If the markets served by domestic processors do not expand to the extent anticipated (a 60% increase from 2005 catch levels could occur before the total TAC for the fishery would be reached), then economic opportunities for domestic harvesters may be lost by setting JVPt at zero. JVP/IWP operations provide additional outlets for U.S. catcher vessels to sell their herring catch. These additional opportunities generate profits for vessel owners and income for captains and crew. Profits made on the sale of inputs used in the harvest sector provide benefits to marine-related businesses. On the other hand, to the extent that JVP/IWP competes with domestic processing, there could be negative impacts to U.S. processors. This would occur if these activities increase substantially and domestic processors are not able to sell as much product as they could in the absence of a JVPt allocation. It also should be noted that in previous years when JVP was specified at a level above 0 mt, very little was utilized. There has been no JVP activity since 2002.

Choosing a positive level of TALFF would not benefit herring vessels the same way as having a positive level of JVPt since foreign, rather than domestic, vessels would supply at-sea storage/processing ships. What is lost by keeping TALFF at zero is the collection of poundage fees on the order of $257,500 per 10,000 metric tons. Any administrative or observer costs are charged to vessels fishing under TALFF. The degree to which US processors are negatively impacted by the presence of TALFF depends on the degree to which the markets these foreign companies are servicing are the same as those serviced by US companies.

5.3.2 Social and Community Impacts

5.3.2.1 Social and Community Impacts of No Action, Alternative 1, and Alternative 3

Since the TACs in all management areas are not *reduced* under the no action alternative and Alternatives 1 and 3, there are no additional social and community impacts expected if these alternatives are implemented for the 2007-2009 fishing years.

There may be lost opportunities associated with keeping JVPt at zero. However, the short-term social and community impacts of these lost opportunities are difficult to predict because very little of the JVPt allocation has been utilized in recent years. There are no sectors of the fishery or fishing communities that are dependent on these opportunities at this time and would likely experience losses from the elimination of this allocation in 2007-2009.

5.3.2.2 Social and Community Impacts of the Council-preferred alternative, the NMFS-preferred alternative (proposed action), and Alternative 2 and 4

Similar to the economic analysis (see previous section), four alternatives – the Council-preferred alternative, the NMFS-preferred alternative, and alternatives 2 and 4 – are of particular concern in terms of their potential fishery impacts, as they involve a substantial (17% to 25%) reduction in the TAC for Area 1A (from 60,000 mt to 50,000 mt under the Council-preferred alternative, and 45,000 mt under the NMFS-preferred altnernative (for 2008 and 2009), and alternatives 2 and 4), the only herring management area where the TAC is consistently reached and the focus of the summer fishery for herring. The following discussion pays particular attention to this feature of the Council-preferred alternative, the

NMFS-preferred alternative, and alternatives 2/4, as they are likely to result in the greatest negative social impacts relative to the other alternatives being considered.

5.3.2.2.1 From a Harvesting Perspective

From a harvesting perspective, purse seine vessels would be most impacted by the reductions in the Area 1A TAC included in the Council-preferred alternative, the NMFS-preferred alternative, and alternatives 2 and 4. These vessels are most dependent on Area 1A for fishing and have limited flexibility to move to other areas in order to compensate for revenues lost by a reduction in the Area 1A TAC. Although only a few purse seine vessels remain, these vessels are key suppliers of bait for communities with active lobster fisheries located in the northern half of the gulf of Maine (see figures provided in Section 4.2.4 of this document, p. 61, for location of lobster permit holders in the area and the connections between these areas and purse seine vessels). Given this, bait suppliers and lobstermen could also be impacted in terms of shortages of supply or higher prices from having to procure bait from other sources that may be farther away. This is particularly crucial during the summer months when the fishery is most active and bait can be scarce. Additionally, lobstering communities that are farthest away from where herring is landed after the Area 1A fishery closes could be impacted the most, as they may have to pay higher costs for bait to be delivered to these areas.

The communities where impacted vessels are homeported may experience negative impacts from the reduced TAC proposed in Area 1A as well. For example, there may be some negative impacts to smaller marine-related businesses in the local communities that provide supplies to the purse seine vessels. Early closure of the fishery may translate to fewer trips for some vessels that cannot fish in more distant grounds. For some shoreside support businesses (particularly those in Downeast Maine), fewer trips also means less fuel purchased, and fewer groceries and other necessities. For others that service vessels that will likely be traveling greater distances and taking longer trips, there may be benefits. Extra operating costs (fuel, repairs, groceries, etc.) to vessels means extra income for some shoreside businesses that cater to these vessels.

Individual vessel impacts affect not only the vessel owner, but also the owner's family as well as the crew and their families. Average crew size on purse seine vessels in 2003 was 5.4, which is larger than the average crew size for either single or paired midwater trawl vessels (see the May 5, 2004 Herring PDT/TC Report). Thirty one individuals were reported to be employed on purse seine operations during 2003.

Smaller fishing operations/vessels may be less able to adapt to a substantially lowered TAC. Given the increase in limited access programs in fisheries in the Gulf of Maine as well as the status of the fisheries, there are fewer alternative fisheries in which affected vessels can engage. Additionally, given that there are now fewer vessels participating in other fisheries in this region (such as groundfish), there may also be fewer opportunities for crew in other fisheries. As discussed in previous sections, there may be safety impacts as a result of a reduction in the Area 1A TAC as inshore vessels may be tempted to underestimate safety concerns in order to continue to access resources.

Midwater trawl (single) and pair trawl vessels that are reliant on Area 1A also are likely to be impacted by the proposed reductions in the Area 1A TAC. These vessels are primarily North of Cape Cod and land fish primarily in the communities of Gloucester MA, Newington NH, Portland ME, and Rockland ME (see figures provided in Section 4.2.4 of this document, p. 61). The pair trawl vessels and the two single midwater trawl vessel apparently able to fish in Area 3 are large enough to have the flexibility to move to other fishing areas and perhaps compensate for some or all of the losses they may experience as a result of a lower TAC in Area 1A. The extent to which the negative impacts of a reduction in the Area 1A TAC

can be mitigated will depend greatly on market conditions and the feasibility of landing marketable fish from areas farther offshore. In general, the impacts on midwater and pair trawl vessels fishing north of Cape Cod are not likely to translate directly into impacts on the communities in which these vessels are homeported. Impacts on some of these communities are likely to be associated more with impacts on secondary stakeholders such as processing facilities and lobster fishermen.

Herring midwater trawlers reliant on Area 1A would likely have to fish on Georges Bank and might utilize certain ports in the western Gulf of Maine to a lesser extent. There could be an indirect effect caused by vessels landing more herring in ports that are located farther away from lobster fishing communities in the Gulf of Maine. This could cause shortages and increased prices in the lobster bait market (this has happened before when herring were scarce in the GOM and fishing shifted to Georges Bank).

Because of the availability of herring in Area 1A and its proximity to markets/processing plants, the TAC in Area 1A is consistently reached. Given this, a reduced TAC may lead to more competition in this area with vessels racing against each other to maximize their potential catch from this area (exacerbating a condition that already exists). Greater competition on the water may translate into fewer social and economic benefits for harvesters (due to safety concerns, shortened fishing year, etc.) and processors (consistent supply of fish, limited storage capacity, etc.).

Other possible direct effects of reductions in the Area 1A TAC include the impact of longer fishing trips (to Area 1B, for example) on crew satisfaction and family life. Longer trips increase the time away from shore for captain and crew. Disturbances in this rhythm of land and sea can disturb how fishermen interact with their families. Additionally, increased steaming time can also impact individual revenue in that trips are likely to be longer without associated income benefits to crew. Where crew are responsible for paying portions of operating costs, income per trip will be reduced further as fuel prices increase and costs of food, etc. increase.

5.3.2.2.2 From a Processing Perspective

While many of the individual vessels in the herring fishery may be able to adapt, at least in part, to a reduction in the Area 1A TAC, there are likely to be impacts on markets for herring, and consequently processors. Impacts on processing facilities are more likely to translate into impacts on the communities in which they are located and the communities in which the majority of their employees reside. In general, if the supply of herring provided by midwater trawlers is reduced (because these boats must fish farther away), processing plants may be impacted economically, especially if fishing costs increase and vessels demand higher prices for their product. This could result in a loss of jobs and income to plant workers and associated social impacts on families and communities.

The Prospect Harbor, ME sardine cannery is the only one of its kind remaining in an area where there used to be many canneries. It is also an institution of sorts, as it represents the sardine canning history of the region and an important source of employment for the many employees who would otherwise have a hard time finding comparable employment opportunities. Many of the cannery's employees have worked there for there entire working lives, and most are women. As stated earlier in this impact assessment, for the cannery to operate optimally requires the herring they purchase to be as fresh as possible. This makes this plant reliant first and foremost on fish from Area 1A since vessels fishing in that area can deliver fish to the plant soon after they are caught. When appropriate quality fish is unavailable from this area (i.e., when the 1A TAC is reached), the plant will turn to fish from Area 1B, and when this 10,000 mt TAC is reached, fish are purchased elsewhere and trucked in (from as far as Point Judith, RI). Given the need for

fresh fish, the fish used for the cannery cannot be stockpiled or frozen. Because of this, a steady supply of fresh fish throughout the year is dependent on constant landings.

The alternatives which propose to reduce the Area 1A TAC in the 2007-2009 fishing years, including the proposed action, may impact the sardine cannery in a number of ways. If a reduction in the Area 1A TAC translates into greater competition for fish in this area (and an increased incentive to derby fish), then it is likely that the TAC will be reached earlier and possibly even earlier than anticipated if midwater and pair trawlers re-rig to purse seine during the proposed June-September purse seine/fixed gear-only area (Amendment 1, pending). When the 1A TAC is reached, the cannery will need to procure fish from other areas, which may have affects on product quality.

This operation is likely to be the processing operation most impacted by a reduction in the Area 1A TAC. As previously discussed, this plant can depend greatly on the supply of herring from purse seine vessels given its geographic location and the fact that the cannery depends on the most in tact and freshest herring available – usually landed by the purse seine fishery. The Area 1A TAC is fully utilized at its current 60,000 mt level; reductions from this level will increase competition between markets for bait and food and frozen products and may affect the supply of herring to the cannery, particularly later in the year and especially if the TAC in Area 1A is reached early and the fishery closes prematurely.

To the extent that the supply of herring (in terms of volume and/or consistency) to the sardine cannery is affected, the canneries may experience difficulty maintaining year-round employment opportunities in addition to overall losses in revenues that may occur. The Prospect Harbor cannery employs approximately 70 individuals full time and up to 125 during the peak season. The majority of employees are women from the surrounding area, and many are elderly. Most cannery employees work only when there is fish to process. Therefore, these employees are directly impacted by a reduced flow of fish to the plant as well as by boom or bust periods where there are either too many fish landed in relation to the plants capacity or too little to keep in functioning. Given this, not only will impacts be felt if supply to this plant is reduced, but impacts will also be experienced by increased competition and an early closure of the 1A fishery.

Fewer alternative employment opportunities exist around the Prospect Harbor plant, further illustrating the importance of this cannery to the local economy and community. While some employees can rely on unemployment benefits available to them during down periods, these are less than salaries that they would have been paid when they are working. Additionally, these benefits may not be available to temporary employees or employees that have not worked enough time during that year to be eligible.

In addition to impacts from the uncertainty of fish supply and associated steady work, there is also the increasing uncertainty about the cumulative impacts of changing herring regulations on the ability of the cannery to remain viable and operating. Key informants noted that while the change in the specifications package may have additional impacts on the fishery, the competition for Area 1A fish that will be codified by the Implementation of Amendment 1 will have greater impacts on the cannery's viability. The plant was purchased in recent years by Bumblebee Corporation and although the company has an agreement with the state of Maine to remain open for a certain number of years, the agreement depends on the availability of labor and the availability of appropriate product (which may be undermined by the cumulative impacts of Amendment 1 and the proposed specifications for 2007-2009).

There are very few employment alternatives in the region around where the cannery is located. A number of small processing operations exist in the area (clam shucking, crab picking, sea cucumber processing etc.), but these are small in scale. Seasonal work in the area include raking for blueberries and picking potatoes. Apart from these, alternatives might include working at a grocery store or WalMart (about 30 miles away). In addition to the lack of alternative employment opportunities, the loss of this plant would

seal the closure of a page in history. Oral histories carried out with a number of plant employees suggest that this is not just a source of employment, but that the cannery is related to their family history, sources of social interactions and long standing friendships, and the pride associated with hard work and a job well done. For packers in the processing house (who get paid per unit/can), alternative employment options would be very unlikely to provide the level of income that they currently enjoy.

Of the alternatives that were considered in this document, the Council-preferred alternative, the NMFS-preferred alternative, and alternatives 2 and 4 are likely to produce the greatest negative impacts on the sardine cannery and its primary stakeholders. It is important to remember that that the 2007-2009 fishery specifications will be implemented in conjunction with the measures proposed in Amendment 1 to the Herring FMP. Interviews with cannery representatives suggest that the implementation of the purse seine/fixed gear only area will not play a mitigating role in the impacts of the Area 1A TAC reduction. While the implementation of Amendment 1 may briefly quell competition for fish in that area, this will only last until a sufficient number of midwater trawlers re-rig their vessels and enter the race to fish for the 1A quota during the summer months.

Two relatively new processing plants have been established in two of New England's most important fishing communities (Gloucester and New Bedford, Massachusetts) and provide employment and related benefits that have likely boosted the economy of both communities. These communities are experiencing significant impacts as a result of increased restrictions in other fisheries and the recent implementation of Amendment 13 to the Northeast Multispecies FMP. The development of the pelagic freezer plants in these communities has likely mitigated some of the impacts of Amendment 13 at the community level and provides employment opportunities for upwards of 100 individuals (collectively). The fishing vessels that are dedicated to these facilities provide economic benefits to local marine-related businesses in the area (fuel and supplies, for example).

Recognizing that these freezer plants will be impacted by any changes to the TACs that affect the supply of herring and/or increase competition between markets, in a more general sense, the options that reduce the Area 1A TAC are likely to impact processing plants adjacent to the Gulf of Maine most. Long-term participation in the herring fishery, related shoreside employment opportunities, and the more far-reaching economic benefits associated with these facilities will become increasingly important as opportunities in other fisheries decrease. This is especially true in New Bedford and Gloucester, both of which include vessels, families, and businesses that are engaged in numerous fisheries throughout the region.

5.3.3 Summary of Impacts on Fishery-Related Businesses and Communities

Since the TACs in all management areas are not proposed to be reduced from 2005/2006 levels under the no action alternative and Alternatives 1 and 3, there are no additional impacts expected if these are implemented for the 2007-2009 fishing years. No negative economic impacts from these alternatives are expected for any of the various herring fleet sectors or any of the processing plants participating in the herring fishery. Long-term positive benefits may be realized by increasing the Area 3 TAC from 50,000 mt to 70,000 mt if the fishery expands significantly. However, with historic landings at 9,000 mt to 21,000 mt from Area 3, such an expansion is not expected in the short-term.

Table 44 summarizes the impacts related to the key component of the Council-preferred alternative, the NMFS-preferred alternative, and alternatives 2 and 4 (a 17% to 25% reduction in the Area 1A TAC), which is expected to produce the greatest social and economic impacts. The Area 1A TAC is the only TAC that is fully utilized on an annual basis, and a 17% to 25% reduction in this TAC is expected to

affect the greatest number of individuals, from the harvesting and processing sectors as well as consumers (lobstermen, bait dealers, etc.).

Table 44 Potential Social and Economic Impacts of a 17% to 25% Reduction in the Area 1A TAC

TAC ALTS	WHO/WHAT MAY BE IMPACTED?	NATURE OF IMPACTS	OTHER COMMENTS
Council-preferred alternative, NMFS-preferred alternative, and Alternatives 2 & 4 High Impact **Key feature: Reduction of Area 1A TAC from 60,000 to 50,000 mt (PA) or 45,000 mt**	• Purse seine vessels • Other vessels dependent on Area 1A • Sardine cannery • Other processors in communities adjacent to GOM • Lobster fishery	• Loss in revenues/income • Loss of supply/effects on markets • Localized Price effects • Derby fishing • Longer steam time • Safety considerations • Increased fuel costs • More time away from families/home	• Purse seine vessels most reliant on Area 1A and most limited in terms of flexibility • These impacts will be shaped by the implementation of Amendment 1 – particularly the PS/FG only area.

Table 45 summarizes the potential loss in revenues for limited access vessels that were active in Area 1A from 2003-2005, assuming that Area 1A landings from these vessels stay proportionately the same as they were during the 2005 fishing year. The estimated impacts in Table 45 are based on lost catch from Area 1A only and do not include costs associated with increased steam time to other areas and/or increased catches from other areas that may offset some of the lost 1A revenues (see previous discussion). If they cannot increase their proportion of the Area 1A TAC, the four traditional purse seine vessels are likely to be the most impacted at the individual vessel level because they cannot safely access other management areas to fish for herring. These estimates also do not consider the potential impacts of the purse seine/fixed gear-only area that may be implemented as part of Amendment 1 to the Herring FMP (see discussion in Section 5.3.1.1.2 of this document).

Table 45 Potential Loss in Revenues from Area 1A TAC Reduction to 50,000 mt and 45,000 mt, assuming 2005 Proportion of Catch by Gear Type

Active Vessels (2003-2005)	% of 2005 Area 1A Catch	Alternative	Maximum Projected Loss (mt) Based on Historic % of 2005 1A Catch	Gear Sector Total Potential Loss ($)	Individual Vessel Potential Loss ($)
Purse Seine (4)	27%	Council-preferred alternative	2,700	$545,400	$136,350
		NMFS-preferred alternative, and aternatives 2&4	4,050	$818,000	$204,500
Midwater Trawl (4)	18%	Council-preferred alternative	1,800	$363,600	$90,900
		NMFS-preferred alternative, and aternatives 2&4	2,700	$545,400	$136,350
Pair Trawl (12)	55%	Council-preferred alternative	5,500	$1,111,000	$92,583
		NMFS-preferred alternative, and aternatives 2&4	8,250	$1,666,500	$138,875

Potential Positive Social and Economic Impacts

The discussion above focuses on the negative impacts of a reduction in the Area 1A TAC on herring fishery-related businesses and communities. If this reduction in TAC leads to healthier herring stocks, then these measures may have positive benefits for all participants over the long-term. Healthy fish stocks are an essential foundation for economic and social sustainability in relation to this fishery. More plentiful herring could also lead to greater participation of the stop seine or weir fishery which depends on herring coming in shore. Moreover, where this action encourages activity in the offshore management areas, these fisheries may be further developed and may result in improved information about the location of stocks – an area where there is much room for growth.

In addition to the stakeholders described in the previous sections of this document, there are a number of stakeholder groups that may also stand to gain from a reduction in the inshore quota, as herring is an important forage species for a number of different fish and mammal species and plays an integral role in the overall health of the Gulf of Maine ecosystem. For example, to the extent to which a reduction in the Area 1A TAC improves the availability and quality of tuna, the tuna fishery may benefit. Additionally, more herring in the inshore gulf of Maine may be associated with increased numbers of marine mammals feeding in this area. If so, this would benefit ecotourism operations such as whale watching trip businesses operating in the Gulf of Maine. Participants in other fisheries (such as the groundfish fishery) may also gain from leaving more herring in the inshore areas. However, such impacts are difficult to predict, as the availability of tuna and marine mammals in the inshore Gulf of Maine is dependent on a number of additional factors. Nevertheless, the importance of herring in the ecosystem warrants mention of the potential long-term benefits of a healthier stock in the inshore Gulf of Maine.

5.4 IMPACTS ON HABITAT

5.4.1 EFH Assessment – Council-preferred and NMFS-preferred alternative

This essential fish habitat (EFH) assessment is provided pursuant to 50 CFR 600.920(e) of the EFH Final Rule to initiate EFH consultation with the National Marine Fisheries Service.

Table 46 Atlantic Herring Fishery Specifications for 2007-2009: Council-preferred and NMFS-preferred alternative (proposed action)

SPECIFICATION	Council-preferred alternative	NMFS-Preferred * (the same as Council-Preferred in 2007, but as follows for 2008-2009)
Allowable Biological Catch (ABC)	194,000	194,000
Optimum Yield (OY)	145,000	145,000
Domestic Annual Harvest (DAH)	145,000	145,000
Domestic Annual Processing (DAP)	141,000	141,000
Total Foreign Processing (JVPt)	0	0
Joint Venture Processing (JVP)	0	0
Internal Waters Processing (IWP)	0	0
U.S. At-sea Processing (USAP)	20,000 (Areas 2 and 3 only)	20,000 (Areas 2 and 3 only)
Border Transfer (BT)	4,000	4,000
Total Allowable Level of Foreign Fishing (TALFF)	0	0
Reserve	0	0
TAC Area 1A	50,000 (5,000 available Jan-May)	45,000 (5,000 available Jan-May)
TAC Area 1B	10,000	10,000
TAC Area 2	30,000	30,000
TAC Area 3	55,000	60,000
Research Set-Aside	3% from each area TAC (2008 and 2009 FY only)	3% from each area TAC (2008 and 2009 FY only)

* **The NMFS-Preferred alternative is the proposed action**.

Note: These specifications will apply to the herring management areas, as modified in Amendment 1, if approved.

Assessing the Potential Adverse Impacts: An assessment of the potential effects of the directed Atlantic herring commercial fishery on EFH for Atlantic herring and other federally-managed species in the Northeast region of the U.S. was conducted as part of an EIS that evaluated impacts of the Atlantic herring fishery on EFH (NMFS 2005). This analysis is included in Appendix VI, Volume II of the Amendment 1 FSEIS and determined that midwater trawls and purse seines do occasionally contact the seafloor and may adversely impact benthic habitats utilized by a number of federally-managed species, including EFH for Atlantic herring eggs. However, after reviewing all the available information, *if* the quality of EFH is reduced as a result of this contact, the impacts are minimal and/or temporary and, pursuant to MSA, do not need to be minimized. This conclusion also applies to pelagic EFH for Atlantic herring larvae, juveniles, and adults and to pelagic EFH for any other federally-managed species in the region.

Minimizing or Mitigating Adverse Impacts: The proposed action for the 2007-2009 herring fishery specifications would affect the amount of herring caught and the geographic distribution of fishing activity between management areas. However, because fishing with midwater trawls and purse seines, the gears used in the directed herring fishery, does not impact EFH in a manner that is more than minimal or more than temporary in nature, the impacts to EFH of these alternatives are negligible, regardless of how much fishing takes place in any particular area. For more information, please refer to Section 5.0 of the EFH DEIS for the Atlantic Herring FMP that includes the gear effects evaluation and adverse impacts determination. The annual specifications proposed under this action have no potential adverse effects on the EFH of any species managed by the New England, Mid-Atlantic or South Atlantic Fishery Management Councils.

Conclusions: Because there are no potential adverse impacts associated with this action, no EFH consultation is required.

5.4.2 Impacts of Other Alternatives Considered by the Council

The other alternatives considered by the Council for the 2007-2009 herring fishery specifications are described briefly below and summarized in Table 47.

No Action

The no action alternative equates to status quo conditions for the Atlantic herring fishery during the 2007-2009 fishing years. The 2005/2006 specifications and TACs would be maintained, based on an ABC value of 220,000 mt. No set-asides would be established under the no action alternative.

Alternative 1 – Status Quo TACs

Maintain the 2005/2006 management area TACs for the 2007-2009 fishing years, but the specifications are based on a new ABC value of 194,000 mt, and research set-asides (3% from every area) are proposed for the 2008 and 2009 fishing years. OY for the U.S. fishery under this alternative remains at its current value of 150,000 mt, and TACs remain the same as they were for 2005 and 2006. Total removals from the herring stock complex (U.S. and Canada) are assumed to be 170,000 mt under this alternative if the TACs are fully utilized and the Canadian catch is consistent with the 20,000 mt assumption.

Alternative 2

Reduce the Area 1A TAC by 15,000 mt (to 45,000 mt) and increase the Area 3 (Georges Bank) TAC by 10,000 mt (to 60,000 mt). OY for the U.S. fishery under this alternative would be 145,000 mt. Total

removals from the herring stock complex (U.S. and Canada) are assumed to be 165,000 mt under this alternative if the TACs are fully utilized and the Canadian catch is consistent with the 20,000 mt assumption. For the herring resource as a whole, this alternative represents the most conservative alternative under consideration, as the total removals from the stock complex expected under this alternative would be the lowest.

Alternative 3

Maintain current TACs for Areas 1A, 1B, and 2 and increases the Area 3 TAC to 70,000 mt (from its current value of 50,000 mt). OY for the U.S. fishery under this alternative would be 170,000 mt . Total removals from the herring stock complex (U.S. and Canada) are assumed to be 190,000 mt under this alternative if the TACs are fully utilized and the Canadian catch is consistent with the 20,000 mt assumption. This alternative encourages expansion of the offshore fishery (Georges Bank) by significantly increasing the TAC in Area 3 where all herring removals are assumed to come from the (more robust) offshore component of the resource.

Alternative 4

Re-distribute the management area TACs such that OY can be almost fully utilized (similar to Alternative 3) and some concerns about fishing effort in the inshore Gulf of Maine can be addressed. OY for the U.S. fishery under this alternative would be 170,000 mt. Total removals from the herring stock complex (U.S. and Canada) are assumed to be 190,000 mt under this alternative if the TACs are fully utilized and the Canadian catch is consistent with the 20,000 mt assumption. This alternative also encourages expansion of the offshore fishery (Georges Bank) by significantly increasing the TAC in Area 3 where all herring removals are assumed to come from the (more robust) offshore component of the resource. It also proposes to address concerns about fishing effort in Area 1A by reducing the 1A TAC and re-allocating some of the inshore component to the Area 2 fishery.

Table 47 Summary of Other Alternatives (Not Selected) for 2007-2009 Herring Fishery Specifications (Values are in Metric Tons)

SPECIFICATION	NO ACTION	ALT 1	ALT 2	ALT 3	ALT 4
ABC	220,000	194,000	194,000	194,000	194,000
U.S. OY	150,000	150,000	145,000	170,000	170,000
DAH	150,000	150,000	145,000	170,000	170,000
DAP	146,000	146,000	141,000	166,000	166,000
JVPt	0	0	0	0	0
JVP	0	0	0	0	0
IWP	0	0	0	0	0
USAP	20,000 (Areas 2/3 only)	20,000 (Areas 2/3)	20,000 (Areas 2/3)	20,000 (Areas 2/3)	20,000 (Areas 2/3)
BT	4,000	4,000	4,000	4,000	4,000
TALFF	0	0	0	0	0
RESERVE	0	0	0	0	0
TAC Area 1A	60,000 (6,000 Jan-May)	60,000 (6,000 Jan-May)	45,000 (6,000 Jan-May)	60,000 (6,000 Jan-May)	45,000 (6,000 Jan-May)
TAC Area 1B	10,000	10,000	10,000	10,000	10,000
TAC Area 2	30,000	30,000	30,000	30,000	45,000
TAC Area 3	50,000	50,000	60,000	70,000	70,000
Research Set-Aside	N/A	3% from each area TAC (08/09 FY only)	3% from each area TAC (08/09 FY only)	3% from each area TAC (08/09 FY only)	3% from each area TAC (08/09 FY only)

Overall Assessment of the Impacts to EFH of Other Alternatives Considered by the Council

An assessment of the potential effects of the directed Atlantic herring commercial fishery on EFH for Atlantic herring and other federally-managed species in the Northeast region of the U.S. was conducted as part of an EIS that evaluated impacts of the Atlantic herring fishery on EFH (NMFS 2005). This analysis is included in Appendix VI, Volume II of the Amendment 1 FSEIS and determined that midwater trawls and purse seines do occasionally contact the seafloor and may adversely impact benthic habitats utilized by a number of federally-managed species, including EFH for Atlantic herring eggs. However, after reviewing all the available information, *if* the quality of EFH is reduced as a result of this contact, the impacts are minimal and/or temporary and, pursuant to MSA, do not need to be minimized. This conclusion also applies to pelagic EFH for Atlantic herring larvae, juveniles, and adults and to pelagic EFH for any other federally-managed species in the region.

The alternatives under consideration in the 2007-2009 herring fishery specifications document would affect the amount of herring caught and the geographic distribution of fishing activity between management areas. However, because fishing with midwater trawls and purse seines, the gears used in the directed herring fishery, does not impact EFH in a manner that is more than minimal or more than temporary in nature, the impacts to EFH of these alternatives are negligible, regardless of how much fishing takes place in any particular area. For more information, please refer to Section 5.0 of the EFH DEIS for the Atlantic Herring FMP that includes the gear effects evaluation and adverse impacts determination. The annual specifications proposed under this action have no potential adverse effects on the EFH of any species managed by the New England, Mid-Atlantic or South Atlantic Fishery Management Councils. Because there are no potential adverse impacts associated with these alternatives, no EFH consultation is required.

5.5 IMPACTS ON PROTECTED SPECIES

Protected species interactions have been well-documented in the major gear types currently used in the Atlantic herring fishery. Purse seines operating in this fishery are known to take several species of seals and harbor porpoise, while midwater trawl gear (including paired midwater trawls) has had documented interactions with pilot whales, white-sided dolphins and seals. Lack of observer coverage hampers quantitative discussions of impacts, but several issues are important to note. The NMFS *List of Fisheries for 2006* places the herring midwater trawl fishery, including pair trawls, in Category II, denoting a fishery that has been determined to have occasional serious injury and mortality of marine mammals. The purse seine fishery is considered to have a remote likelihood of interactions and is listed in Category III. This gear type has the ability to release entrapped animals alive and, as reported in the NMFS sea sampling database, has considerable success with pinnipeds.

While proposed Amendment 1 to the Herring FMP (currently in the proposed rule phase of the fishery management plan approval process) may impose additional controls, the 2007-2009 herring fishery specifications, including ABC and OY, will be determined in this action. All of the five specification alternatives as well as the proposed action are based on an ABC value of 194,000 mt, exclusive of No Action, and include a 3% set-aside to support research from all management area TACs (for 2008 and 2009). In addition to ABC specifications, the discussion focuses on OY and TACs because of their potential impacts on protected species from a seasonal and spatial distribution as well as a forage perspective. Direct or indirect impacts to the herring resource and herring fishery also derive from the distribution of the management area TACs. Adjustments to values such as DAH, DAP or USAP may result in social and economic consequences for the herring fishery, but will likely have only negligible effects on protected species that have the potential to interact with the gear types used in the fishery. Therefore, they are not discussed in this section.

5.5.1 Impacts of ABC on Protected Species - *No Action*

ABC is specified for the Atlantic herring stock complex based on the best available scientific information related to herring stock biomass and the application of fishing mortality rates (See Section 5.1). It should be noted that for the No Action Alternative, the 2005/2006 fishery specifications, the Council initially proposed an OY specification of 180,000 mt (NMFS reduced to 150,000 mt) and an ABC specification of 220,000 mt. A buffer between ABC and OY was established because of scientific uncertainty, the importance of recruitment and ensuring strong year classes in the future, the importance of herring as a forage species, and the potential impact of any increase in the Canadian fisheries for herring, particularly the NB weir fishery, which catches primarily juvenile fish from the inshore component of the resource. With the 2006 TRAC Assessment now available, some of the uncertainty is addressed, but other aspects of this rationale still apply, particularly with respect to forage availability and protected species. Therefore, relative to the Proposed Action, No Action may have potentially less positive consequences for protected species from a forage perspective, based on the potential to overfish the herring stock complex with an ABC specified at 220,000 mt.

5.5.2 Impacts of ABC on Protected Species – Council-preferred alternative and NMFS-preferred alternative

In response to the 2006 TRAC Assessment, the Herring PDT recommended that ABC for the Atlantic herring fishery be set at 194,000 mt for the 2007-2009 fishing years, and the Council has proposed in all alternatives (except the No Action Alternative discussed above) to specify ABC at 194,000 mt for the 2007-2009 fishing years. The proposed ABC value represents total removals from the herring stock complex, including removals from both US and Canada, and is more precautionary than No Action, given that herring serves as a forage base for numbers of protected species.

5.5.3 Impacts of OY and TAC Alternatives

Status Quo/No Action

The no action alternative equates to status quo conditions for the Atlantic herring fishery during the 2007-2009 fishing years (Table 3, Section 3.1). The 2005/2006 specifications and TACs would be maintained, based on an ABC value of 220,000 mt, OY would be set at 150,000 mt. Impacts to protected species would in all probability remain unchanged. Effects would continue to occur, with impacts principally on the species mentioned above, but the herring fishery as a whole would not likely jeopardize the continued existence of threatened or endangered species or critical habitat.

NMFS-preferred alternative (proposed action)

The NMFS-preferred alternative has an OY of 145,000 mt and would reduce the Area 1A TAC and increase the Area 3 TAC. The status quo would be maintained for Areas 1B and 2. Again, possible overall benefits to protected species could result because of potentially greater prey availability overall. If this occurs in Area 1A through a reduced TAC, there could be specific benefits for species such as harbor porpoise, and gray and harbor seals that are seasonally abundant in the inshore Gulf of Maine. If the fishing effort increases in Area 3 because of the higher TAC, an increase in interactions with protected species such as pilot whales and white-sided dolphins is possible although not predictable with any degree of certainty. It should be noted, however, that if the herring fishery expands, shifting effort out of Area 1A would be a benefit to the inshore component of the herring resource, especially if that effort shift occurs during the peak months of the fishing season, a period which also corresponds to the herring spawning months in this area. Indirect benefits could accrue to protected species in the form of enhanced prey species availability.

Council-preferred alternative

The Council-preferred alternative has an OY of 145,000 mt and would reduce the Area 1A TAC and increase the Area 3 TAC. In this case, the Area 1A TAC is reduced by 10,000 mt, Area 1B remains the same and there is a modified seasonal split of the Area 1A TAC. The Area 3 TAC increases by 5,000 mt. Possible overall benefits to protected species could result because of potentially greater prey availability overall as a result of the OY value. The reduction in the Area 1A TAC could potentially result in specific benefits for species such as harbor porpoise, and gray and harbor seals that are seasonally abundant in the inshore Gulf of Maine.

If fishing effort increases in Area 3 because of the higher TAC, an increase in interactions with protected species such as pilot whales and white-sided dolphins is possible although not predictable with any degree of certainty. It should also be noted that if the herring fishery expands, shifting effort out of Area 1A would be a benefit to the inshore component of the herring resource, especially if that effort shift occurs during the peak months of the fishing season, a period which also corresponds to the herring spawning

months in this area. Indirect benefits could take the form of enhanced prey species availability for protected species.

Alternative 1

This proposal is most similar to the No Action alternative, but employs an ABC value of 194,000 mt for 2007-2009, consistent with the MSY value resulting from the 2006 TRAC Assessment. OY is set at 150,000 mt, the same level in effect in the current specifications (2005-2006). The impacts of this alternative are not likely to be very different from the current management regime since no TACs will be reduced from 2005/2006 levels.

Alternative 2

Alternative 2 has an OY of 145,000 mt and would reduce the Area 1A TAC and increase the Area 3 TAC. The status quo would be maintained for Areas 1B and 2. Again, possible overall benefits to protected species could result because of potentially greater prey availability overall. If this occurs in Area 1A through a reduced TAC, there could be specific benefits for species such as harbor porpoise, and gray and harbor seals that are seasonally abundant in the inshore Gulf of Maine. If the fishing effort increases in Area 3 because of the higher TAC, an increase in interactions with protected species such as pilot whales and white-sided dolphins is possible although not predictable with any degree of certainty. It should be noted, however, that if the herring fishery expands, shifting effort out of Area 1A would be a benefit to the inshore component of the herring resource, especially if that effort shift occurs during the peak months of the fishing season, a period which also corresponds to the herring spawning months in this area. Indirect benefits could accrue to protected species in the form of enhanced prey species availability.

Alternative 3

Alternative 3 sets OY at 170,000 mt, and consequently compares less positively with Alternatives 1 and 2 relative to protected species, but as in Alternative 2, the Area 3 TAC increases from 50,000 to 70,000 mt. This feature may serve to shift effort out of 1A, but again, with similar potential outcomes as described for Alternative 2, particularly if the inshore areas become unavailable when and if TACs are reached. Alternative 3 also reduces any buffer the Council may consider, thereby making it less risk averse relative to Alternative 2 in maintaining a continued and sustained forage base for protected species.

Alternative 4

Alternative 4 has the same OY as Alternative 3, 170,000 mt. Comments about the buffer made in Alternative 3 also apply. However, this option attempts to move effort out of the inshore Gulf of Maine by reducing the Area 1A TAC from 60,000 mt to 45,000 mt. and increases the TACs for Areas 2 and 3. As in Alternative 2, inshore species may benefit from the potential effort reductions but risks may be greater than the other alternatives in the context of long-term resource stability and protected species forage base considerations.

5.6 CUMULATIVE EFFECTS

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

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

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

The following analysis will identify and characterize the impact on the environment from the action proposed in this document (the NMFS-preferred alternative) when analyzed in the context of other past, present, and reasonably foreseeable future actions. The analysis is generally qualitative in nature because of the limitations of determining effects over the large geographic areas under consideration. This analysis is also based on the comprehensive cumulative effects analysis presented in the Final Amendment 1 EIS document and updates information as appropriate. The Amendment 1 cumulative effects analysis (Section 8.7 of Amendment 1, completed May 2006) should be referenced for additional information.

Cumulative effects can be more easily identified by analyzing the impacts of the proposed action on valued ecosystem components (VECs). The affected environment is described in this document based on VECs that were identified for consideration relative to the proposed specifications. The VECs described in this document and considered in this CEA include: **Atlantic herring; protected resources; habitat and essential fish habitat (EFH); and the Atlantic herring fishery (fishery-related businesses and communities)**. Another VEC considered in this analysis is "non-target species," or bycatch in the herring fishery, as described in Sections 4.2.5, 4.2.6, and 4.2.7 of this document. Non-target species were addressed in Amendment 1 through bycatch discussions as well as consideration of the impacts of the proposed measures on other fisheries (lobster and mackerel). Because of the nature of impacts of the proposed 2007-2009 fishery specifications, non-target species are considered in this document primarily as they relate to bycatch in the directed herring fishery.

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

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

The geographic area that encompasses the physical, biological and human environmental impacts to be considered in the cumulative effects analysis is described in detail in Section 7.0 of the Amendment 1 document and updated in Section 4.0 of this document. The physical environment, including habitat and EFH, is bounded by the range of the Atlantic herring fishery, from the GOM through the mid-Atlantic Bight, and includes adjacent upland areas (from which non-fishing impacts may originate). The geographic range for impacts to fish species is the range of each fish species in the western Atlantic Ocean, as described in the Affected Environment. For Protected Species, the geographic range is the total range of Atlantic herring. The geographic range for the human environment is defined to be those fishing communities bordering the range of the herring fishery.

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

Consistent with the cumulative effects analysis in Amendment 1, the temporal scope of future actions for all VECs, which includes the proposed fishery specifications for 2007-2009, extends five years into the future. This period was chosen because of the dynamic nature of resource management and lack of specific information on projects that may occur in the future, which make it difficult to predict impacts beyond this time frame with any certainty. This is also the rebuilding time frame for the Atlantic herring resource, as defined in the Herring FMP, should the resource become overfished and subject to a rebuilding program in the future.

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

5.6.1 Past, Present, and Reasonably Foreseeable Future Actions

5.6.1.1 Past and Present Actions

Section 4.0 of this document summarizes the current state of the herring resource, herring fishery, and provides additional information about non-target species, habitat, and protected resources. The Amendment 1 Final EIS should be referenced for more detailed discussion about the past and present actions that have affected the VECs related to this action. The following paragraphs generally summarize and update the list of relevant past and present actions and the current state of each VEC.

Herring Resource

Atlantic herring management measures were implemented in two related, but separate FMPs in 1999 – one by the federal government (NEFMC 1999, amended in 2006) and one by the states (ASMFC 1999, amended in 2006). The status of the herring resource is updated in Section 4.1 of this document, and the herring fishery is summarized in Section 4.2 of this document. The offshore stock has recovered from its collapse in the early 1970s and, overall, the coastal Atlantic herring resource is not overfished, and

overfishing is not occurring. There is more concern for the inshore stock since it receives more fishing pressure, and recent survey trends in the inshore Gulf of Maine are declining. Additional past and present actions that affect the herring resource are discussed below.

Human Environment/Herring Fishery

Updated information about the human environment is provided in Section 4.2 of this document. Landings have declined dramatically since the 1960s but have been variable since then, averaging about 100,000 mt/year, and have not shown a definite trend. There was a shift to more mobile gear (purse seines and midwater trawls) from fixed gear in the early 1980s. With that change, the domestic fishery transformed from what was primarily a canning industry for human consumption to a fishery that supplies lobster bait and an overseas market for frozen herring. The economic and social structure of the industry has adjusted to these changes and has not changed significantly in recent years. Additional past and present actions that affect the human environment (fishery-related businesses and communities) are discussed below.

Habitat/EFH

Herring EFH is generally described in Section 4.3 of this document. Herring EFH has not been adversely affected in more than a minimal or temporary manner by fishing activities because the primary substrates utilized by herring for egg deposition are not affected by disturbance, and the fact that the noise produced by fishing operations only temporarily disperses schools of juvenile and adult herring.

The EFH designations for Atlantic herring were developed as part of an Omnibus Amendment prepared by the New England Fishery Management Council (NEFMC) for all NEFMC managed species. The EFH Omnibus Amendment was approved for Atlantic herring by the Secretary of Commerce on October 27, 1999. The final rule implementing the Atlantic herring FMP to allow for the development of a sustainable Atlantic herring fishery was published on December 11, 2000 (65 FR 77450).

The Habitat Closed Areas (HCAs) established in 2004 under Amendment 13 to the Northeast Multispecies FMP and Amendment 10 to the Atlantic Sea Scallop FMP currently prohibit all bottom-tending mobile gear as part of a level 3 closure. Groundfish closed areas, established in 1994 and 1998 to protect the overfished stocks of cod, haddock and other groundfish species, overlap in some areas with the HCAs.

Although not explicitly described in this document, numerous previous actions to protect fish habitat have contributed to existing conditions. For example, fishery management actions that include gear restrictions, time and area closures, and harvest restrictions have been implemented as part of many MSFCMA managed species' FMPs. Generally, these measures have had positive impacts on EFH.

Protected Species/Protected Resources

A general description of protected species that may be affected by the proposed action is provided in Section 4.4 of this document and in more detail in proposed Amendment 1 to the FMP. The populations of the potentially-affected protected species are generally healthy with notable increases in recent years for some seal species.

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

large whale species. Other marine mammals, however, such as harbor porpoise, dolphins and to a greater degree seals, are vulnerable to entanglement in net gear, including midwater trawl gear and purse seines.

The Atlantic Large Whale Take Reduction Team (ALWTRT) was formed in 1996 to address interactions between strategic stocks of large whales and pot and gillnet fisheries in the western Atlantic. The main tools of the plan include a combination of broad gear modifications and time/area closures (which are being supplemented by progressive gear research), expanded disentanglement efforts, extensive outreach efforts in key areas, and an expanded right whale surveillance program to supplement the Mandatory Ship Reporting System. New regulations to the Atlantic Large Whale Take Reduction Plan (ALWTRP) are proposed to be implemented to address the number of observed Atlantic large whale entanglements. A Notice of Availability for the DEIS for the ALWTRP was published in the Federal Register on February 25, 2005. The purpose of the ALWTRP is to further reduce the risk of entanglement to Atlantic large whales in fishing gear. The ALWTRP proposed action includes broad-based gear modifications in lieu of seasonal and/or area management requirements. In addition to the currently regulated lobster trap/pot fishery, other trap/pot fisheries such as red crab could be included.

There is a Harbor Porpoise Take Reduction Plan in place that is anticipated to reduce takes in gillnet gear, which will have a positive effect on the population of this species. An Atlantic Trawl Gear Take Reduction Team also has been organized to begin to address interactions of small cetaceans and small whales in trawl fisheries.

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

Non-Target Species (Bycatch)

Updated information about non-target species (bycatch) affected by the herring fishery is provided in Section 4.2 of this document. In recent years, Atlantic herring, spiny dogfish, Atlantic mackerel, and haddock have represented the majority of observed bycatch by directed herring vessels. Bycatch of haddock in the herring fishery was recently addressed through Framework 43 to the Northeast Multispecies FMP, as discussed below.

Non-target species are also addressed in Amendment 1 in the context of "other fisheries," namely the mackerel and lobster fisheries. While impacts to these fisheries are considered in the analyses provided in Section 5.3 of this document, they are not considered in the context of this cumulative effects analysis because of the narrow scope of the proposed action and the conclusions in the analysis presented in Section 5.3 of this document. The potential impacts of the proposed action on other fisheries is unclear because they may be influenced by changes in fishing behavior and/or adaptations by bait dealers and other processors. While the seasonal supply of herring for lobster bait may be affected by the proposed action, it is unclear at this time whether or not this will result in negative impacts on other fisheries like the lobster fishery. If impacts on other fisheries do occur, they are expected to be minimal. No impacts on the mackerel fishery are expected from the proposed action.

Additional Past and Present Actions

Amendment 2 to the ASMFC Interstate Herring FMP: The Atlantic States Marine Fisheries Commission (ASMFC) recently developed an amendment to herring management in state waters to promote consistency with federal regulations and the measures under consideration in the Council's Amendment 1. Consistent with management measures contained in this Federal Amendment, Amendment 2 revises management area boundaries, biological reference points, the specification process, research set-asides, internal waters processing operations, and measures to address fixed gear fisheries. ASMFC Amendment 2 also requires fixed gear fishermen to report herring catches through the IVR program, a requirement which is essential to ensure the success of the fixed gear measures included in both the ASMFC and Council amendments.

Amendment 2 differs from the Federal Amendment with regard to its effort control measures (days out) and spawning restrictions. The days out measure was adopted as it is currently being implemented by States. By April of each fishing year, if the catch in a particular area is projected to be harvested before the end of a given period, states will meet to discuss and agree to the start date, number of days out, and which consecutive days of the week will have landings restrictions. Under this measure, fixed gear fisheries are exempt from the days out provision and off-loading of herring is permitted during days out of the fishery; the intent of the provision is to have herring vessels at the dock at the time the restriction is set to begin. Vessels with an Atlantic herring permit will be allowed to participate in other fisheries for other species in restricted areas during the days out provision. For spawning restrictions, a zero tolerance provision was approved, which will prohibit any vessel from fishing for, taking, landing, or possessing spawn herring from or within a restricted spawning area. East of Cutler fixed gear fisheries will be exempt from spawning restrictions.

Although difficult to quantify at this time (Amendment 2 was just recently implemented), the impact of the ASMFC measures on the VECs under consideration were predicted in the NEFMC Amendment 1 to be positive for Atlantic herring, and unknown or neutral for other VECs.

Framework 43 to the Multispecies FMP: Framework 43 was developed by the Council to address the bycatch of multispecies, particularly haddock, in the directed fishery for herring. The measures implemented in Framework 43 (August 2006) include a catch cap for haddock, an incidental catch allowance for other regulated multispecies, and a monitoring program for the catch cap. These measures will be applicable to Category 1 herring vessels (those intending to catch 500 mt or more and using VMS) during the 2006 fishing year, and all vessels with a limited access directed fishery permit for herring once Amendment 1 to the Herring FMP is implemented. According to Framework 43:

- Herring purse seine and midwater trawl gear (single and paired) are no longer defined as exempted gear relative to the multispecies fishery, since this status is not consistent with available information that documents catches of groundfish, nor is it consistent with catch caps that acknowledge groundfish catch and may allow the retention of small amounts of groundfish. Herring purse seine and midwater trawl fishing will now be classified as an exempted fishery (less than 5% groundfish bycatch).
- With the exception of the prohibition on catching regulated groundfish that will be revised by the catch caps, all current regulatory provisions for herring midwater and purse seine gear will be adopted as provisions for the exempted fishery. Current access to groundfish closed areas for these fisheries did not change as a result of Framework 43.

Framework 43 is expected to have unknown or neutral impacts for most of the VECs under consideration, and positive impacts for the herring fishery relative to the no action alternative (see Section 5.1 of Framework 43). The measures in Framework 43 should allow the herring fleet to continue its normal fishing operations (particularly on GB), despite the presence of two large year classes of haddock. The measures provide no incentive for the industry to target haddock and any haddock landed cannot be sold for human consumption. The measures maintain a haddock possession tolerance as close to zero as practicable, without causing harm to the haddock resource or slowing the haddock rebuilding schedule. To the extent that these measures will prevent a shift of midwater trawl fishing effort into the inshore GOM, the impacts of the Framework 43 measures could be positive for the herring resource. Moreover, there may be indirect benefits associated with improving the collection of bycatch information. If better information about bycatch in the herring fishery can be utilized to develop more effective management measures, the Atlantic herring resource and non-target species will likely benefit over the long-term.

The suspension of haddock possession prohibitions is likely to result in positive economic benefits to the herring fishery because the fishery would be allowed to operate throughout the range and especially in Area 3 until the 90% of the haddock catch cap is reached. Based on recent observed levels of haddock bycatch in the herring fishery, the Framework 43 catch cap is unlikely to be reached in the short-term, but provides a backstop and establishes a mechanism to better document bycatch. Without these provisions, herring fishing in Area 3, and area where effort in the fishery is encouraged, would likely decrease.

General Conclusions

Based on the information presented in this document as well as other applicable documents (mentioned in the discussion above), the impacts of the past and present actions to the valued environmental components (VECs) considered in this assessment are neutral (habitat/EFH, protected species) or slightly positive (herring resource, non-target species). The impacts on fishery-related businesses and communities are less clear at this time and are likely to be both positive and negative.

5.6.1.2 Reasonably Foreseeable Future Actions

The Amendment 1 Final EIS should be referenced for additional discussion relative to reasonably foreseeable future actions that are likely to affect the VECs related to the action proposed in this document. The following paragraphs generally summarize and update the list of relevant future actions.

Fishery Management Actions

The following actions are promulgated under authority of the M-SFCMA:

EFH Omnibus Amendment: An EFH Omnibus Amendment is currently under development for all of the Council's FMPs and will apply to all 27 species managed by the Council. The purpose of the amendment is to review and revise EFH components of the FMPs and to develop a comprehensive EFH management plan that will successfully minimize adverse effects of fishing on EFH through actions that will apply to all Council-managed FMPs. The Council is considering several measures for inclusion in the Omnibus Amendment, including a review and update of the following: (1) description and identification of EFH; (2) non-fishing activities that may adversely impact EFH; (3) identification and consideration of new Habitat Areas of Particular Concern; and (4) integration of alternatives to minimize any adverse effects of fishing on EFH. While it is possible that the Council would recommend measures that could impact multispecies EFH, because the amendment is under development, it is not possible to predict impacts to the VECs under consideration in this document with any certainty.

Amendments 9 and 10 to the Squid, Mackerel Butterfish Fishery Management Plan and Amendment 1 to the Tilefish FMP: Although these amendments are currently under development, Amendment 9 and Amendment 1 will likely propose measures to reduce impacts on EFH. Although the precise nature of these measures cannot be determined at this time, it is possible that the Mid-Atlantic Fishery Management Council could recommend measures that protect habitat for various species, including Atlantic herring.

Amendment 10 is being developed specifically to consider measures relating to controlled or limited access in the Atlantic mackerel fishery. The Council is concerned about the recent, rapid expansion of the Atlantic mackerel fishery, which is one of the relatively few in the Northwest Atlantic Ocean that is not considered over-exploited. The Council is considering the development of a system of controlled or limited access to the fishery to avoid the overcapitalization problem that has plagued open access fisheries throughout the U.S. The overlap and interactions between the Atlantic herring and mackerel fisheries suggest that Amendment 10 may impact the herring fishery and its participants. Currently, the DSEIS for Amendment 10 is scheduled to be completed over the next year or so, and implementation of Amendment 10 is expected prior to the start of the 2008 calendar year. The impacts of the proposed measures on the VECs under consideration in this analysis are unknown at this time.

Amendment 1 to the Atlantic Herring FMP: Amendment 1 to the Herring Fishery Management Plan was submitted to NMFS on May 3, 2006. Amendment 1 includes the following measures which may affect the VECs under consideration: specification of maximum sustainable yield (MSY); adjustments to the specification process for the Atlantic herring fishery; a limited access program for the herring fishery; adjustment to Atlantic herring management areas; other modifications to permit and reporting requirements; establishment of a purse seine and fixed gear-only area; and other administrative and procedural measures or adjustments. Amendment 1 is scheduled to be implemented sometime near the beginning of the 2007 fishing year. The impacts of Amendment 1 are unclear at this time because (1) the measures have not been approved/disapproved by NMFS; and (2) none of the measures have been implemented.

However, the impacts of the measures proposed in Amendment 1 on the relevant VECs were analyzed thoroughly in the final Amendment 1 EIS document:

- For Atlantic herring, the overall conclusion in Amendment 1 was that the direct impacts of the management action on the Atlantic herring resource – the biological impacts – are not likely to be significant, but there should be long-term benefits to the resource resulting from the proposed action (**conclusion – positive impacts**).
- For fishery-related businesses and communities, the management measures included in Amendment 1 that are most likely to have impacts are the proposed limited access program and the purse seine/fixed gear-only area. The proposed measures are estimated to qualify 31 vessels for limited access directed fishery permits to fish in all management areas, three additional vessels for limited access directed fishery permits in Areas 2/3 only, and 56 vessels for limited access incidental catch permits with a 25 mt possession limit. The estimated total number of limited access vessels under the Amendment 1 limited access program is 90, with 34 unique vessels qualifying for the directed herring fishery (**conclusion – neutral/low negative impacts**).
- For habitat/EFH, the measures proposed in Amendment 1 are not expected to adversely impact EFH. The Gear Effects Evaluation (Appendix VI, Volume II of Amendment 1) concluded that there are potential adverse habitat impacts associated with the use of midwater trawls and purse seines, but that they are minimal and/or temporary in nature. Under the action proposed in the amendment, the impacts would continue to be minimal and/or temporary and therefore not require minimization (**conclusion – neutral impacts**).

- For protected species/protected resources, because herring is a primary prey species for seals, porpoises and some whales, levels of protected species interactions with fishery are likely. The Amendment 1 measures, however, include a limited access program that controls capitalization of the fleet, including growth of the midwater trawl sector, and a seasonal purse seine/fixed gear only area that should, at a minimum, not increase interactions with protected species beyond the status quo, and may have indirect positive benefits by imposing more controls on the fishery. Similarly, because most of the independent measures improve the management program through administrative and monitoring mechanisms, they are unlikely to affect protected species in any direct or measurable way (**conclusion – potentially positive impacts**).
- For non-target species (Other Fisheries in Amendment 1), the impacts of the measures proposed in Amendment 1 on the supply of lobster bait were unknown. In general, the proposed measures as well as most of the management alternatives that were considered during the development of Amendment 1 are not expected to substantially alter the supply of herring for lobster bait and/or result in any significant impacts on the lobster fishery. In terms of mackerel and participants in the mackerel fishery, the Amendment 1 limited access program qualifies the largest number of mackerel vessels (7) for limited access incidental catch permits. The proposed limited access incidental catch permit should mitigate the negative impacts of the limited access directed fishery program on mackerel vessels that may be excluded, and consequently, on the mackerel fishery overall (**conclusion – neutral/low negative impacts**).

Protected Species/ Protected Resources Actions

Potential future actions whose effects would be cumulative to the proposed action include actions taken to protect marine mammals, and endangered and threatened species. These could be modified in the future under either a fishery management plan, marine mammal take reduction plan, or regulation promulgated under authority of the Marine Mammal Protection Act or Endangered Species Act.

Specifically, known or anticipated future actions include: short-term closures to sink gillnets under the Atlantic Large Whale Take Reduction Plan Dynamic Area Management (DAM) system; possible changes to the Harbor Porpoise Take Reduction Plan; and measures adopted under the NMFS final rule implementing large-mesh gillnet closures off the North Carolina/Virginia coast to protect sea turtles. Since the specific nature of those potential changes are not known at this time, their effects cannot be determined at this writing. Additionally, in 2005 NOAA Fisheries prepared a Draft Environmental Impact Statement for the ALWTRP to solicit comments on revised management measures and provisions in the plan and possible modifications to reduce interactions of right, humpback fin and minke whales with commercial fisheries.

In 2001, NMFS approved a new approach to address sea turtle bycatch across similar gear types rather than fishery by fishery because previous management strategies were considered insufficient. Key elements of a more comprehensive and integrated plan are to evaluate the significance of bycatch by gear type, develop solutions (gear modifications and/or changes to fishing practices) to reduce sea turtle bycatch and implement and evaluate solutions based on the best available data. This last element includes efforts to improve monitoring and assessments of sea turtle populations as well as bycatch estimates.
In June 2006, NOAA Fisheries Service published a proposed rule describing regulations to reduce the risk of collisions between North Atlantic right whales and ocean-going vessels. Right whales are among the most endangered species in the world, and are highly vulnerable to ship collisions. The rule proposes vessel speed restrictions along the U.S. east coast, a first in the Agency's long-standing efforts to recover right whales. The rule proposes a speed restriction of 10 knots or less during certain times in each of three major regions along the U.S. east coast (Northeast, Mid-Atlantic, and Southeast). These proposed measures are adapted to right whale seasonal occurrence in each area, as well as commercial ship traffic patterns and navigational concerns. Speed restrictions would apply to vessels that are 65 feet in length or

greater, except federal agency vessels. The rule also proposes a speed restriction to protect whales that appear in times and places when these seasonal measures are not in effect, through "dynamic management."

These proposed regulations are part of the agency's larger Ship Strike Reduction Strategy, which recommends continuing existing protective actions, such as a system of aircraft surveys and mandatory ship reporting systems that provide advisories and information on right whale locations to mariners. The strategy calls for developing a conservation agreement with Canada, consulting under the Endangered Species Act with federal agencies on operations of their ships, and an expanded outreach and education program. In addition, NOAA Fisheries Service and National Ocean Service developed a proposal to modify key shipping routes into Boston. The proposal, submitted to the International Maritime Organization in April, by the U.S. Coast Guard on behalf of the United States, is expected to have a significant reduction of risks to right whales from ships.

General Conclusions

With the exception of the positive impacts expected from the RFFAs on the Atlantic herring resource, the impacts associated with reasonably foreseeable future actions to the VECs considered in this assessment are mixed, and most are neutral. Many impacts of the future actions cannot be predicted with a high degree of certainty. The impacts on fishery-related businesses and communities and non-target species are the most difficult to predict at this time, as there are likely to be both positive and negative impacts resulting from the suite of measures expected to be proposed in the relevant RFFAs.

5.6.2 Non-Fishing Impacts

Non-fishing activities pose a risk to the herring resource. As discussed in detail in the draft Herring EFH EIS (NMFS, July 1, 2004), impacts resulting from non-fishing activities like projects permitted under the Clean Water Act and Ocean Dumping Act, pollution, loss of coastal wetlands, marine transportation, and marine mining are unknown and/or unquantifiable. In general, the greatest potential for adverse impacts to herring and herring EFH occurs in close proximity to the coast where human induced disturbances, like pollution and dredging activities, are occurring. Because inshore and coastal areas support essential egg, larval and juvenile herring habitats, it is likely that the potential threats to inshore and coastal habitats are of greater importance to the species than threats to offshore habitats. It is also likely that these inshore activities will continue to grow in importance in the future. Activities of concern include chemical pollutants, sewage, changes in water temperature, salinity and dissolved oxygen, suspended sediment and activities that involve dredging and the disposal of dredged material. These impacts are discussed thoroughly in Amendment 1 to the Herring FMP.

Though largely unquantifiable, it is likely that the non-fishing activities noted above would have negative impacts on habitat quality from disturbance and construction activities in the area immediately around the affected area. Given the wide distribution of the affected species, minor overall negative effects to offshore habitat are anticipated since the affected areas are localized to the project sites, which involve a small percentage of the fish populations and their habitat. Any impacts to inshore water quality from permitted projects and other non-fishing activities, including impacts to planktonic, juvenile, and adult life stages, are unknown but likely to be negative in the immediate vicinity of the activity.

5.6.3 Cumulative Impacts on Herring Resource

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

The Council met the requirements of the MSFCMA and National Standard 1 when it developed the Herring FMP and implemented conservation and management measures that are intended to prevent overfishing and achieve, on a continuing basis, OY for the Atlantic herring fishery. The proposed fishery specifications for the 2007-2009 fishing years are intended to continue to achieve the goals and objectives of the Herring FMP as modified in Amendment 1. The direct and indirect impacts of the proposed specifications on the affected environment and the valued environmental components (VECs) are discussed in detail in Section 5.0 of this document and are intended to achieve the goals and objectives of the FMP and the MSFCMA by preventing overfishing and providing for OY in the fishery that will produce the greatest overall benefit to the Nation.

The proposed action does not allow harvest levels in the Atlantic herring fishery to exceed levels established in recent years and actually reduces the total allowable yield (OY) by 5,000 mt. The proposed reduction in ABC is not likely to result in any short-term impacts because: (1) OY is proposed to be set at a level lower than ABC for reasons discussed throughout this document, and (2) yield from the domestic herring fishery has never reached the level proposed for ABC. The long-term benefits of reducing ABC to 194,000 mt are addressed in the TRAC 2006 Assessment document (Appendix I), as this is the level of biomass that is expected to produce MSY on a continuing basis. In addition, the TAC for Area 1A, where fishing effort on the inshore stock component is concentrated, is proposed to be reduced by 10,000-15,000 mt, a conservative measure that addresses recent declining trends in the inshore surveys.

As supported by the information and analyses presented in Section 5.2 of this document, the proposed reductions in OY and the TAC in Area 1A are expected to have positive impacts on the herring resource relative to the no action alternative. Because the fishery currently does not fully utilize the available OY (sum of TACs) and is not expected to in the short term, the proposed reductions will contribute little to any short-term cumulative impact on the stock. However, the proposed reduction in the Area 1A TAC should produce a long-term benefit for the inshore component to the extent that it reduces fishing mortality on this stock component and shifts fishing effort to offshore areas. In addition, to the extent that these measures promote and support research on the Atlantic herring fishery and resource, there may be indirect positive impacts on the herring resource, particularly as new scientific information contributes to effective management.

The proposed action also includes a requirement for the Council to conduct a one-year review of the fishery specifications to determine whether changes should be made for the 2008 and 2009 fishing years. This provides an opportunity to mitigate any unforeseen impacts to this VEC, if necessary.

Additional mortality from non-directed fisheries (bycatch) is accounted for through the stock assessment process. Additional indirect effects on the Atlantic herring resource that would result from non-fishing activities are difficult to quantify at this time, but generally are considered to result in some level of adverse impact to the resource. The proposed action, which reduces OY and the Area 1A TAC, would result in some benefit to the resource when considered together with non-fishing impacts that may adversely impact the herring resource on a localized scale.

5.6.4 Cumulative Impacts on the Herring Fishery/Human Environment

The direct and indirect impacts of the proposed specifications on the affected environment and the valued environmental components (VECs) are discussed in detail in Section 5.0 of this document. The TACs are intended to achieve the goals and objectives of the FMP and the MSFCMA by preventing overfishing and providing for OY in the fishery that will produce the greatest overall benefit to the Nation.

Table 48 summarizes the impacts related to the key component of the proposed action (a 17% reduction in the Area 1A TAC in 2007, and a 25% reduction in 2008 and 2009), which is expected to produce the greatest social and economic impacts relative to the other proposed specifications. The Area 1A TAC is the only TAC that is fully utilized on an annual basis, and a 17-25% reduction in this TAC is expected to affect a number of individuals, from the harvesting and processing sectors as well as consumers (lobstermen, bait dealers, etc.).

Table 48 Potential Social and Economic Impacts of Proposed 17-25% Reduction in the Area 1A TAC

TAC ALTS	WHO/WHAT MAY BE IMPACTED?	NATURE OF IMPACTS	OTHER COMMENTS
Proposed Action **High Impact** **Key feature: Reduction of Area 1A TAC from 60,000 to 50,000 mt in 2007, and to 45,000 mt in 2008 and 2009**	• Purse seine vessels • Other vessels dependent on Area 1A • Sardine cannery • Other processors in communities adjacent to GOM • Lobster fishery	• Loss in revenues/income • Loss of supply/effects on markets • Localized Price effects • Derby fishing • Longer steam time • Safety considerations • Increased fuel costs • More time away from families/home	• Purse seine vessels most reliant on Area 1A and most limited in terms of flexibility • These impacts will be shaped by the implementation of Amendment 1 – particularly the PS/FG only area.

Table 49 summarizes the potential loss in revenues for limited access vessels that were active in Area 1A from 2003-2005, assuming that Area 1A landings from these vessels stay proportionately the same as they were during the 2005 fishing year. The estimated impacts in Table 49 are based on lost catch from Area 1A only and do not include costs associated with increased steam time to other areas and/or increased catches from other areas that may offset some of the lost 1A revenues. If they cannot increase their proportion of the Area 1A TAC, the four traditional purse seine vessels are likely to be the most impacted at the individual vessel level because they cannot safely access other management areas to fish for herring. These estimates also do not consider the potential impacts of the purse seine/fixed gear-only area that may be implemented as part of Amendment 1 to the Herring FMP (see discussion in Section 5.3.1.1.2 of this document).

Table 49 Potential Loss in Revenues from Area 1A TAC Reduction to 50,000 mt in 2007 and 45,000 mt in 2008 and 2009 (Proposed Action), Assuming 2005 Proportion of Catch by Gear Type

Active Vessels (2003-2005)	% of 2005 Area 1A Catch	Maximum Projected Loss (mt) Based on Historic % of 2005 1A Catch	Gear Sector Total Potential Loss ($)	Individual Vessel Potential Loss ($)
Purse Seine (4)	27%	2,700 (at 50,000 mt level) 4,050 (at 45,000 mt level)	$545,400 (at 50,000 mt level) $818,100 (at 45,000 mt level)	$136,350 (at 50,000 mt level) $204,525 (at 45,000 mt level)
Midwater Trawl (4)	18%	1,800 (at 50,000 mt level) 2,700 (at 45,000 mt level)	$363,600 (at 50,000 mt level) $545,400 (at 45,000 mt level)	$90,900 (at 50,000 mt level) $136,350 (at 45,000 mt level)
Pair Trawl (12)	55%	5,500 (at 50,000 mt level) 8,250 (at 45,000 mt level)	$1,111,000 (at 50,000 mt level) $1,666,500 (at 45,000 mt level)	$92,583 (at 50,000 mt level) $138,875 (at 45,000 mt level)

With a 10,000 – 15,000 mt decrease in the combined Area 1 TAC, the impact of the proposed action on the purse seine fleet could be large. It is difficult to predict what the impact will be on the purse seine fleet because at the time the proposed reduction in the Area 1A TAC would be implemented, the purse seine/fixed gear (PS/FG) only area may be in effect. It is consequently difficult to predict whether the cumulative effect of the Amendment 1 measures and the proposed reduction in the Area 1A TAC will result in substantial economic impacts that are either positive or negative for this sector of the fishery.

Without knowing what portion of an Area 1A TAC of 60,000 mt the purse seine fleet might land with the implementation of a PS/FG only area, it is difficult to know what a reduction of 10,000 – 15,000 mt might mean under the same conditions. The PS/FG only area would eliminate competing midwater trawl vessels from Area 1A during the most productive part of the Area 1A fishery (June – September). Given this, it is likely that the existing purse seine fleet would increase its landings from the area. On the other hand, establishing a PS/FG only area may intensify the race to fish in Area 1A as midwater trawl vessels try to catch more herring from the area prior to June 1.

If the PS/FG only area is not approved/implemented as part of Amendment 1, a reduction in the Area 1A TAC would exacerbate existing levels of competition for the inshore quota and may result in an even earlier closure of the fishery. Purse seine vessels would be particularly disadvantaged if this were to occur, as they have fewer options available to them and are entirely dependent on herring. In 2005, the purse seine fleet caught 27% of the Area 1A TAC. If the proportion of the herring catch by the purse seine fleet remains the same and the decrease in the Area 1A TAC cannot be made up from fishing in other areas, there would be a 2,700 mt loss in catch under the proposed action in 2007, and a 4,050 mt loss in 2008 and 2009.. Using the 2005 average price of herring of $202 per metric ton, this catch is worth $545,400 and $818,000, respectively, across the sector (there are four vessels in the limited access purse seine fleet). Purse seine vessels would have to either increase their proportion of the herring catch in Area 1A relative to midwater trawlers (which may be achieved by implementing the PS/FG only area)

or move to other areas. Moving to offshore areas may be problematic due to the size of the vessels and the schooling behavior of the fish in offshore areas. There were no landings from Area 3 by the purse seine fleet in 2005.

If the proposed reduction in the Area 1A TAC leads to healthier herring stocks, then these measures may have positive benefits for all fishery participants over the long-term. Healthy fish stocks are an essential foundation for economic and social sustainability in relation to this fishery. More plentiful herring could also lead to greater participation of the stop seine or weir fishery which depends on herring coming in shore. Moreover, where this action encourages activity in the offshore management areas, these fisheries may be further developed and may result in improved information about the location of stocks – an area where there is much room for growth. In addition, the proposed research set-aside may benefit the fishery. Improved information generated by the research should have positive outcomes for participants as it is likely to lead to more appropriate and effective management measures. Industry participation in this process could improve the relevance of the research to be carried out and may cultivate a greater sense of stewardship by participants in the fishery.

The proposed action also includes a requirement for the Council to conduct a one-year review of the fishery specifications to determine whether changes should be made for the 2008 and 2009 fishing years. This provides an opportunity to mitigate any unforeseen impacts to this VEC, if necessary.

This analysis has considered the potential impacts of the proposed action and other alternatives on the Atlantic herring fishery (fishery-related businesses and communities), in combination with relevant past, present, and reasonably foreseeable future actions as well as applicable non-fishing impacts. The incremental benefits from the proposed action are not likely to result in significant cumulative effects on the Atlantic herring fishery. The influence of the impacts of related future actions (Amendment 1) makes it difficult to predict with any certainty whether or not significant cumulative impacts will be realized in the fishery. While negative economic impacts are expected for a small number of individual participants, overall, the long-term impacts of the measures proposed to maintain a healthy herring resource, including those in the action proposed in this document, are expected to be positive.

5.6.5 Cumulative Impacts on Habitat (Including EFH)

A general description of habitat and EFH is provided in Section 4.3 of this document. Section 5.4 of this document addresses the impacts of the proposed specifications for the 2007-2009 fishing years on habitat and supports the conclusion that no impacts on habitat are expected from the proposed action.

The cumulative impact of the proposed action on habitat is minimal and not significant. The proposed Action for the 2007-2009 herring fishery specifications would affect the amount of herring caught and the geographic distribution of fishing activity between management areas. However, because fishing with midwater trawls and purse seines, the gears used in the directed herring fishery, does not impact EFH in a manner that is more than minimal or more than temporary in nature, the impacts to EFH of these alternatives are negligible, regardless of how much fishing takes place in any particular area.

5.6.6 Cumulative Impacts on Protected Species/Protected Resources

A general description of protected species is provided in Section 4.4 of this document, and more details are provided in proposed Amendment 1 to the Herring FMP. Section 5.5 of this document addresses the impacts of the proposed specifications for the 2007-2009 fishing years on protected species and supports the conclusion that no significant impacts on protected species are expected from the proposed action.

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

Because of their vulnerability to the gear types used, and also because herring is a primary prey species for seals, porpoises and some whales, protected species interactions with the herring fishery are likely to continue. The proposed action, however, should, at a minimum, not increase interactions or otherwise affect protected species beyond the status quo, and may have indirect positive benefits relative to herring as forage for protected species in the inshore Gulf of Maine as a result of the proposed OY and area TACs. This positive outcome could occur if effort shifts from Area 1, where herring TACs are most likely to be reached, to offshore areas (Area 2 and 3) where TACs have not been reached since the implementation of the Herring FMP. Despite ongoing negative effects on protected species as described above, the proposed action will not add or significantly contribute to negative cumulative effects.

5.6.7 Cumulative Impacts on Non-Target Species

Non-target species are discussed in the context of bycatch and incidental catch in the herring fishery throughout Sections 4.2.5, 4.2.6, and 4.2.7 of this document. A more thorough discussion of non-target species, including the relationship of herring to other fisheries (mackerel and lobster), is provided in Amendment 1 to the Herring FMP. For the purposes of this analysis, the relationship of herring to these other fisheries is addressed in the discussion of impacts on the fishery, provided in Section 5.3 of this document. The focus of the cumulative effects analysis for the fishery specifications as they impact non-target species is bycatch in the directed herring fishery.

The impacts of the proposed action on non-target species are likely to be minimal. The proposed reduction in the Area 1A TAC may benefit some non-target species in the Gulf of Maine if the herring fishery closes early and the catch of non-target species is consequently reduced. These impacts, however, are difficult to predict at this time, as they rely on changes in fishing patterns and adaptations that fishery participants may make in response to the new TACs (for example, increasing effort in offshore areas).

The proposed action also includes a requirement for the Council to conduct a one-year review of the fishery specifications to determine whether changes should be made for the 2008 and 2009 fishing years. This provides an opportunity to mitigate any unforeseen adverse impacts to this VEC, if necessary.

All species caught to any degree in the herring fishery, such as alewives, spiny dogfish, blueback herring, and Atlantic mackerel are managed under other FMPs. These FMPs identify significant sources of mortality or other fisheries impacts. Haddock bycatch in the herring fishery was addressed in Framework 43 to the Multispecies FMP (see previous discussion). Overall, the impacts of the proposed action, when combined with past, present, and reasonably foreseeable future actions, are not expected to be significant.

6.0 APPLICABLE LAW

6.1 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT (MSFCMA)

The proposed specifications for the Atlantic herring fishery were developed in a manner that is consistent with the provisions of the Atlantic Herring FMP, which established the specification process and its related requirements, as well as Amendment 1 to the Herring FMP. The Atlantic Herring FMP was found to be in compliance with the National Standards and other required provisions of the MSFCMA. Adjustments to the specification process, which are proposed in Amendment 1 (pending), are presumed also to be consistent with the National Standards and other required provisions of the M-S Act, as discussed in Section 10.0 of Amendment 1. Therefore, the proposed specifications which were developed in accordance with the proposed Amendment 1 specifications process are presumed to be consistent with National Standards and other required provisions of the Magnuson-Stevens Act. Nothing related to the proposed specifications for the 2007-2009 fishing years changes this determination.

6.2 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

6.2.1 Finding of No Significant Impact (FONSI)

National Oceanic and Atmospheric Administration Administrative Order 216-6 (NAO 216-6) (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality regulations at 40 C.F.R. 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant in making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These include:

1. *Can the proposed action be reasonably expected to jeopardize the sustainability of any target species that may be affected by the action?*

The proposed action is not expected to jeopardize the sustainability of the target species affected by this action – Atlantic herring. Relative to the no action alternative, the proposed action (NMFS-preferred alternative) is more conservative, is intended to prevent overfishing of the herring resource, including discrete spawning components, and is consistent with the best available scientific information (TRAC 2006). Overall, based on the updated stock assessment and related recommendations provided by the Herring PDT/TC, the Council has concluded the herring resource is healthy at this time, and the proposed action is therefore biologically sound. (see section 5 for a discussion of impacts of the proposed specifications)

The proposed action does not allow harvest levels in the Atlantic herring fishery to exceed levels established in recent years and actually reduces the total allowable yield (OY) by 5,000 mt. The proposed reduction in ABC is not likely to result in any short-term impacts because: (1) OY is proposed to be set at a level lower than ABC for reasons discussed throughout this document, and (2) yield from the domestic herring fishery has never reached the level proposed for ABC. The long-term benefits of reducing ABC to 194,000 mt are addressed in the TRAC 2006 Assessment document (Appendix I), as this is the level of biomass that is expected to produce MSY on a continuing basis. In addition, the TAC for Area 1A, where fishing effort on the inshore stock component is concentrated, is proposed to be reduced by 10,000 mt in 2007, and by 15,000 mt in 2008 and 2009, a conservative measure that addresses recent declining trends in the inshore surveys.

2. Can the proposed action be reasonably expected to jeopardize the sustainability of any non-target species?

Non-target species are discussed in Sections 4.2.5, 4.2.6, and 4.2.7 of this document. The proposed action is not expected to jeopardize the sustainability of any non-target species. The proposed action does not allow harvest levels in the Atlantic herring fishery to exceed levels established in recent years and reduces allowable catch in Area 1A where the majority of the fishery is concentrated during summer months. The proposed measures will likely reduce fishing effort and may therefore reduce interactions between herring fishing vessels and other species in the inshore Gulf of Maine.

3. Can the proposed action be reasonably expected to allow substantial damage to the ocean and coastal habitats and/or EFH as defined under the Magnuson-Stevens Act and identified in FMPs?

EFH and habitat are generally described in Section 4.3 of this document, and impacts are discussed in Section 5.4. This action is not expected to allow substantial damage to the ocean and coastal habitats and/or EFH as defined under the Magnuson-Stevens Act and identified in the FMP. In general, EFH that occurs in areas where the fishery occurs is designated as the bottom habitats consisting of varying substrates (depending upon species) within the Gulf of Maine, Georges Bank, and the continental shelf off southern New England and the Mid-Atlantic south to Cape Hatteras. The primary gears utilized to harvest Atlantic herring are purse seines and midwater trawls which typically do not impact bottom habitats. NOAA fisheries concluded that a consultation under the Magnuson-Stevens Act's EFH provisions was not required for the 2005 and 2006 herring specifications, and the same holds true for the specifications proposed for the 2007-2009 fishing years.

4. Can the proposed action be reasonably expected to have a substantial adverse impact on public health or safety?

When developing management measures, the Council usually receives extensive comments from affected members of the public regarding the safety implications of measures under consideration. The proposed action is not expected to have substantial adverse impacts on public health or safety. No such impacts were expected from specifications for previous years, and the Council has received no comments from affected members of the public suggesting that such impacts could be expected from the specifications that are proposed for the 2007-2009 fishing years.

5. Can the proposed action be reasonably expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?

Protected resources that may be affected by the proposed action are generally described in Section 4.4 of this document, and impacts are discussed in Section 5.5. The proposed action is not reasonably expected to have an adverse impact on endangered or threatened species, marine mammals, or critical habitat for these species. The activities to be conducted under the proposed action are within the scope of the FMP and do not change the basis for the determinations made in previous consultations.

Specifically, the proposed action should, at a minimum, not increase interactions or otherwise affect protected species beyond the status quo, and may have indirect positive benefits relative to herring as forage for protected species in the inshore Gulf of Maine. This positive outcome could occur if, as intended by the Council, the specification of OY and the distribution of TACs results in effort shifts from Area 1, where herring TACS are most likely to be reached, to offshore areas (Area 2 and 3) where TACs have not been reached since the implementation of the Herring FMP.

6. Can the proposed action be expected to have a substantial impact on biodiversity and ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships)?

The proposed action is not expected to have a substantial impact on biodiversity and ecosystem function within the affected area. While herring is recognized as one of many important forage fish for marine mammals, other fish, and birds throughout the region, the resource appears to be large enough at this time to accommodate all predators including Atlantic bluefish, Atlantic striped bass, and several other pelagic species such as shark and tunas. The Atlantic herring itself is not known to prey on other species of fish but prefers chaetognaths and euphausiids.

The proposed action is intended to continue to ensure biodiversity and ecosystem stability over the short-term. The Council is proposing to establish a buffer of 29,000 mt between ABC and OY when projected Canadian catch is included. This buffer is intended, in part, to ensure that an adequate forage base continues to be available for important fish, marine mammal, and bird species in the Gulf of Maine region. This buffer is provided in addition to the predation mortality on herring assumed in the stock assessment, which produced a lower value for MSY, and consequently ABC proposed in this action (194,000 mt instead of 220,000 mt).

7. Are significant social or economic impacts interrelated with significant natural or physical environmental effects?

A discussion of the impacts of the proposed action is presented in Section 5.0 of this document. The analyses find that no significant natural or physical environmental effects are expected from the proposed action. The proposed action does not allow harvest levels in the Atlantic herring fishery to exceed levels established in recent years and actually reduces the total allowable yield (OY) by 5,000 mt. The proposed reduction in ABC is not likely to result in any short-term impacts because: (1) OY is proposed to be set at a level lower than ABC for reasons discussed throughout this document, and (2) yield from the domestic herring fishery has never reached the level proposed for ABC. The long-term benefits of reducing ABC to 194,000 mt are addressed in the TRAC 2006 Assessment document (Appendix I), as this is the level of biomass that is expected to produce MSY on a continuing basis. In addition, the TAC for Area 1A, where fishing effort on the inshore stock component is concentrated, is proposed to be reduced by 15,000 mt, a conservative measure that addresses recent declining trends in the inshore surveys.

Table 50 summarizes the impacts related to the key component of the proposed action (a 17% reduction in the Area 1A TAC in 2007, and a 25% reduction in 2008 and 2009), which is expected to produce the greatest social and economic impacts relative to the other proposed specifications. The Area 1A TAC is the only TAC that is fully utilized on an annual basis, and a 17-25% reduction in this TAC is expected to affect a number of individuals, from the harvesting and processing sectors as well as consumers (lobstermen, bait dealers, etc.).

Table 50 Potential Social and Economic Impacts of Proposed 17-25% Reduction in the Area 1A TAC

TAC ALTS	WHO/WHAT MAY BE IMPACTED?	NATURE OF IMPACTS	OTHER COMMENTS
Proposed Action **High Impact** **Key feature: Reduction of Area 1A TAC from 60,000 to 50,000 mt in 2007, and to 45,000 mt in 2008 and 2009**	• Purse seine vessels • Other vessels dependent on Area 1A • Sardine cannery • Other processors in communities adjacent to GOM • Lobster fishery	• Loss in revenues/income • Loss of supply/effects on markets • Localized Price effects • Derby fishing • Longer steam time • Safety considerations • Increased fuel costs • More time away from families/home	• Purse seine vessels most reliant on Area 1A and most limited in terms of flexibility • These impacts will be shaped by the implementation of Amendment 1 – particularly the PS/FG only area.

Table 51 summarizes the potential loss in revenues for limited access vessels that were active in Area 1A from 2003-2005, assuming that Area 1A landings from these vessels stay proportionately the same as they were during the 2005 fishing year. The estimated impacts in Table 51 are based on lost catch from Area 1A only and do not include costs associated with increased steam time to other areas and/or increased catches from other areas that may offset some of the lost 1A revenues. If they cannot increase their proportion of the Area 1A TAC, the four traditional purse seine vessels are likely to be the most impacted at the individual vessel level because they cannot safely access other management areas to fish for herring. These estimates also do not consider the potential impacts of the purse seine/fixed gear-only area that may be implemented as part of Amendment 1 to the Herring FMP (see discussion in Section 5.3.1.1.2 of this document).

Table 51 Potential Loss in Revenues from Area 1A TAC Reduction to 50,000 mt in 2007 and 45,000 mt in 2008 and 2009 (Proposed Action), Assuming 2005 Proportion of Catch by Gear Type

Active Vessels (2003-2005)	% of 2005 Area 1A Catch	Maximum Projected Loss (mt) Based on Historic % of 2005 1A Catch	Gear Sector Total Potential Loss ($)	Individual Vessel Potential Loss ($)
Purse Seine (4)	27%	2,700 (at 50,000 mt level) 4,050 (at 45,000 mt level)	$545,400 (at 50,000 mt level) $818,100 (at 45,000 mt level)	$136,350 (at 50,000 mt level) $204,525 (at 45,000 mt level)
Midwater Trawl (4)	18%	1,800 (at 50,000 mt level) 2,700 (at 45,000 mt level)	$363,600 (at 50,000 mt level) $545,400 (at 45,000 mt level)	$90,900 (at 50,000 mt level) $136,350 (at 45,000 mt level)
Pair Trawl (12)	55%	5,500 (at 50,000 mt level) 8,250 (at 45,000 mt level)	$1,111,000 (at 50,000 mt level) $1,666,500 (at 45,000 mt level)	$92,583 (at 50,000 mt level) $138,875 (at 45,000 mt level)

If the proposed reduction in the Area 1A TAC leads to healthier herring stocks, then these measures may have positive benefits for all participants over the long-term. Healthy fish stocks are an essential foundation for economic and social sustainability in relation to this fishery. More plentiful herring could also lead to greater participation of the stop seine or weir fishery which depends on herring coming in shore. Moreover, where this action encourages activity in the offshore management areas, these fisheries may be further developed and may result in improved information about the location of stocks – an area where there is much room for growth.

These impacts will not be evenly distributed across fishery participants, with larger impacts expected to fall on vessels that are most dependent on Area 1A and cannot safely access offshore areas to fish for herring. Some of the economic impacts are likely to be offset by adaptations to the proposed action as well as the measures that may be implemented in Amendment 1.

Despite the potential socio-economic impacts resulting from the proposed action, there is not a need to prepare an EIS. The purpose of NEPA is to protect the environment by requiring Federal agencies to consider the impacts of their proposed action on the human environment, defined as "the natural and physical environment and the relationship of the people with that environment." The EA for the 2007-2009 fishery specifications describes and analyzes the proposed measures and alternatives and concludes there will be no significant impacts to the natural and physical environment. While some fishermen, shoreside businesses and others may experience impacts, these impacts in and of themselves do not require the preparation of an EIS, as supported by NEPA's implementing regulations at 40 CFR. 1508.14. Consequently, because the EA demonstrates that the action's potential natural and physical impacts are not significant, the execution of a FONSI remains appropriate under criteria 7.

8. To what degree are the effects on the quality of human environment expected to be highly controversial?

The effects of the proposed action on the quality of human environment are not expected to be highly controversial. The need to maintain a sustainable herring resource is grounded in Federal fisheries law and forms the basis of the goals and objectives of the herring management program, as described in Amendment 1 to the Herring FMP. While there was substantial debate over the status of the inshore component and the impact of the directed fishery in the inshore Gulf of Maine, the Council developed the proposed specifications while considering the needs of herring fishery participants, other fishery-related interests, and the long-term health of the Atlantic herring resource.

9. *Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?*

The proposed action is not expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas. The proposed action affects fishing for herring in the U.S. Exclusive Economic Zone and is not expected to have any impacts on shoreside historical and/or cultural resources. In addition, the proposed action is not expected to substantially affect fishing and other vessel operations around the unique historical and cultural resources encompassed by the Stellwagen Bank National Marine Sanctuary.

10. *Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?*

The proposed action is not expected to result in highly uncertain effects on the human environment or involve unique or unknown risks. The specifications proposed in this document used the best available science (presented in section 4) and are consistent with those adopted in past years and are based on the provisions for the specifications process outlined in both the Herring FMP and Amendment 1. While there is uncertainty related to the biomass of the inshore stock component and the inshore/offshore mixing rates, the analytic tools used to evaluate the proposed action and other alternatives account for this by evaluating the proposed measures across a range of mixing ratios and providing sensitivity runs for the inshore stock size. The analytic methodology was applied in previous actions (2005/2006 specifications), and related uncertainties have been further addressed in this assessment. In addition, while there may be some degree of uncertainty related to how fishery participants may respond to the proposed specifications, potential adaptations and responses have been considered to the extent possible in this analysis.

11. Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

The proposed action is not related to other actions with individually insignificant but cumulatively significant impacts. Recent management actions in this fishery include Amendment 1 to the Herring FMP and Framework 43 to the Northeast Multispecies FMP.

The proposed action is most closely related to Amendment 1 to the Herring FMP, which was recently submitted to NMFS (May 3, 2006). This action sets specifications using a process authorized by the FMP, and most recently Amendment 1 to the FMP. The cumulative effects analysis presented in Section 5.6 of this document considers the impacts of the proposed action in combination with relevant past, present, and reasonably foreseeable future actions and concludes that no additional significant cumulative impacts are expected from the 2007-2009 herring specifications. The most notable RFFA is Amendment 1 to the Herring FMP.

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

The proposed action is not likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, nor is the proposed action expected to cause loss or destruction to significant scientific, cultural, or historical resources, because none of these features are present in the affected area. The proposed action is specific only to the specifications and TACs for the Atlantic herring fishery, which occurs primarily in the Exclusive Economic Zone (EEZ).

13. Can the proposed action reasonably be expected to result in the introduction or spread of a non-indigenous species?

The proposed action is not expected to result in the introduction or spread of a non-indigenous species. The proposed action relates specifically to removals of Atlantic herring in the Northeast Region. Vessels affected by the proposed action are those currently engaged in the Atlantic herring fishery and expected to qualify for a limited access permit under Amendment 1 to the Herring FMP. The fishing-related activity of these vessels is anticipated to occur solely within the Northeast Region and should not result in the introduction or spread of a non-indigenous species.

14. Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

The proposed action is not likely to establish a precedent for future actions with significant effects and does not represent a decision in principle about a future consideration. The proposed action adopts specifications for the 2007-2009 fishing years only, with a required review by the Council during the 2007 fishing year. This action is consistent with specifications adopted in past years and is based on the provisions for the specifications process outlined in both the Herring FMP and Amendment 1. The intent of the process is to establish specifications and other TACs for a short time frame (in this case, three years) so that new stock and fishery information can be reviewed and considered prior to making decisions about specifications in future years. The measures are designed to specifically address current stock and fishery conditions and are not intended to represent a decision about future management actions that may include other measures.

15. Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

The proposed action is intended to establish fishery specifications and TACs that will offer further protection to marine resources, particularly Atlantic herring, and would not threaten a violation of Federal, State, or Local law or other requirements to protect the environment. This action was determined to be consistent with the Coastal Zone Management Act (CZMA) requirements of the affected States.

16. Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

As stated in the responses to the first two criteria in this section, the proposed action is not expected to result in cumulative adverse effects that would have a substantial effect on target and/or non-target species. This action would establish specifications and TACs for the 2007-2009 fishing years, with the intent of minimizing the risk of overfishing the inshore component of the resource while allowing the herring fishery to continue to expand.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for the 2007-2009 herring specifications, it is hereby determined that the 2007-2009 herring specifications will not significantly impact the quality of the human environment as described above and in the supporting Environmental Assessments. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an EIS for this action is not necessary.

_____ _____

Assistant Administrator for Fisheries, NOAA Date

William T. Hogarth, Ph. D

6.3 MARINE MAMMAL PROTECTION ACT

The NEFMC has reviewed the impacts of the 2007-2009 herring specifications on marine mammals and has concluded that the management actions proposed are consistent with the provisions of the MMPA, and will not alter existing measures to protect the species likely to inhabit the herring management unit. For further information on the potential impacts of the fishery and the proposed management action on marine mammals, see Section 5.5 of this document.

6.4 ENDANGERED SPECIES ACT

Section 7 of the Endangered Species Act requires federal agencies conducting, authorizing or funding activities that affect threatened or endangered species to ensure that those effects do not jeopardize the continued existence of listed species. The NEFMC has concluded, using information available at this writing, that the proposed herring specifications and the prosecution of the herring fishery is not likely to jeopardize any ESA-listed species or alter or modify any critical habitat, based on the discussion of impacts in this document (Section 5.5). The NEFMC is seeking the concurrence of the National Marine Fisheries Service in this matter.

6.5 ADMINISTRATIVE PROCEDURES ACT

The Council is not requesting relief from the requirements of the APA for notice and comment rulemaking.

6.6 PAPERWORK REDUCTION ACT

The proposed contains no new or additional collection-of-information requirements.

6.7 COASTAL ZONE MANAGEMENT ACT

The Council determined that the proposed 2007-2009 Atlantic herring specifications are consistent with the approved coastal management programs of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina.

This determination was submitted for review by the responsible state agencies under §307 of the Coastal Zone Management Act, on November 6, 2006.

6.8 DATA QUALITY ACT

Pursuant to NOAA Fisheries guidelines implementing Section 515 of Public Law 106-554 (Data Quality Act), all information products released to the public must first undergo a Pre-Dissemination Review to ensure and maximize the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by Federal agencies. The following section addresses these requirements.

Utility

Utility means that disseminated information is useful to its intended users. "Useful" means that the content of the information is helpful, beneficial, or serviceable to its intended users, or that the information supports the usefulness of other disseminated information by making it more accessible or easier to read, see, understand, obtain or use. The intended users of the information contained in this document are participants in the Atlantic herring fishery and other interested parties and members of the general public. The information contained in this document may be useful to owners of vessels holding an Atlantic herring permit as well as Atlantic herring dealers and processors since it serves to notify these individuals of any potential changes to management measures for the fishery. This information will enable these individuals to adjust their fishing practices and make appropriate business decisions based on the new management measures and corresponding regulations.

The information being provided in this specifications package concerning the status of the Atlantic herring fishery is updated based on landings and effort information through the 2005 fishing year (January 1 – December 31, 2005). Information presented in this document is intended to support the proposed specifications for the 2007-2009 fishing years, which have been developed through a multi-stage process involving all interested members of the public. Consequently, the information pertaining to management measures contained in this document has been improved based on comments from the public, fishing industry, members of the Council, and NOAA Fisheries.

The media being used in the dissemination of the information contained in this document will be contained in a *Federal Register* notice announcing the proposed and final rules for this action. This information will be made available through printed publication and on the Internet website for the Northeast Regional Office (NERO) of NOAA Fisheries.

Integrity

Integrity refers to security – the protection of information from unauthorized access or revision, to ensure that the information is not compromised through corruption or falsification. Prior to dissemination, NOAA information, independent of the intended mechanism for distribution, is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information.

Objectivity

Objective information is presented in an accurate, clear, complete, and unbiased manner, and in proper context. The substance of the information is accurate, reliable, and unbiased; in the scientific, financial, or statistical context, original and supporting data are generated and the analytical results are developed using sound, commonly-accepted scientific and research methods. "Accurate" means that information is within an acceptable degree of imprecision or error appropriate to the particular kind of information at issue and otherwise meets commonly accepted scientific, financial, and statistical standards.

Several sources of data were used in the development of this document, including the analysis of potential impacts. These data sources include, but are not limited to: landings data from vessel trip reports, landings data from individual voice reports, information from resource trawl surveys, data from the dealer weighout purchase reports, descriptive information provided (on a voluntary basis) by processors and dealers of Atlantic herring, and ex-vessel price information. Although there are some limitations to the data used in the analysis of impacts of management measures and in the description of the affected environment, these data are considered to be the best available.

The policy choices (i.e., management measures) proposed in this specifications package are supported by the best available scientific information. Qualitative discussion is provided in cases where quantitative information was unavailable, utilizing appropriate references as necessary.

The review process for any action under an FMP involves the Northeast Regional Office (NERO) of NOAA Fisheries, the Northeast Fisheries Science Center (Center), and NOAA Fisheries Headquarters (Headquarters). The Council review process involves public meetings at which affected stakeholders have the opportunity to provide comments on the proposed changes to the FMP. Reviews by staff at NERO are conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. The Center's technical review is conducted by senior-level scientists with specialties in population dynamics, stock assessment methodology, fishery resources, population biology, and the social sciences.

Final approval of this specification package and clearance of the proposed and final rules is conducted by staff at NOAA Fisheries Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget. This review process is standard for any action under an FMP, and provides input from individuals having various expertise who may not have been directly involved in the development of the proposed action. Thus, the review process for any FMP modification, including the herring specifications for the 2007-2009 fishing years, is performed by technically-qualified individuals to ensure the action is valid, complete, unbiased, objective, and relevant.

6.9 IMPACTS RELATIVE TO FEDERALISM/E.O. 13132

The Executive Order on Federalism established nine fundamental federalism principles to which Executive agencies must adhere in formulating and implementing policies having federalism implications. The E.O. also lists a series of policy making criteria to which agencies must adhere when formulating and implementing policies that have federalism implications. However, no federalism issues or implications have been identified relative to the proposed action.

The proposed action does not contain policies with federalism implications sufficient to warrant preparation of an assessment under E.O. 13132. The affected States have been closely involved in the development of the proposed specifications through their involvement in the Regional Fishery Management Council process (i.e., all affected states are represented as voting members on at least one Council) and the ASMFC process. The proposed specifications were developed with the full participation and cooperation of the state representatives of the New England Council and the ASMFC Atlantic Herring Section. No comments were received from any state officials relative to any federalism implications of the proposed specifications.

6.10 REGULATORY FLEXIBILITY ACT/E.O. 12866

6.10.1 Regulatory Impact Review and Initial Regulatory Flexibility Analysis (IRFA)

This section provides the analysis and conclusions to address the requirements of Executive Order 12866 and the Regulatory Flexibility Act (RFA). Since many of the requirements of these mandates duplicate those required under the Magnuson-Stevens Act and NEPA, this section contains references to other sections of this document. The following sections provide the basis for concluding that the proposed action is not significant under E.O. 12866 and will not have a significant economic impact on a substantial number of small entities under the RFA.

6.10.2 Description of Management Objectives

The goals and objectives of the management plan for the Atlantic herring resource are stated in Section 2.3 of the Atlantic Herring FMP and are modified in Section 3.2 of Amendment 1. The proposed action is consistent with these goals and objectives and is designed to achieve many of the objectives, as discussed in Section 1.2 of this document.

6.10.3 Description of the Fishery

Section 4.0 of the Herring FMP contains a detailed description of the Atlantic herring fishery. Section 7.4 of Amendment 1 updates the information in the Herring FMP and provides a comprehensive description of fishery-related businesses and communities. In addition, following development of the Herring FMP, Stock Assessment and Fishery Evaluation (SAFE) Reports have been prepared for each fishing year from 1998-2005. The 2005 SAFE Report was developed by the Herring PDT following the completion of Amendment 1 and its associated EIS, and updates fishery information through the 2005 fishing year whenever possible. Much of the information from the 2005 SAFE Report is presented in Section 4.0 of this document.

6.10.4 Statement of the Problem

The purpose and need for this action is identified in Section 1.2 of this document. The Herring FMP requires that the Council and the Regional Administrator annually review the best available stock and fishery data when developing specifications for the upcoming fishing year. Amendment 1 modifies this process and allows for three-year specifications, as proposed in this document, with a required one year review to be conducted by the Council.

6.10.5 Description of the Alternatives

The proposed action is described in Section 2.0 of this document. Alternatives to the proposed action that were considered during the specification process, in addition to the no action alternative, are described in Section 3.0 of this document.

6.10.6 Economic Analysis

The economic impacts of the proposed action as well as other alternatives considered during the specification process are discussed in detail in Section 5.3 of this document.

Table 52 summarizes the impacts related to the key component of the proposed action (a 17% reduction in the Area 1A TAC in 2007, and a 25% reduction in 2008 and 2009), which is expected to produce the greatest social and economic impacts relative to the other proposed specifications. The Area 1A TAC is the only TAC that is fully utilized on an annual basis, and a 17-25% reduction in this TAC is expected to affect a number of individuals, from the harvesting and processing sectors as well as consumers (lobstermen, bait dealers, etc.).

Table 52 Potential Social and Economic Impacts of Proposed 17-25% Reduction in the Area 1A TAC

TAC ALTS	WHO/WHAT MAY BE IMPACTED?	NATURE OF IMPACTS	OTHER COMMENTS
Proposed Action **High Impact** **Key feature: Reduction of Area 1A TAC from 60,000 to 50,000 mt in 2007, and to 45,000 mt in 2008 and 2009**	• Purse seine vessels • Other vessels dependent on Area 1A • Sardine cannery • Other processors in communities adjacent to GOM • Lobster fishery	• Loss in revenues/income • Loss of supply/effects on markets • Localized Price effects • Derby fishing • Longer steam time • Safety considerations • Increased fuel costs • More time away from families/home	• Purse seine vessels most reliant on Area 1A and most limited in terms of flexibility • These impacts will be shaped by the implementation of Amendment 1 – particularly the PS/FG only area.

Table 53 summarizes the potential loss in revenues for limited access vessels that were active in Area 1A from 2003-2005, assuming that Area 1A landings from these vessels stay proportionately the same as they were during the 2005 fishing year. The estimated impacts in Table 51 are based on lost catch from Area 1A only and do not include costs associated with increased steam time to other areas and/or increased catches from other areas that may offset some of the lost 1A revenues. If they cannot increase their proportion of the Area 1A TAC, the four traditional purse seine vessels are likely to be the most impacted at the individual vessel level because they cannot safely access other management areas to fish for herring. These estimates also do not consider the potential impacts of the purse seine/fixed gear-only area that may be implemented as part of Amendment 1 to the Herring FMP (see discussion in Section 5.3.1.1.2 of this document).

Table 53 Potential Loss in Revenues from Area 1A TAC Reduction to 50,000 mt in 2007 and 45,000 mt in 2008 and 2009 (Proposed Action), Assuming 2005 Proportion of Catch by Gear Type

Active Vessels (2003-2005)	% of 2005 Area 1A Catch	Maximum Projected Loss (mt) Based on Historic % of 2005 1A Catch	Gear Sector Total Potential Loss ($)	Individual Vessel Potential Loss ($)
Purse Seine (4)	27%	2,700 (at 50,000 mt level) 4,050 (at 45,000 mt level)	$545,400 (at 50,000 mt level) $818,100 (at 45,000 mt level)	$136,350 (at 50,000 mt level) $204,525 (at 45,000 mt level)
Midwater Trawl (4)	18%	1,800 (at 50,000 mt level) 2,700 (at 45,000 mt level)	$363,600 (at 50,000 mt level) $545,400 (at 45,000 mt level)	$90,900 (at 50,000 mt level) $136,350 (at 45,000 mt level)
Pair Trawl (12)	55%	5,500 (at 50,000 mt level) 8,250 (at 45,000 mt level)	$1,111,000 (at 50,000 mt level) $1,666,500 (at 45,000 mt level)	$92,583 (at 50,000 mt level) $138,875 (at 45,000 mt level)

If the proposed reduction in the Area 1A TAC leads to healthier herring stocks, then these measures may have positive benefits for all participants over the long-term. Healthy fish stocks are an essential foundation for economic and social sustainability in relation to this fishery. More plentiful herring could also lead to greater participation of the stop seine or weir fishery which depends on herring coming in shore. Moreover, where this action encourages activity in the offshore management areas, these fisheries may be further developed and may result in improved information about the location of stocks – an area where there is much room for growth.

These impacts will not be evenly distributed across fishery participants, with larger impacts expected to fall on vessels that are most dependent on Area 1A and cannot safely access offshore areas to fish for herring. Some of the economic impacts are likely to be offset by adaptations to the proposed action as well as the measures that may be implemented in Amendment 1.

6.10.7 Determination of Significance Under E.O. 12866

NMFS Guidelines provide criteria to be used to evaluate whether a proposed action is significant. A significant regulatory action means any regulatory action that is likely to result in a rule that may:

1. *Have an annual effect on the economy of $100 million or more, or adversely effect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local or tribal governments or communities.*

   The proposed action will not have an effect on the economy in excess of $100 million. The proposed action is not expected to have any adverse impacts on the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local or tribal governments or communities.

2. *Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency.*

   The proposed action will not create a serious inconsistency with or otherwise interfere with an action taken or planned by another agency. No other agency has indicated that it plans an action that will affect the Atlantic herring fishery in the EEZ.

3. *Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof.*

   The proposed action will not materially alter the budgetary impact of entitlements, grants, user fees or loan programs, or the rights and obligations of their participants.

4. Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

The proposed action does not raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in E.O. 12866.

6.10.8 Initial Regulatory Flexibility Analysis

The following sections contain analyses of the effect of the proposed action on small entities. Under Section 603(b) of the RFA, each initial regulatory flexibility analysis is required to address:

1. Reasons why the agency is considering the action,
2. The objectives and legal basis for the proposed rule,
3. The kind and number of small entities to which the proposed rule will apply,
4. The projected reporting, record-keeping and other compliance requirements of the proposed rule, and
5. All Federal rules that may duplicate, overlap or conflict with the proposed rule.

6.10.9 Reasons for Considering the Action

The purpose and need for this action is identified in Section 1.2 of this document. The Herring FMP requires that the Council and the Regional Administrator annually review the best available stock and fishery data when developing specifications for the upcoming fishing year. Amendment 1 modifies this process and allows for three-year specifications, as proposed in this document, with a required one year review to be conducted by the Council.

6.10.10 Objectives and Legal Basis for the Action

The objective of the proposed action is to implement specifications for the 2007-2009 Atlantic herring fishery, as required under the regulations implementing the Atlantic Herring FMP, which are provided in 50 CFR 648. The proposed action is also consistent with the related provisions in Amendment 1 (pending).

6.10.11 Description and Number of Small Entities to Which the Rule Applies

All of the potentially affected businesses are considered small entities under the standards described in NOAA Fisheries guidelines because they have gross receipts that do not exceed $3.5 million annually. During the 2005 fishing year, there were 143 vessels that landed herring, 33 of which averaged more than 2,000 lb of herring per trip. More information about the affected entities is provided in Section 4.2 of this document. The 33 directed herring vessels during 2005 are described in Table 17and Table 18 – 10 pair trawl vessels, 10 midwater trawl vessels, 4 purse seine vessels, and 9 bottom trawl vessels. All of the processors involved in the herring fishery are described in detail in Section 7.4.1 of Amendment 1, and updated information about the processors is provided in Section 5.1.2.2 of this document.

Amendment 1 to the Herring FMP is expected to be implemented at or near the start of the 2007 fishing year. The measures in Amendment 1 will likely include a limited access program for all management areas in the herring fishery and will further limit participation in the directed fishery. The impacts of the proposed herring fishery specifications for 2007-2009 should be considered relative to the vessels that are

expected to qualify for limited access permits under the Amendment 1 management program. More specifically, since the Area 1A TAC is proposed to be reduced, the impacts should be considered relative to the vessels that qualify for limited access permits to fish in Area 1.

Of the 90 vessels that qualify for limited access permits to fish in Area 1 (see Section 5.3.1.1 of this document as well as the analyses provided in Amendment 1), 31 vessels qualify for limited access directed fishery permits. Of these qualifying vessels, only 20 had landings from Area 1A from 2003 through 2005. These 20 recently-active limited access directed fishery permit vessels are the primary focus of the discussion of impacts in this document. See Section 4.2 of this document for more detailed information.

6.10.12 Recordkeeping and Reporting Requirements

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

6.10.13 Duplication, Overlap, or Conflict with Other Federal Rules

The proposed action does not duplicate, overlap or conflict with any other Federal rules.

6.10.14 Economic Impacts on Small Entities Resulting from the Proposed Action

Section 5.3 of this document contains the economic analysis of the proposed action and other alternatives that were considered during the specification process. The proposed specifications should allow for incremental growth in the industry, while taking into consideration biological uncertainty and the importance of herring as a forage species in the Northeast Region.

Table 54 summarizes the impacts related to the key component of the proposed action (a 17% reduction in the Area 1A TAC in 2007, and a 25% reduction in 2008 and 2009), which is expected to produce the greatest social and economic impacts relative to the other proposed specifications. The Area 1A TAC is the only TAC that is fully utilized on an annual basis, and a 17-25% reduction in this TAC is expected to affect a number of individuals, from the harvesting and processing sectors as well as consumers (lobstermen, bait dealers, etc.).

Table 54 Potential Social and Economic Impacts of Proposed 17% Reduction in the Area 1A TAC

TAC ALTS	WHO/WHAT MAY BE IMPACTED?	NATURE OF IMPACTS	OTHER COMMENTS
Proposed Action **High Impact** **Key feature: Reduction of Area 1A TAC from 60,000 to 50,000 mt in 2007, and to 45,000 mt in 2008 and 2009**	• Purse seine vessels • Other vessels dependent on Area 1A • Sardine cannery • Other processors in communities adjacent to GOM • Lobster fishery	• Loss in revenues/income • Loss of supply/effects on markets • Localized Price effects • Derby fishing • Longer steam time • Safety considerations • Increased fuel costs • More time away from families/home	• Purse seine vessels most reliant on Area 1A and most limited in terms of flexibility • These impacts will be shaped by the implementation of Amendment 1 – particularly the PS/FG only area.

Table 55 summarizes the potential loss in revenues for limited access vessels that were active in Area 1A from 2003-2005, assuming that Area 1A landings from these vessels stay proportionately the same as they were during the 2005 fishing year. The estimated impacts in Table 55 are based on lost catch from Area 1A only and do not include costs associated with increased steam time to other areas and/or increased catches from other areas that may offset some of the lost 1A revenues. If they cannot increase their proportion of the Area 1A TAC, the four traditional purse seine vessels are likely to be the most impacted at the individual vessel level because they cannot safely access other management areas to fish for herring. These estimates also do not consider the potential impacts of the purse seine/fixed gear-only area that may be implemented as part of Amendment 1 to the Herring FMP (see discussion in Section 5.3.1.1.2 of this document).

Table 55 Potential Loss in Revenues from Area 1A TAC Reduction to 50,000 mt in 2007 and 45,000 mt in 2008 and 2009 (Proposed Action), Assuming 2005 Proportion of Catch by Gear Type

Active Vessels (2003-2005)	% of 2005 Area 1A Catch	Maximum Projected Loss (mt) Based on Historic % of 2005 1A Catch	Gear Sector Total Potential Loss ($)	Individual Vessel Potential Loss ($)
Purse Seine (4)	27%	2,700 (at 50,000 mt level) 4,050 (at 45,000 mt level)	$545,400 (at 50,000 mt level) $818,100 (at 45,000 mt level)	$136,350 (at 50,000 mt level) $204,525 (at 45,000 mt level)
Midwater Trawl (4)	18%	1,800 (at 50,000 mt level) 2,700 (at 45,000 mt level)	$363,600 (at 50,000 mt level) $545,400 (at 45,000 mt level)	$90,900 (at 50,000 mt level) $136,350 (at 45,000 mt level)
Pair Trawl (12)	55%	5,500 (at 50,000 mt level) 8,250 (at 45,000 mt level)	$1,111,000 (at 50,000 mt level) $1,666,500 (at 45,000 mt level)	$92,583 (at 50,000 mt level) $138,875 (at 45,000 mt level)

With a 10,000-15,000 mt decrease in the Area 1 TAC, the impact of the proposed action on the purse seine fleet could be large. It is difficult to predict what the impact will be on the purse seine fleet because at the time the proposed reduction in the Area 1A TAC would be implemented, the purse seine/fixed gear (PS/FG) only area may be in effect. Without knowing what portion of an Area 1A TAC of 60,000 mt the purse seine fleet might land with the implementation of a PS/FG only area, it is difficult to know what a reduction of 10,000-15,000 mt might mean under the same conditions. The PS/FG only area would eliminate competing midwater trawl vessels from Area 1A during the most productive part of the Area 1A fishery (June – September). Given this, it is likely that the existing purse seine fleet would increase its landings from the area. On the other hand, establishing a PS/FG only area may intensify the race to fish in Area 1A as midwater trawl vessels try to catch more herring from the area prior to June 1.

If the PS/FG only area is not approved/implemented as part of Amendment 1, a reduction in the Area 1A TAC would exacerbate existing levels of competition for the inshore quota and may result in an even earlier closure of the fishery. Purse seine vessels would be particularly disadvantaged if this were to occur, as they have fewer options available to them and are entirely dependent on herring. In 2005, the purse seine fleet caught 27% of the Area 1A TAC. If the proportion of the herring catch by the purse seine fleet remains the same and the decrease in the Area 1A TAC cannot be made up from fishing in other areas, there would be a 2,700 mt loss in catch under the proposed action in 2007, and a 4,050 mt loss in 2008 and 2009. Using the 2005 average price of herring of $202 per metric ton, this catch is worth $545,400 and $818,000, respectively, across the sector (there are four vessels in the limited access purse seine fleet). Purse seine vessels would have to either increase their proportion of the herring catch in Area 1A relative to midwater trawlers (which may be achieved by implementing the PS/FG only area) or move to other areas. Moving to offshore areas may be problematic due to the size of the vessels and the schooling behavior of the fish in offshore areas. There were no landings from Area 3 by the purse seine fleet in 2005.

If the proposed reduction in the Area 1A TAC leads to healthier herring stocks, then these measures may have positive benefits for all participants over the long-term. Healthy fish stocks are an essential foundation for economic and social sustainability in relation to this fishery. More plentiful herring could also lead to greater participation of the stop seine or weir fishery which depends on herring coming in shore. Moreover, where this action encourages activity in the offshore management areas, these fisheries may be further developed and may result in improved information about the location of stocks – an area where there is much room for growth.

7.0 REFERENCES

For the description of the affected environment (Section 4.0), the references included in Section 14.0 of the Amendment 1 document apply to this document and are incorporated by reference. The references listed below are those in addition to references in Amendment 1 and/or those that were specifically referenced for the purposes of preparing this specifications document.

Atlantic States Marine Fisheries Commission (ASMFC). 1999. Amendment 1 to the Interstate Fishery Management Plan for Atlantic Sea Herring. Fishery Management Report No. 33.

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TRAC. 2003. Report of the meeting held 10-14 February 2003. Transboundary Resource Assessment Committee. St Andrews, NB. May 2003. 27 pp.

TRAC. 2006. Report of the meeting held May 2006. Transboundary Resource Assessment Committee. Woods Hole, MA. see Appendix I.

8.0 LIST OF PREPARERS AND AGENCIES CONSULTED

This document was prepared by the New England Fishery Management Council and the National Marine Fisheries Service, in consultation with the Atlantic States Marine Fisheries Commission and the Mid-Atlantic Fishery Management Council. Members of the New England Fishery Management Council's Herring Plan Development Team and the ASMFC Herring Technical Committee include:

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- Peter Himchak, NJ DFW

The following agencies were consulted during the development of the herring fishery specifications, either through direct communication/correspondence and/or participation on the Herring Committee or PDT:

- NOAA Fisheries, National Marine Fisheries Service, Northeast Regional Office, Gloucester MA
- Northeast Fisheries Science Center, Woods Hole MA
- Atlantic States Marine Fisheries Commission and Atlantic Herring Section
- Mid-Atlantic Fishery Management Council

Letters were also sent to the potentially-affected States for the purposes of reviewing the consistency of the proposed action relative to each State's Coastal Zone Management Program (see Section 6.7 of this document for a list of States that were contacted).

9.0 LIST OF ACRONYMS

ABC	Allowable Biological Catch
ACOE	Army Core of Engineers
AHE	Affected Human Environment
APA	American Pelagic Association
ASMFC	Atlantic States Marine Fisheries Commission or Commission
B	Biomass
BT	Border Transfer
CAA	Catch at Age
CEQ	Council on Environmental Quality
CHOIR	Coalition for the Atlantic Herring Fishery's Orderly, Informed, and Responsible Long-Term Development
CZMA	Coastal Zone Management Act
DAH	Domestic Annual Harvest
DAP	Domestic Annual Processing
DEA	Data Envelopment Analysis
DMF	Division of Marine Fisheries
DMR	Department of Marine Resources
DSEIS	Draft Supplemental Environmental Impact Statement
DWF	Distant-Water Fleets
EA	Environmental Assessment
ECPA	East Coast Pelagic Association
ECTA	East Coast Tuna Association
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
E.O.	Executive Order
ESA	Endangered Species Act of 1973
F	Fishing Mortality Rate

FEIS	Final Environmental Impact Statement
FMP	Fishery Management Plan
FSEIS	Final Supplemental Environmental Impact Statement
FY	Fishing Year
GB	Georges Bank
GEA	Gear Effects Evaluation
GIFA	Governing International Fisheries Agreement
GMRI	Gulf of Maine Research Institute
GOM	Gulf of Maine
GRT	Gross Registered Tons
HAPC	Habitat Area of Particular Concern
HCA	Habitat Closed Area
HPTRP	Harbor Porpoise Take Reduction Plan
ICNAF	International Commission for the Northwest Atlantic Fisheries
IRFA	Initial Regulatory Flexibility Analysis
IOY	Initial Optimal Yield
IVR	Interactive Voice Response
IWC	International Whaling Commission
IWP	Internal Waters Processing
JVP	Joint Venture Processing
LWTRP	Large Whale Take Reduction Plan
M	Natural Mortality Rate
MA DMF	Massachusetts Division of Marine Fisheries
MAFMC	Mid-Atlantic Fishery Management Council
ME DMR	Maine Department of Marine Resources
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistical Survey
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
mt	Metric Tons
NAO	North Atlantic Oscillation
NB	New Brunswick
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NS	National Standard
NT	Net Tonnage
NSGs	National Standard Guidelines

OCS	Outer Continental Shelf
OLE	Office of Law Enforcement
OY	Optimum Yield
PBR	Potential Biological Removal
PDT	Plan Development Team
PS/FG	Purse Seine/Fixed Gear
PRA	Paperwork Reduction Act
RFA	Regulatory Flexibility Act
RFFA	Reasonably Foreseeable Future Action
RIR	Regulatory Impact Review
SARC	Stock Assessment Review Committee
SAV	Submerged Aquatic Vegetation
SAW	Stock Assessment Workshop
SSB	Spawning Stock Biomass
SSC	Scientific and Statistical Committee
SFA	Sustainable Fisheries Act
TAC	Total Allowable Catch
TALFF	Total Allowable Level of Foreign Fishing
TC	Technical Committee
TRAC	Transboundary Resource Assessment Committee
TRT	Take Reduction Team
USAP	U.S. At-Sea Processing
USFWS	US Fish and Wildlife Service
VEC	Valued Ecosystem Component
VMS	Vessel Monitoring System
VPA	Virtual Population Analysis
VTR	Vessel Trip Report

ATLANTIC HERRING FISHERY SPECIFICATIONS
2007-2009 FISHING YEARS

APPENDIX I:

2006 TRANSBOUNDARY RESOURCE ASSESSMENT COMMITTEE (TRAC) STATUS REPORT

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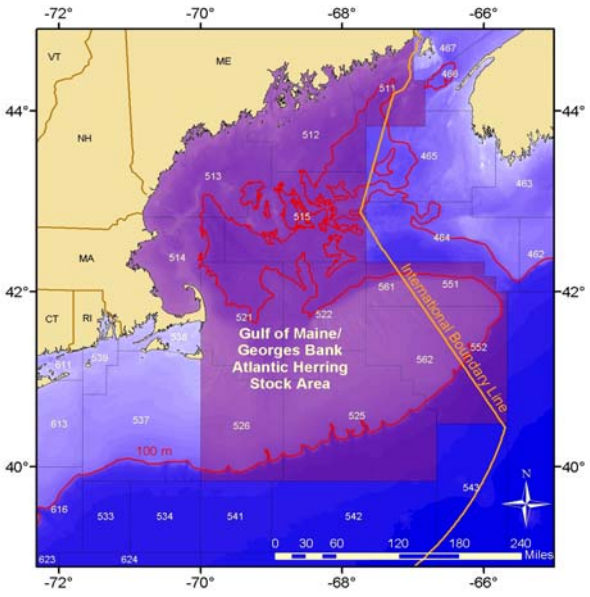
Fisheries and Oceans Canada | Pêches et Océans Canada | NOAA FISHERIES NATIONAL MARINE FISHERIES SERVICE

Transboundary Resource Assessment Committee Status Report 2006/01

Gulf of Maine-Georges Bank Herring Stock Complex



Summary

- Combined Canada and USA herring landings increased from 106,000 mt in 2002 to 110,000 mt in 2003, increased further to 115,000 mt in 2004, and declined to 105,000 mt in 2005.
- **Stock biomass (2+)** increased from about 105,000 mt in 1982 to about 1.3 million mt in 2000. Subsequently, biomass has declined slightly and was 1.0 million mt in 2005.
- **Recruitment** at age 2 increased in the late 1980s with several moderate year classes. In the past decade, three very large year classes have been produced (the 1994, 1998, and 2002 cohorts).
- **Fishing mortality (age 2+)** declined from peak values above 0.70 in the 1970s to an average of 0.30 during the mid-late 1980s (Figure 1). Fishing mortality declined to 0.15 in 1991 and has remained at about 0.1 since 2002 (Figure 1).
- Assuming that fishing mortality in 2006 is equal to that in 2005 (F=0.11) produces a catch in 2006 of 105,000 mt (the same catch as in 2005). The resulting SSB in 2007 would be 952,000 mt, a decline of about 6%. Assuming average recruitment in 2006 through 2008, continuing to fish at F=0.11 in 2007 would generate a catch in 2007 of 99,000 mt and SSB in 2008 would be 901,000 mt.
- The relative proportion of the inshore component of the overall herring stock complex was 18% based on the average proportion from three different data sources (commercial acoustic survey biomass estimates; morphometric studies; and NEFSC autumn survey swept biomass estimates).

Landings, 2+ biomass (thousands mt), Recruits (billions)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Avg [1]	Min [1]	Max [1]
Canada Landed	18	21	20	19	17	24	13	11	21	13	23	9	39
USA Landed	109	99	106	106	109	108	93	101	94	92	69	25	109
Total Landed	127	120	126	125	126	133	107	110	115	105	93	36	133
2+ Biomass	999	1013	1034	1032	1291	1261	1094	1076	1122	1040	628	105	1432
Age 2 Recruits	7.223	3.068	2.978	1.768	5.52	1.158	1.52	2.411	4.768	1.483	2.3	0.409	8.086
Fishing Mortality	0.15	0.13	0.1	0.12	0.1	0.13	0.11	0.11	0.11	0.11	0.34	0.1	0.81
Exploitation Rate	14%	12%	10%	12%	10%	12%	10%	10%	10%	10%	29%	10%	52%

1 Data for landings (thousands mt) is from 1978-2005, for 2+ biomass (thousands mt), recruitment (billions), and F (2+) from 1967-2005.

Fishery

Combined Canada/USA landings. Combined Canada/USA landings averaged 77,000 mt during 1978-1994 (Figure 1). Landings increased during 1995-2001, averaging 123,000 mt, and peaking at 133,000 mt in 2001. Landings declined slightly during 2002-2005, and averaged 109,000 mt. During 1978-2005, the USA accounted for about 72% of the total landings, but during the most recent decade, this percentage increased to about 85%.

Canadian landings. Landings by Canada averaged about 27,000 mt during 1978-1994, declined to an average of 19,000 mt during 1995-2001, and declined further to 14,000 mt during 2002-2005. Canadian landing have been dominated by the New Brunswick weir fishery, with small contributions from cove shutoff fisheries in southwest Nova Scotia and mid-water trawl landings on Georges Bank.

USA landings. Landings by the United States averaged about 49,000 mt during 1978-1994, increased to an average of 103,000 mt during 1995-2001, and declined to an average of 95,000 mt during 2002-2005. During 1978-1982, USA landings were about equally split between the weir fisheries and purse seines. During 1983-1992, most USA landings were taken by purse seines but subsequently single mid-water and paired mid-water trawling have dominated the landings, with purse seining accounting for only about 10-15% of the total USA landings during 2000-2005. The USA Georges Bank mid-water trawl fishery began in 1994, peaked at 35,000 mt in 2001 and averaged about 13,000 mt during 1994-2005.

Harvest Strategy & Reference Points

The Atlantic herring TRAC recommends that a strategy be adopted to maintain a low to neutral risk of exceeding the fishing mortality limit reference point, and that when stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding. A Fox surplus production model estimated Fmsy = 0.31, MSY = 194,000 mt, and Bmsy = 629,000 mt (Figure 4). Yield per recruit reference points (proxies for Fmsy) were estimated as: F0.1=0.21, and F40%=0.20.

State of Resource

The state of the resource was based on results from an age-structured, analytical assessment which used fishery catch statistics and biological samples to characterize the size and age composition of the catches during 1967 to 2005. Several model formulations were considered, all of which give similar trends in stock size but differed in scale. The final model formulation was selected, with some difficulty, to balance various data sources and their uncertainty, and was calibrated to trends in abundance from the NMFS spring, fall and winter bottom trawl surveys, as well as the NMFS hydroacoustic survey.

Retrospective analyses were used to detect any patterns to overestimate - or underestimate - fishing mortality, biomass and recruitment relative to the terminal year estimates. A significant retrospective pattern was detected in this assessment in overestimating SSB (averaging + 14.5%/year, and ranging between 1-24%) and this is a concern. The pattern has persisted for several years and is expected to continue in the future.

Stock biomass (2+) increased steadily from about 105,000 mt in 1982 to nearly 1.3 and was estimated to be 1.0 million mt at the beginning of 2005. Biomass increases in the late 1990s were due to improved recruitment, especially from two very large year classes, 1994 and 1998 (Figure 2). Weights-at-age in the population declined in the late 1980s but have remained steady since 1995.

Recruitment (at age 2) markedly improved in the late 1980s with several moderate year classes and three very large year classes (1994 cohort: 7.2 billion; 1998 cohort: 5.5 billion; and the 2002 cohort: 4.8 billion). Recruitment from the 1999-2000 and 2003 year classes all appear weaker than the long-term (1967-2005) average of 2.3 billion fish.

Fishing mortality (age 2+) declined from peak values above 0.7 in the 1970s to an average of 0.3 during the mid-late 1980s (Figure 1). Fishing mortality declined to 0.15 in 1991 and has remained stable at about 0.1 from 2002 onwards (Figure 1).

Productivity

Age structure, spatial distribution, and fish growth reflect changes in the productive potential of the stock complex. The **population age structure** displays an increasing presence of older age groups since 1995, consistent with lowered exploitation levels. Increasing abundance of older fish in the catch-at-age and future surveys would help to confirm this pattern. **Spatial distribution** patterns of herring in the most recent NMFS fall bottom trawl surveys (1998-2005) were similar to patterns observed in the 1960s, prior to the collapse of the offshore stock component. Declines in **weights-at-age** are a factor in limiting increases in the population biomass, and **predator consumption** estimates of herring have increased since the mid-1980s. On balance, however, the productive potential of the herring stock complex has improved in recent years.

Outlook

An outlook is provided in terms of the consequences on SSB and for yield in 2006, 2007 and 2008 of maintaining the current (2005) fishing mortality rate (F=0.11). Although uncertainty in stock size and recruitment generates uncertainty in forecast results, a formal risk analysis was not undertaken due to the significant retrospective pattern in SSB and the difficulty and uncertainty in selecting the final model formulation. Nevertheless, the forecasts are considered useful for general management guidance.

The projections assumed that recruitment of the 2004-2006 year classes was equal to the long-term average (2.3 billion fish at age 2) (Figures 2 and 3). A fishing mortality of F=0.11 in 2006 generates a catch of 105,000 mt (equal to the 2005 landings) and an SSB in 2007 of 952,000 mt, a decline of about 6%. Continuing to fish at F=0.11 in both 2007 and 2008 produces annual catches of 99,000 mt and 94,000 mt, respectively, and results in a slight decline in SSB in 2008 to 901,000 mt.

SSB, Yield (thousands mt)

	SSB	***Yield***	**F**
2006	1008	105	0.11
2007	952	99	0.11
2008	901	94	0.11

Special Considerations

The 2002 year class will dominate catches in 2006 and 2007, although the 1998 will still be important. Catches over the next several years are therefore dependent on the magnitude of the 2002 year class, which still has high uncertainty.

The retrospective pattern in SSB that has been apparent during the last several years should be considered. Ignoring the retrospective pattern in biomass could increase the risk of not meeting conservation objectives.

An investigation of natural mortality rates used in the model indicated that a rate higher than the assumed M=0.2 (*i.e.*, M=0.3-0.4) was more consistent with the available data.

Relative Proportion of Inshore Component

Three data sources were examined to investigate the relative proportion of the inshore component within the overall herring stock complex. Commercial acoustic estimates of biomass during 1999-2000 suggested that the average proportion on the inshore component was about 10%. Morphometric analyses of four samples of herring obtained during 2005 in the winter fishery area from Long Island to Marthas Vineyard indicated an average inshore proportion of about 13%. Swept area biomass estimates from the NMFS autumn survey estimated the inshore component to be about 30% of the total complex. The average of these three estimates is 18%.

Source Documents

Overholtz, W.D., L.D. Jacobson, G.D. Melvin, M. Cieri, M. Power, D. Libby, and K. Clark. 2004. Stock assessment of the Gulf of Maine-Georges Bank Atlantic herring complex, 2003. Northeast Fisheries Science Center Reference Document 04-06, 290 p.

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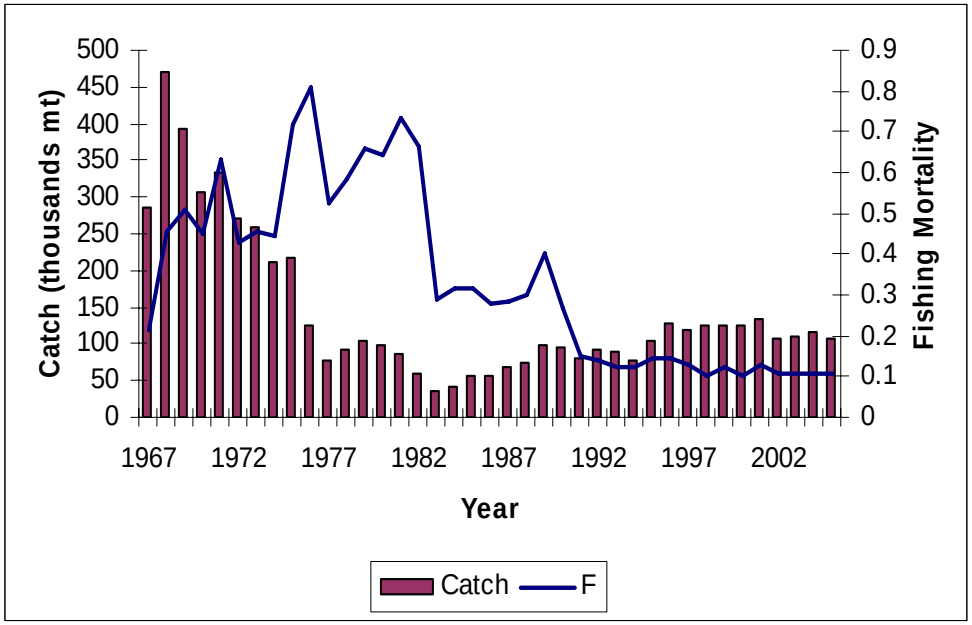

Figure 1. Landings and Age 2+ fishing mortality.

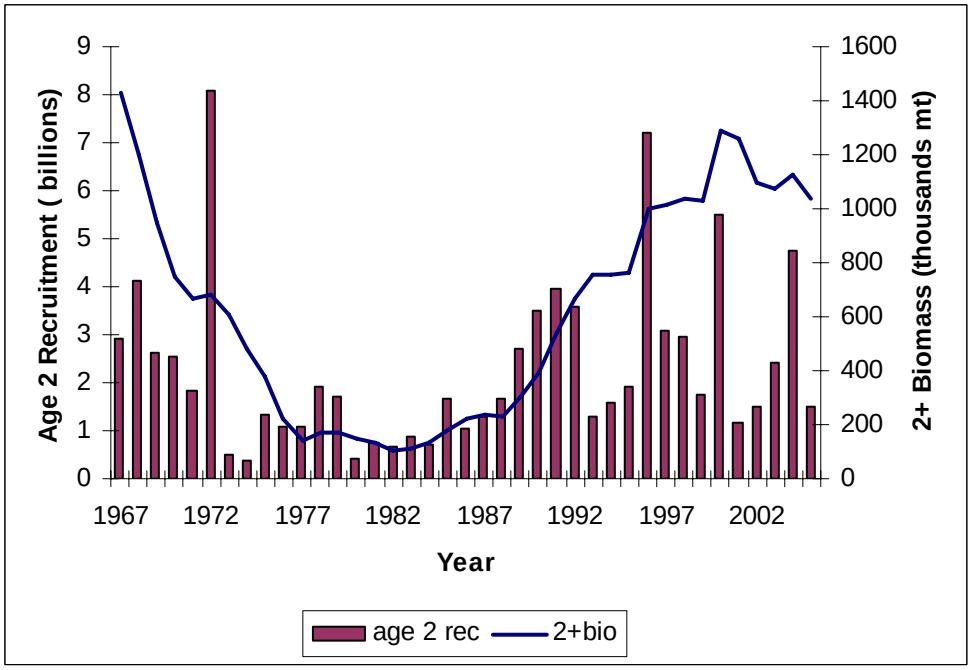

Figure 2. Age 2+ biomass and Age 2 recruitment.

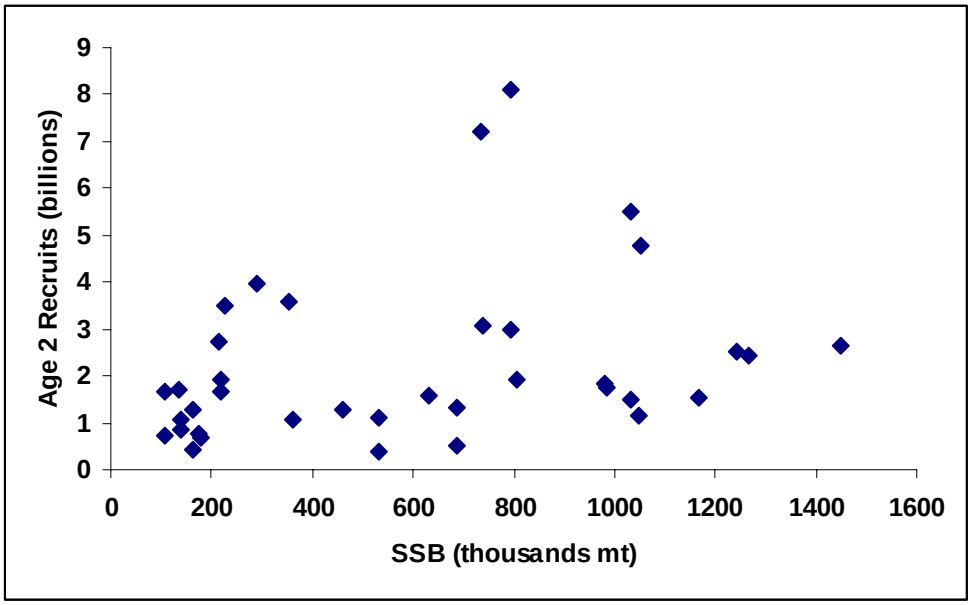

Figure 3. SSB and Age 2 recruitment.

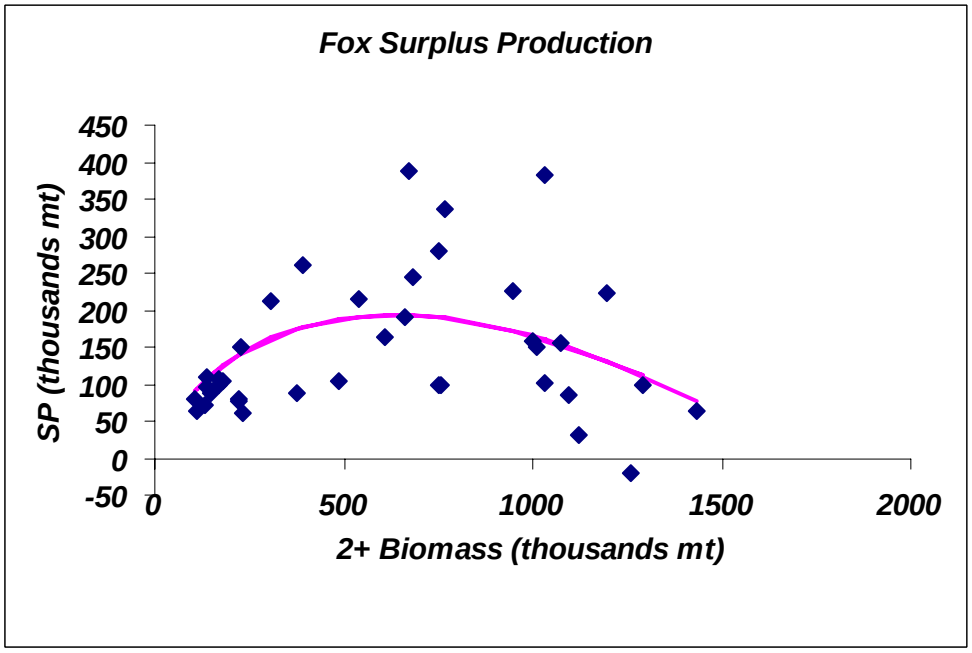

Figure 4. Age 2+ biomass and surplus production.