NEW ENGLAND FISHERY MANAGEMENT COUNCIL

Atlantic Herring Fishery Management Plan (FMP):

Options for 2005 Fishery Specifications
(January 1, 2005 – December 31, 2005)
and Additional Analysis

This document summarizes the options under consideration for the 2005 specifications for the Atlantic herring fishery. It supplements the May 5, 2004 Herring PDT/TC Report and includes additional background information and analyses provided by the PDT/TC.

- **The relative risk assessment presented in this document has been updated and replaces the assessment in the May 5, 2004 Herring PDT/TC Report.**

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1.0 NO ACTION ALTERNATIVE (2004 SPECIFICATIONS)

If the Council and Section take no action to revise the fishery specifications for Atlantic herring, the following specifications would remain effective through the 2005 fishing year:

Table 1 Current (2004) Specifications for the Atlantic Herring Fishery

SPECIFICATION	ALLOCATION (MT)
ABC	300,000
OY	250,000
DAH	250,000
DAP	226,000
JVPt	20,000
JVP	10,000 Area 2 and 3 only
IWP	10,000
USAP	20,000 Area 2 and 3 only
BT	4,000
TALFF	0
RESERVE	0
TAC Area 1A	60,000 (6,000 Jan 1 – May 31)
TAC Area 1B	10,000
TAC Area 2	50,000 (TAC reserve 70,000)
TAC Area 3	60,000

Discussion

Section 648.200(d) of the regulations for the Atlantic herring fishery state that:

> (d) On or about November 1 of each year, NMFS shall make a final determination concerning the specifications for Atlantic herring. Notification of the final specifications and responses to public comments shall be published in the Federal Register. If the final specification amounts differ from those recommended by the Council, the reason(s) for the difference(s) must be clearly stated and the revised specifications must be consistent with the criteria set forth in paragraph (b) of this section. **The previous year's specifications shall remain effective unless revised through the specification process. NMFS shall issue notification in the Federal Register if the previous year's specifications will not be changed (emphasis added).**

2.0 OPTIONS UNDER CONSIDERATION

The Council is considering the following options for modifying the Atlantic herring fishery specifications for 2005:

SPECIFICATION	ALLOCATION (MT)
Allowable Biological Catch **ABC**	Current – 300,000 OS/Section June 15 – 220,000
Optimum Yield **OY**	Current – 250,000 OS/Section June 15 – Several Options (see Section 2.2.1, p. 5)
Domestic Annual Harvest **DAH**	Current – 250,000 OS/Section June 15 – 220,000 PDT/TC – FMP states that DAH ≤ OY
Domestic Annual Processing **DAP**	Current – 226,000 OS/Section June 15 – 216,000 PDT/TC – FMP states that DAP = DAH – JVPt – BT
Joint Venture Processing (total) **JVPt**	Current – 20,000 OS/Section June 15 – 0
Joint Venture Processing (EEZ) **JVP**	Current – 10,000, Area 2 and 3 only OS/Section June 15 – 0
Internal Waters Processing **IWP**	Current – 10,000 OS/Section June 15 – 0
U.S. At-Sea Processing **USAP**	Current – 20,000, Area 2 and 3 only OS/Section June 15 – no recommendation
Border Transfer **BT**	Current – 4,000 OS/Section June 15 – No Change
Total Allowable Level of Foreign Fishing **TALFF**	Current – 0 OS/Section June 15 – No Change
RESERVE	Current – 0 Proposed – No Change
TAC Area 1A	Current – 60,000, (6,000 Jan 1 – May 31) OS/Section June 15 – Four TAC Options
TAC Area 1B	Current – 10,000 OS/Section June 15 – Four TAC Options
TAC Area 2	Current – 50,000, (TAC reserve 70,000) OS/Section June 15 – Four TAC Options, no reserve
TAC Area 3	Current – 60,000 OS/Section June 15 – Four TAC Options, no change

2.1 BACKGROUND

Domestic annual harvest (DAH) is established based on the expected catch from U.S. fishing vessels during the upcoming fishing year. The Herring FMP specifies that OY is equal to DAH plus a reserve.

OY = DAH + Reserve

The FMP provides a list of factors to consider when determining the amount of OY, if any, to be assigned to a reserve. This reserve is different from the current TAC reserve in Area 2; no portion of OY has ever been assigned to this reserve. There has been no discussion to date of assigning any portion of the OY for 2005 to a reserve.

The Herring FMP also specifies that domestic annual harvest (DAH) 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 = DAP + JVPt + BT

JVPt consists of joint venture processing operations in both federal waters (JVPs) and state waters (internal waters processing, or IWP).

JVPt = JVPs + IWP

- Allocation to 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 allocation for the 2005 fishing year.
- The Herring FMP specifies that because JVP is derived from DAH, DAH must be determined first before establishing an allocation for JVP.

The Herring FMP authorizes the allocation of a portion of DAP for at-sea processing by domestic processing vessels that exceed the current size limits (U.S. at-sea processing, USAP). When determining the USAP allocation, the Council should consider the availability of other processing capacity, development of the fishery, status of the resource, and opportunities for vessels to enter the herring fishery. Considerations related to the USAP allocation for the 2005 fishing year are discussed in Sections 2.5 and 0 of this document.

At the June 15, 2004 meeting, the Herring Committee/Section made the following preliminary recommendations for the 2005 fishery specifications:

- DAH = 220,000 mt
- DAP = 216,000 mt
- JVPt = 0 mt
- BT = 4,000 mt
- TALFF = 0 mt
- USAP = no agreement reached

Because the Herring FMP requires that DAH be specified at a level equal to or less than OY and that DAP be a subset of DAH, the Committee/Section should reconsider their preliminary recommendations and make final recommendations regarding DAH and DAP that are based on the selection of OY and are consistent with the formulas in the Herring FMP identified in the previous section of this document.

There is no information to suggest that the BT allocation of 4,000 mt should be changed for the 2005 fishing year. The Committee/Section and Council should therefore specify DAH and DAP based on available fishery information and apply the formula in the Herring FMP to determine the final 2005 specification for JVPt. The Committee/Section and Council also should consider the information presented in Sections 2.5 and 4.6.3 relative to USAP and specify the USAP allocation for the 2005 fishing year.

2.2 OPTIMUM YIELD AND OPTIONS FOR AREA-SPECIFIC TOTAL ALLOWABLE CATCHES (TACS)

The specification of optimum yield (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. As a result, a range of options for specifying OY for the 2005 fishing year is proposed; the options for OY are directly correlated with the options under consideration for allocating area-specific TACs; each TAC option is associated with its own value for OY.

The Herring FMP specifies that OY will be less than or equal to allowable biological catch (ABC) minus the expected Canadian catch (C) from the stock complex. The estimate of the Canadian catch that is deducted from ABC will be no more than 20,000 mt for the New Brunswick weir fishery and no more than 10,000 mt for the Georges Bank Canadian harvest:

$$OY \leq ABC\text{-}C \quad (C \text{ not to exceed } 30{,}000 \text{ mt})$$

If ABC is specified at 220,000 mt for the 2005 fishing year, OY could be less than or equal to 190,000 mt if the maximum catch is assumed for the Canadian herring fisheries. OY values proposed for the 2005 fishing year range from 150,000 mt – 180,000 mt (see below), which are consistent with the formula specified in the Herring FMP in all scenarios.

The FMP also states that the establishment of OY will include consideration of relevant economic, social, or ecological factors and that for this reason, OY may be less than ABC – C. In addition, the Herring PDT/TC has recommended that OY be specified at a level lower than ABC for biological and ecological reasons. Recognizing that the proposed value for ABC is conservative, a buffer between ABC and OY still may be appropriate 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. The options under consideration for area-specific TACs (and OY) are consistent with this PDT recommendation.

2.2.1 Options Identified by the Herring Committee/Section (June 15, 2004)

At its June 15, 2004 meeting, the Herring Committee/Section selected TAC Options 1, 2, 4, and 7 from the May 5, 2004 PDT/TC Report for further consideration/analysis during the specification process. For all of the TAC options under consideration:

- The Area 2 TAC reserve would be eliminated. All allowable catches would be allocated to the fishery at the beginning of the fishing year.
- The split season in Area 1A (January – May; June – December) would apply during the 2005 fishing year.

Table 2 Options Under Consideration for Specifying TACs and OY for the 2005 Fishing Year

TAC OPTION (May 5, 2004 PDT/TC Report)	Area 1A	Area 1B	Area 2	Area 3	Total U.S. OY	NB Weir Fishery	Grand Total
1	60,000	10,000	20,000	60,000	150,000	20,000	170,000
2 (Status Quo)	60,000	10,000	50,000	60,000	180,000	20,000	200,000
4	45,000	10,000	35,000	60,000	150,000	20,000	170,000
7	55,000	5,000	30,000	60,000	150,000	20,000	170,000

All values in the above table are expressed in metric tons (mt).

Reviewing the risk assessment developed during Amendment 1 provides an opportunity to take advantage of the most recent years of fishery data to characterize the impacts of various TAC distributions relative to historical catch (historical = most recent 5-year and 10-year time periods). A relative risk assessment of the TAC options under consideration is presented in Section 3.2.1 (p. 16) of this document.

2.3 CONSIDERATIONS RELATED TO SPECIFYING DAH

The Herring FMP specifies that domestic annual harvest (DAH) will be less than or equal to OY and 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 = DAP + JVPt + BT

When specifying domestic annual harvest (DAH), important considerations relate to the actual and potential capacity of the U.S. harvesting fleet. In preparation for Amendment 1 to the Herring FMP, which is considering limited access for the herring fishery, the Herring PDT conducted a preliminary assessment of harvesting capacity in the herring fishery based on a relatively common analytical approach called "data envelopment analysis." This preliminary analysis was presented to the Herring Committee in 2003 and again in June 2004, and it will be

updated for the Amendment 1 DSEIS. It is presented in the May 5, 2004 PDT/TC Report and should be considered by the Council relative to discussions about DAH, DAP, and JVPt.

U.S. Atlantic Herring Catch

The U.S. herring fishery landed an average 101,930 mt of herring from 1996-2003.

Table 3 Total U.S. Atlantic Herring Landings, 1996-2003

YEAR	TOTAL U.S. Herring Landings (MT)
1996	107,508
1997	97,422
1998	81,601
1999	105,647
2000	108,658
2001 **32 vessels** **1,422 trips**	121,332
2002 **37 vessels** **1,245 trips**	92,594
2003 **38 vessels** **1,337 trips**	100,674

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

The table below summarizes a simple projection of landings that could be expected based on the average landings from 1996-2003.

Average Landings 1996-2003 = 101,930 mt	
Market/Fishery Expansion	**Potential Harvest (mt)**
0 – status quo	101,930
+10%	112,123
+20%	122,316
+50%	152,895
+80%	183,474
+100%	203,860

2.4 CONSIDERATIONS RELATED TO SPECIFYING DAP AND JVPT

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. 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.

The Herring PDT provided production estimates for the Council to consider when specifying DAP based primarily on past fishery performance (landings) and personal communication with shoreside processing facilities. Some Herring PDT members visited most processing facilities and interviewed individuals at those facilities as part of ongoing research related to Amendment 1 to the Herring FMP. Table 4 summarizes the information provided by processing facilities and incorporates a 20% increase in production to account for any expansion of the fishery and markets that would allow for increased shoreside production during the upcoming fishing year.

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; therefore, production estimates provided in Table 4 do not include any fish that may be landed in the U.S. and trucked to Canada for processing at the sardine canneries in Canada. The estimate provided in Table 4 for the U.S. sardine canneries, however, does include any fish that may be landed in the U.S. and trucked to the two canneries in the U.S. for domestic processing.

The Herring PDT notes that the information about processing capacity provided in Table 4 may overestimate production likely to occur during the 2005 fishing year for a few reasons. First, the 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 2005 fishing year; it is unclear whether or not this increase will be realized. Second, to cross-check the production estimates in Table 4, the Herring PDT queried the 2002 dealer data (2003 data are incomplete) and found that landings to some of the processing facilities were reported to be significantly less than the estimates provided in Table 4. However, it appears that the dealer data may not reflect true landings, since only 68,400 metric tons of herring landings are recorded in the 2002 dealer database versus 92,600 mt recorded in the logbook data.

In addition, the ability of the herring fleet to access specific markets may affect the true value of DAP. For example, Cape Seafoods and NORPEL 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).

Table 4 Information for Consideration Relative to Potential Domestic Annual Processing (DAP) in 2005

DOMESTIC PROCESSOR	POTENTIAL HERRING PRODUCTION	SOURCE OF INFORMATION AND ADDITIONAL COMMENTS
Lobster Bait	60,000 mt	• Approximately 60% of 2003 herring landings
Sardine Canneries	36,000 mt	• Personal communication –based on production estimate of 30,000 mt for two U.S. canneries provided by Connors Bros. • Added 20% to account for potential increase in production during 2005 • Includes fish trucked to the two U.S. canneries, but not fish trucked to Canadian canneries
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 2005
NORPEL, New Bedford MA	30,000 mt	• Personal communication – based on 20,000-30,000 mt production estimate provided by NORPEL (mean 25,000 mt) • Added 20% to account for potential increase in production during 2005
Lund's Fisheries, Cape May NJ	2,300 mt	• Personal communication – based on highest year of herring production from 2000-2003 (2000: 1,900 mt) • Added 20% to account for potential increase in production during 2005
U.S. At-Sea Processing (USAP)	20,000 mt	• Current allocation for USAP – domestic processing vessels that exceed vessel size limits • Allocation has not been utilized in previous years • Industry comments from June 15, 2004 OS/Section meeting suggest that there may be opportunities to utilize this allocation in 2005
Other	20,000 mt	• Accounts for potential increase in demand for herring as lobster bait • Accounts for domestic processing outside of USAP, including at-sea freezing by domestic catcher/processor vessels
TOTAL	**195,900 mt**	• **May overestimate DAP – 2002 dealer data reflect much lower amounts, and 20% expansion of fishery/markets may not occur in 2005**

Note: This table does not represent an estimate of DAP for the 2005 fishing year; the table was provided by the Herring PDT for the Council to consider when specifying DAP for 2005.

2.5 CONSIDERATIONS RELATED TO SPECIFYING USAP

In the May 5, 2004 Herring PDT/TC Report, the PDT/TC recommended setting USAP at 0 mt for 2005 and eliminating the USAP allocation altogether in Amendment 1. The PDT made this recommendation because the USAP allocation has not been utilized since it was established and there was no information at the time to suggest that there were plans to utilize this allocation in 2005. The intention of eliminating this allocation in Amendment 1 would not be to prohibit U.S. at-sea processing, but rather to allow this activity to occur as market conditions demand, similar to other U.S. processing operations.

At the June 15, 2004 Herring Committee/Section meeting, the industry testified that there were plans under consideration to use a U.S. processing vessel in Areas 2 and 3 to process herring and mackerel received from domestic catcher vessels. Industry representatives who spoke in support of maintaining the current allocation for USAP (20,000 mt in Areas 2 and 3 only) provided the following information about the potential operation:

- The processing vessel (U.S. flag, U.S. crew) would receive fish from domestic catcher vessels already engaged in herring or other fisheries.
    - Most of these vessels are combination vessels that fish for squid and/or groundfish and can midwater trawl to supplement their income. Most of these vessels lost DAS as a result of Amendment 13 to the Northeast Multispecies FMP.
    - Most of these vessels do not have RSW tanks and therefore cannot land marketable quantities of herring from offshore areas to shoreside facilities. Many participated in JVP operations in 2000 and 2001 but have not had much opportunity to participate in the herring fishery since that time.
    - It is anticipated that 10-15 vessels may participate in a USAP operation in Areas 2 and 3.
- Industry representatives noted that this operation is consistent with the Herring PDT recommendation to encourage expansion of the offshore fishery, primarily Area 3.
- Industry representatives stated that there would be 100% observer coverage in this fishery, with an observer on the processing vessel, paid for by the industry.

The Committee/Section did not reach agreement about the 2005 allocation for USAP at the June 15, 2004 meeting and should revisit this issue at the July 12, 2004 meeting in order to provide a recommendation to the Council.

Additional Herring PDT Comments

The PDT previously recommended setting it at 0 mt for 2005 because in the absence of information suggesting that this allocation may be utilized in 2005, the PDT felt that maintaining the 20,000 mt allocation was unnecessary and inflated the estimate of DAP. **However, new information was provided by the industry at the June 15, 2004 meeting and the PDT no longer supports its initial recommendation.**

There is no biological, economic, or technical reason to set the USAP allocation at 0 mt in 2005 if the U.S. industry intends to utilize this allocation in Areas 2 and 3. Furthermore, there is no technical reason to differentiate between domestic at-sea and shoreside processing, given current market and fishery conditions. USAP activities may provide a market for vessels that do not have other opportunities in the fishery, may encourage some vessels to fish in offshore areas, and may increase the potential to achieve OY for the herring fishery. Additional discussion is provided in Section 4.6.3 of this document.

Additional Council Staff Comments

Council staff notes that two of the objectives of Amendment 1 are to:

- 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, and
- provide, to the extent practicable, controlled opportunities for fishermen and vessels in other Mid-Atlantic and New England fisheries.

If the Council sets the USAP allocation at 0 mt in 2005, then it should re-visit the goals and objectives of Amendment 1, as this would suggest that there may not be opportunities for fishermen and vessels in other Mid-Atlantic and New England fisheries.

In addition, Council staff notes that there may be concerns associated with National Standard 1 if the USAP allocation is set at 0 for 2005, as a zero allocation may reduce the potential to achieve OY in the Atlantic herring fishery.

3.0 BIOLOGICAL IMPACTS

3.1 ALLOWABLE BIOLOGICAL CATCH (ABC)

The proposed allowable biological catch (ABC) of Atlantic herring for the 2005 fishing year is 220,000 mt.

PDT/TC Recommendation (May 5, 2004): The Herring PDT/TC recommends that the Council/Section consider specifying ABC for 2005 consistent with the MSY proxy alternative that is proposed in Amendment 1 (220,000 mt). MSY itself is not a fishery specification and will be addressed in Amendment 1. According to projections from the forward projection model (FPM) presented at the TRAC Meeting in February 2003, the impacts of total removals under an ABC of 220,000 mt are not expected to be significant enough to compromise the health of the herring resource as a whole. Additional information is provided in the TRAC Assessment Report (*Stock Assessment of the Gulf of Maine-Georges Bank Atlantic Herring Complex, 2003*, Northeast Fisheries Science Center Reference Document 04-06, February 2004).

Herring Committee/Section Recommendation (June 15, 2004): At the June 15, 2004 meeting, the Herring Committee and ASMFC Herring Section both passed motions to specify ABC for Atlantic herring at 220,000 mt for the 2005 fishing year.

Additional PDT/TC Discussion: The June 15, 2004 recommendation from the Herring Committee and Section is consistent with the PDT/TC recommendation. The PDT/TC recommends establishing ABC for 2005 at 220,000 mt to be consistent with the MSY proxy proposed in Amendment 1. The 220,000 mt proxy proposed in Amendment 1 is 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 is intended to be a placeholder for ABC and may be re-visited through the specification process in future years as problems with the stock assessment are resolved.

Both the forward projection model (FPM) and the ADAPT virtual population assessment (VPA) model that were presented at the TRAC assessment meeting in 2003 agree on historical herring biomass estimates until about the mid-1980s. The two models diverge from about 1985 onward (Figure 1). At its June 19, 2003 meeting, some members of the Council's Scientific and Statistical Committee (SSC) suggested that a level of biomass consistent with the earlier period in the assessments may be the appropriate level on which to base an estimate of MSY. This is the approach that the Council utilized to develop the proxy for MSY proposed in Amendment 1.

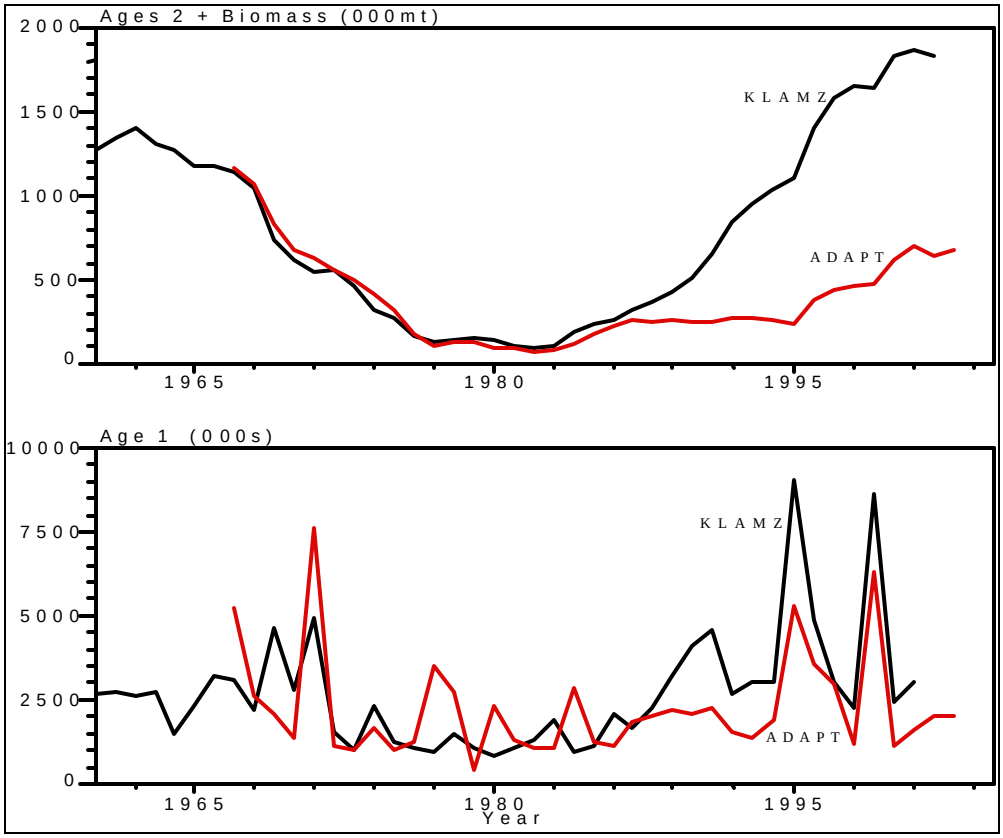
The Council utilized average herring biomass estimates from the 1960-1970 time period to form the basis for a B_{MSY} proxy (from which MSY is derived). During this time period, biomass was still at a high level, and fishing mortality from foreign fishing activities ("ICNAF fisheries") had not reached peak levels. Fishing mortality from the ICNAF fisheries reached record-high levels in the early and mid-1970s, which is when the herring stock declined rapidly and crashed on Georges Bank.

At its June 19, 2003 meeting, the SSC agreed that estimates of F_{MSY} from 0.2-0.25 are reasonable and do not appear to be as sensitive to the differences between the two assessment models presented at the TRAC meeting. Figure 1 indicates that Atlantic herring biomass averaged 1.13 million mt (1,130,000 mt) during the 1960-1970 time period. Both models that were presented at the TRAC assessment agree on this result.

When developing the proposed MSY proxy of 220,000 mt, the Council rounded this historical average biomass down to 1.1 million mt. Applying the lower estimate of F_{MSY} to the 1,100,000 mt proxy for B_{MSY} results in the following proxy for MSY:

$$1{,}100{,}000 \text{ mt} \times 0.2 = 220{,}000 \text{ mt}.$$

Figure 1 Herring Biomass Estimates Resulting from the KLAMZ and ADAPT Assessment Models



The situation with Atlantic herring is unique in that two divergent stock assessments have been presented with no consensus on which assessment is most accurate, and consequently, no consensus regarding the current biomass of the Atlantic herring stock complex, current fishing mortality rates, and/or appropriate reference points to utilize for management purposes (aside from the range of 0.2-0.25 for F_{MSY}). The Council, therefore, must make its selection based on the best available scientific information. The following additional information should be considered:

Relative to National Standard 2 (Best Available Scientific Information), NMFS' National Standard Guidelines (NSGs) state:

> "Scientific Information. (a) Standard 2. Conservation and management measures shall be based upon the best scientific information available. (b) FMP development. The fact that scientific information concerning a fishery is incomplete does not prevent the preparation and implementation of [[Page 33]] an FMP (see related Secs. 600.320(d)(2) and 600.340(b). (1) Scientific information includes, but is not limited to, information of a biological, ecological, economic, or social nature. Successful fishery management depends, in part, on the timely availability, quality, and quantity of scientific information, as well as on the thorough

> analysis of this information, and the extent to which the information is applied. **If there are conflicting facts or opinions relevant to a particular point, a Council may choose among them, but should justify the choice.**" (emphasis added)

The Council believes that the proposed MSY proxy of 220,000 mt in Amendment 1 is based on the best available science because it utilizes the scientific information and methodology for establishing an MSY proxy that was developed by the Herring PDT based on the SSC recommendations. The proposed proxy should be considered precautionary and temporary, to be replaced with a scientifically-accepted estimate of MSY for the Atlantic herring stock complex when such an estimate is available.

Additional Supporting Information

The estimate of MSY (and the proposed value for ABC) can serve as a proxy until the next stock assessment for the Atlantic herring resource occurs, which may be during 2006. The Herring PDT believes that removals of this magnitude in the short-term would not jeopardize the health of the Gulf of Maine-Georges Bank herring complex. Several additional lines of supporting evidence suggest that this would be the case (see discussion below as well as information presented in the May 5, 2004 Herring PDT/TC Report).

NEFSC Spring and autumn bottom trawl indices of abundance suggest that herring biomass from this stock complex increased dramatically during the 1990s (Figure 2 and Figure 3). The autumn time series suggests that herring are as abundant or more abundant than during the 1960s and early 1970s (Figure 3). The spring index shows that trends in both series are consistent, suggesting a major recovery in the 1990s.

Figure 2 NEFSC Spring Survey kg/tow for the Gulf of Maine-Georges Bank Herring Complex, 1963-2004

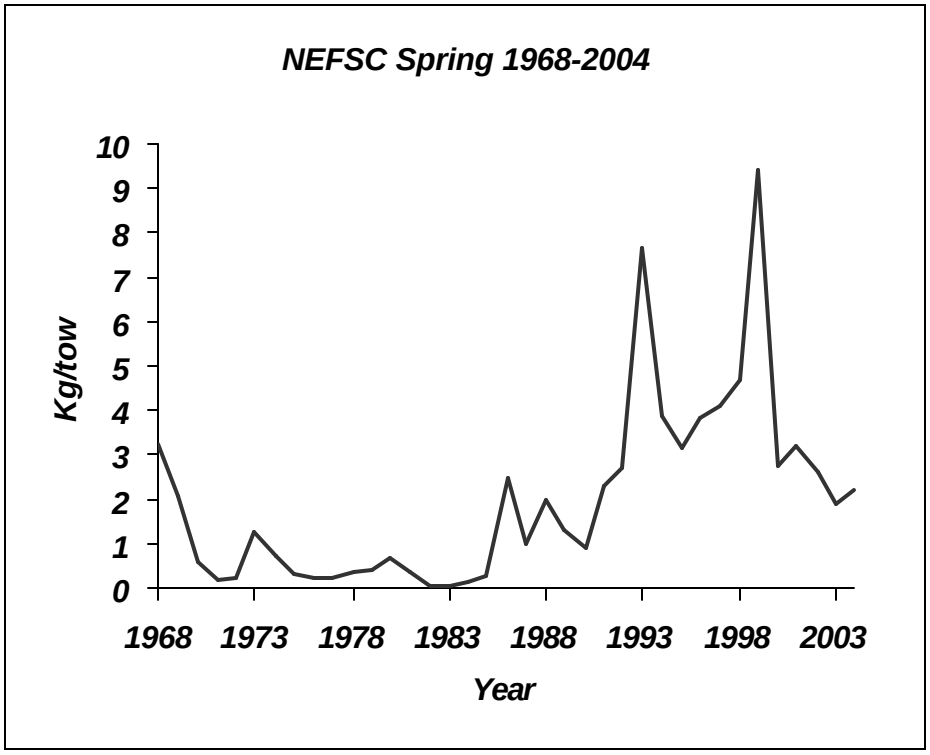
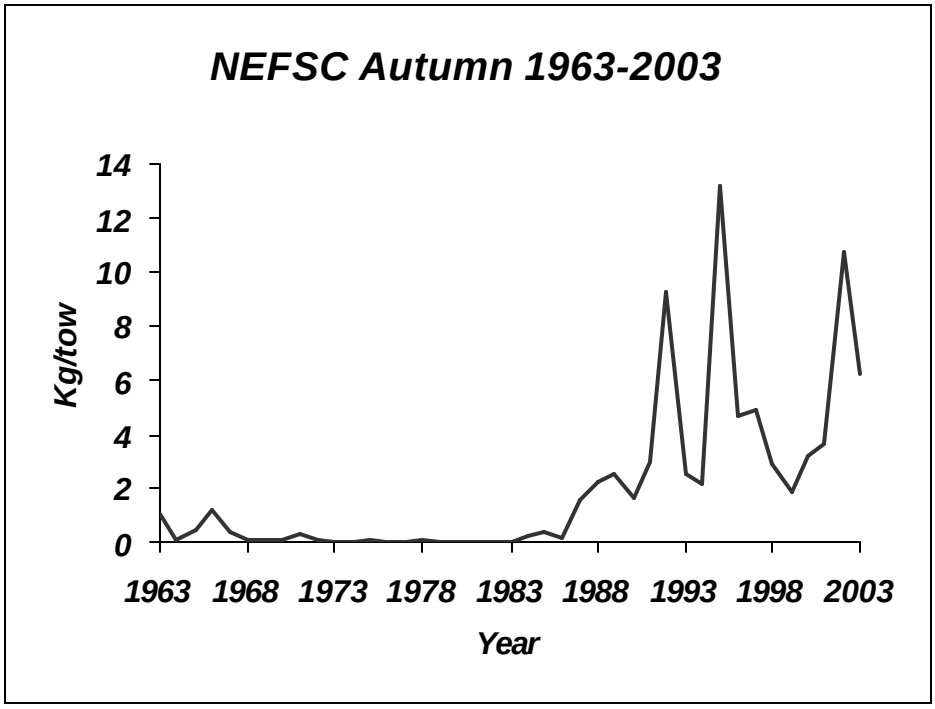


Figure 3 NEFSC Autumn Survey kg/tow for the Gulf of Maine-Georges Bank Herring Complex, 1963-2004



Hydroacoustic surveys of pre-spawning herring on Georges Bank began in 1998 and have covered the full extent of the spawning distribution since 1999 (Overholtz et al. 2004). Design and model (geostatistical) based estimates from these surveys are in agreement that herring biomass currently is at least 1.0 million mt or greater, for the offshore component. Nine of the ten design based estimates suggest that biomass exceeded 1.0 million mt (range 1.2-2.4 million mt) (Table 5) and (Overholtz et al. 2004) during 1999-2002. Biomass in 2002 was estimated to be 0.844 million mt, however herring spawned early that year and it was felt that significant numbers were missed by the survey (Overholtz et al. 2004). Bootstrap estimates of biomass (median) for the nine surveys in 1999-2001 ranged from 1.1-2.3 million mt with 80% CI's between 0.9-2.6 million mt (Overholtz et al. 2004). The median bootstrap estimate for 2002 was 0.838 million mt with an 80% CI of 0.752-0.916 million mt.

Table 5 Estimates of Herring Mean Sa (Hydroacoustic Signal Intensity) and Biomass for the Gulf of Maine-Georges Bank Herring Complex, 1999-2002

Year	Survey	Mean Sa	Biomass (million mt)
1999	Zigzag 1	3444.588	1.4422
	Zigzag 2	3059.560	1.1661
	Parallel	1164.686	1.2889
2000	Zigzag	1053.267	1.2540
	Parallel	2132.484	1.7562
	Stratified Random	1291.377	1.7171
2001	Zigzag	1447.870	1.6109
	Parallel	1997.915	2.3549
	Stratified Random	1168.296	1.4845
2002	Parallel	627.614	0.8443

All of these sources of supporting evidence suggest that the current herring biomass is large, at least in the 1 million mt range, and can support removals of 220,000 mt in the short-term. Additional surveys, analyses and stock assessment work will be necessary to confirm these estimates in future.

Additional Literature References

Overholtz, W.J., 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. 2900 pp.

TRAC. 2003. Report of the meeting held 10-14 February 2003. Transboundary Resource Assessment Committee. St Andrews, NB. May 2003. 27 pp.

3.2 IMPACTS OF PROPOSED TAC OPTIONS

3.2.1 Relative Risk Assessment of TAC Options Under Consideration

While 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; however, both mix while on feeding (Area 1A and 1B) and over-wintering grounds (Area 2). There is no evidence of mixing either in Area 3 or during spawning season in any location other than 1B (August- November).

At its June 19, 2003 meeting, the SSC expressed concern that the recent distribution of landings, while not jeopardizing the overall stock complex, could overexploit a stock component, particularly the inshore (Gulf of Maine) component. Therefore, the SSC recommended that the Herring PDT conduct a risk analysis of current, historic, and projected landing distributions, given a range of possible mixing regimes.

Factors that the 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 10-year and 5-year average landings for the stock complex (1994-2003 and 1999-2003);
- landings from the New Brunswick (NB) weir fishery;
- all other relevant biological and fishery information; and
- the June 19, 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 weekly landings by management area over a five-year (1999-2003) and ten-year period (1994-2003) as a basis for comparison of TAC distributions. This time frame was chosen instead of a 15-year average (as suggested by the SSC) because 15 years encompassed some years when the Georges Bank/Nantucket Shoals component of the stock was still recovering from overfishing.

Uncertainty associated with the mixing of herring stock components is a critical scientific issue that is addressed in the relative risk assessment by considering a range of possible mixing scenarios instead of relying on one specific mixing formula. 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 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.

Because of the uncertainties associated with the mixing formulas, five different mixing regimes were applied to the landings data by quarter for the relative risk assessment. The PDT agreed that winter and summer mixing ratios (instead of all quarters) would be adequate to illustrate the range of relative risk under different catch and mixing scenarios. Mixing scenarios are based on the quarter approach as outlined in the original FMP (Winter: December-March, Summer: April through July). The mixing scenarios considered in this risk assessment are:

1. **0.5 Summer/0.2 Winter –** In the summer, 50% of the catch from Areas 1A and 2 comes from the inshore component. In the winter, 80% of the catch in Area 1A and 20% of the catch in Area 2 comes from the inshore component (this is the mixing ratio provided in the Herring FMP based on historical tagging studies).
2. **0.6 Summer/0.2 Winter –** In the summer, 60% of the catch in Area 1A is from the inshore component and 40% from the offshore component. In the winter Area 2 fishery, 20% of the catch comes from the inshore component and 80% from the offshore component.

   The winter mixing ratio of 0.2 is from the original Herring FMP (see above). There is no specific literature reference for the summer ratio of 0.6; this ratio was included by the Herring PDT to provide for a more complete range of scenarios to be considered in the relative risk assessment.
3. **0.5 Summer/0.5 Winter –** In the summer, 50% of the catch from Areas 1A and 2 comes from the inshore component. In the winter, 50% of the catch from Areas 1A and 2 comes from the inshore component.

   The summer ratio is as described above from the original Herring FMP.

   The winter mixing ratio is based on the findings of Overholtz (2002). He observed that the NMFS spring bottom trawl survey encountered few herring south of 40.5^{o} (Figure 6, Overholtz 2002). During this time, the Georges Bank component was extirpated, and all catch is assumed to come only from the Gulf of Maine (inshore) stock component. However, as the Georges Bank component recovered from heavy foreign fishing, the NMFS survey encountered herring farther south of 40.5^{o}.

   A mixing ratio of 0.50 is consistent with the suggestion by the SSC that the different components of the stock may stratify during the winter fishery in Area 2. The SSC suggested that the Gulf of Maine component might overwinter farther north than the Georges Bank component, which is also implied by the findings of Overholtz (2002). Since 1997, the first year for which exact fishing location (by lat/lon) is available by VTR, approximately 50% (53.5%) of winter catch of herring has occurred north of 40.5^{o}.

The Abstract from the Overholtz (2002) paper is provided below for additional information:

Spatial patterns of the Gulf of Maine-Georges Bank Atlantic herring (*Clupea harengus*) complex were evident at three levels of resolution from analyses using bottom trawl survey data from spring 1968 to 1998 and autumn 1963 to 1998. The geographic range of the complex contracted significantly during 1973-1985 in both spring and autumn, coincident with major declines in abundance following the distant water fleet fishery during 1961-1976. Following recovery in abundance, distribution patterns that were previously observed were re-established. Medium scale patterns (e.g., 50-200 km) in the data suggest that herring were not uniformly distributed over the continental shelf during the spring and autumn, but rather aggregated in sub-groups within the range of the entire complex. Fine scale patterns in the survey data (5-50 km) suggest that herring maintained pre-collapse behavioral relationships even though the stock complex had declined by ~85%. Among-site distances between the herring schools, presumably from the Gulf of Maine spawning component, remained remarkably constant as the Georges Bank and Nantucket Shoals spawning components were extirpated. As the complex recovered, it appeared that more and perhaps larger schools of herring were present. These analyses suggest that a fully-recovered stock complex has distributional characteristics and patterns that can be monitored and quantified. Quantification of spatial patterns may have important consequences for assessment, stock identification, and fishery management.

4. **0.3 Summer/0.3 Winter –** In the summer, 30% of the catch from Areas 1A and 2 comes from the inshore component. In the winter, 30% of the catch from Areas 1A and 2 comes from the inshore component (Armstrong & Cadrin, 2001).

   The Abstract from the Armstrong & Cadrin (2001) paper is provided below for additional information:

   The purpose of this study was to characterize morphometric variation between the two major spawning components of Atlantic herring, *Clupea harengus*, in the Gulf of Maine-Georges Bank stock complex and to evaluate the use of morphometric differences for stock discrimination. Morphometric characters, including both traditional and truss network distances, were measures on herring from pre- and post-spawning aggregations on Jeffreys Ledge (inshore Gulf of Maine) and Georges Bank. Prespawning herring were morphometrically distinct from postspawning herring on the same spawning ground, principally due to differences in abdominal size. Many truss measurements were affected by spawning condition while most of the traditional measurements were not. The Jeffreys Ledge and Georges Bank stocks could not be effectively discriminated using morphometrics based on prespawning samples due to the confounding effects of spawning condition on morphometry. Extrinsic samples of postspawning herring were classified into their respective spawning groups using discriminant analysis of morphometric characters with 88% accuracy. This study indicates that morphometric characters can be used to distinguish spawning stocks of Atlantic herring in the northwest Atlantic with moderate accuracy. However, due to the confounding effects of spawning condition, these analyses can only be accomplished on postspawning fish.

5. **<u>0.3 Summer/0.15 Winter</u> –** In the summer, 30% of the catch in Area 1A is from the inshore component and 70% from the offshore component. In the winter Area 2 fishery, 15% of the catch comes from the inshore component and 85% from the offshore component.

   This ratio is based on information from the TRAC Assessment and assumes that the entire complex is located in Area 2 and mixes randomly among subcomponents.

The actual stock component mixing ratios most likely vary among years due to environmental variables, changes in the relative stock sizes of the different components, and patterns in fishery exploitation. As such, they are currently the subjects of investigation by tagging and morphometric studies. While the exact mixing ratios for 2005 are uncertain, the ratios given here represent a reasonable range of possibilities based on available scientific literature, the June 19, 2003 SSC recommendations, and Herring PDT examination.

Using the range of mixing scenarios described above, removals from the inshore component were estimated for the historical (ten-year and five-year) time series and a range of options considered for area-specific TACs.

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

- Area 1B mixing rates are assumed to be 0.3 (30% GOM and 70% GB/NS) throughout the year;
- For the fall fishery (August – November), 100% of the catch from Area 1A is assumed to come from the inshore component of the stock;
- All catch from Area 3 is assumed to come from the offshore component of the stock;
- Catch from the New Brunswick weir fishery is assumed to be 20,000 mt and come from the inshore stock component.
- Each projection 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**.

TAC Options and Relative Risk Assessment Results

The risk assessment evaluates relative risk associated with the TAC options by producing estimates of removals from the inshore component under a range of mixing scenarios, which should be compared to five-year and ten-year historical removals under the same range of mixing scenarios. **More risk is associated with TAC options that project removals of the inshore component that are higher than historical removals.** The Council should select TACs for Areas 1A, 1B, 2, and 3 based on choices regarding both the risk of overfishing the inshore component (relative to five-year and ten-year historical removals) and issues/tradeoffs associated with allocating the catch of the inshore component of the resource between Areas 1 (primarily 1A) and 2.

Comparing removals of the inshore component over the most recent five-year and ten-year time period illustrate the impacts of the Atlantic herring management program and the area-specific TACs that were implemented in the Herring FMP. The Herring FMP became effective for the 2000 fishing year and implemented quotas by management area in a previously un-regulated fishery. Five-year historical removals are consequently lower than ten-year historical removals because the five-year average includes three years of management under area-specific TACs, which appear to have reduced the harvest of the inshore component of the resource when compared to the historical ten-year average.

Table 6 presents the results of the relative risk assessment based on the TAC options that were identified by the Committee/Section at the June 15, 2004 meeting and based on the five mixing scenarios described in the previous discussion. More risk is associated with TAC options that project removals of the inshore component that are higher than five-year and ten-year historical removals. **Again, it is important to note that the risk assessment assumes that 20,000 mt of the inshore stock component is removed by the NB weir fishery and that all of the area-specific TACs are fully utilized.** Figure 4 also illustrates the results of the risk assessment relative to five-year and ten-year historical removals of the inshore component.

- The TAC distribution in Option 1 closely represents current harvest levels in the fishery (60,000 mt in Area 1A and 20,000 mt in Area 2) with the exception of Area 3 (catches in Area 3 do not impact this analysis, as no inshore fish are assumed to be caught in Area 3 at any time of the year). The projected removals of the inshore component under Option 2 illustrate the potential impacts of the current TACs, should all of the TACs be fully utilized in all management areas where inshore fish are caught. **Therefore, the results for Option 2 reflect the impacts of the current TAC allocation, while the results for Option 1 reflect the impacts of the current TAC utilization.**
- In a relative sense, options with projected removals that are less than the five-year average removals are the most risk-averse of the options that were analyzed. Options with projected removals that are between the five-year and ten-year average removals are relatively less risk-averse. Options with projected removals above the ten-year average are the most risk-prone of the options that were analyzed.

Table 6 Results of Relative Risk Assessment of TAC Options Under Consideration

Mixing Ratios	Summer	0.5	0.6	0.5	0.3	0.3	Median
	Winter	0.2	0.2	0.5	0.3	0.15	
Removals of Inshore Component (mt)	10-year Historical	77,443	80,988	83,129	74,625	72,228	77,443
	5-year Historical	69,106	71,839	74,364	65,393	62,764	69,106
TAC Options	1	74,906	77,289	80,571	72,030	69,198	74,906
	2	80,543	82,926	94,663	80,485	73,425	80,543
	4	62,715	65,098	72,611	61,249	56,301	62,715
	7	70,271	72,654	78,754	68,334	64,093	70,271

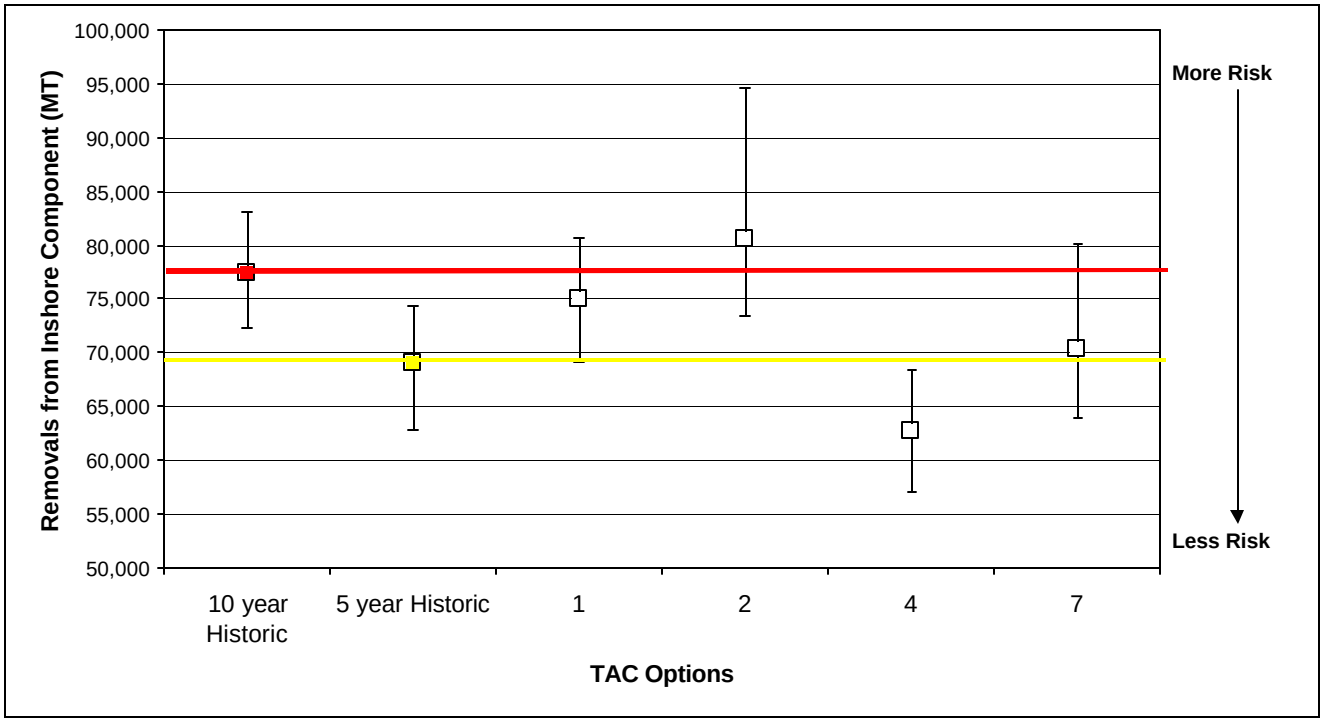
Note: The five-year and ten-year historical averages are different than those in the May 5 PDT/TC Report because they have been updated to reflect removals through 2003, including actual removals from the NB weir fishery through 2003.

The projections assume that all TACs are fully utilized in all management areas, in addition to removals of 20,000 mt of inshore fish from the NB weir fishery.

Highlighted cells represent scenarios that predict removals of the inshore component that are higher than the ten-year median value.

TAC Options under consideration are summarized in Table 2 p. 5.

Figure 4 Results of Risk Assessment Relative to Five-Year and Ten-Year Removals of the Inshore Component



Note: Points on the graph represent median levels of removals, and bars represent the range of predicted removals under the various mixing scenarios (see Table 6 for actual values).

The lower horizontal line on the graph represents median five-year removals of the inshore component, while the upper horizontal line represents median ten-year removals.

This is a relative risk assessment for the purposes of comparing TAC options and only considers removals of the inshore component of the resource. The assessment assumes that all TACs are fully utilized in all management areas, in addition to removals of 20,000 mt of inshore fish from the NB weir fishery.

TAC Options under consideration are summarized in Table 2 p. 5.

Summary

Based on information presented in the May 5, 2004 Herring PDT/TC Report, the PDT/TC notes the following:

- Available trawl survey data do not indicate that a significant drop in herring biomass is occurring. In terms of the Atlantic herring stock complex as a whole, available data suggest that biomass is stable and increasing over time.
- Available survey data suggest that the inshore component of the resource has remained relatively stable in recent years. It is important to note that data specific to the inshore component of the resource are limited – inshore hydroacoustic data are not considered reliable enough at this time to identify trends, so the available data are generally limited to those from bottom trawl surveys and commercial catch sampling.
- Assessment of the Atlantic herring resource remains complex-wide; data are not available at this time to generate a biomass estimate, apply a target fishing mortality rate, and estimate an appropriate level of yield specifically from the inshore component of the resource. Herring PDT biologists are working on developing a separate stock assessment for the inshore component of the resource. If a separate assessment of the inshore component can be conducted, it should be peer-reviewed through a benchmark stock assessment for herring (TRAC or SARC) prior to use in the management arena.
- Available information does not provide a clear answer to the question of whether or not harvest at current levels will jeopardize the inshore component of the resource. However, harvest levels for the Atlantic herring fishery have been relatively consistent for many years, and available data suggest that the inshore component of the stock is stable and has not experienced significant declines in biomass under these harvest levels. Without any biological targets or benchmarks specifically for the inshore component of the resource, the PDT/TC cannot certify that maintaining harvest of this stock component at or near current levels will not cause a decline in biomass. Nevertheless, given a long time series of relatively consistent catch and stable surveys, the PDT/TC is comfortable concluding that no significant declines in the inshore component of the resource should be expected under harvest levels in 2005 similar to those observed in recent years unless recruitment for this stock component falters.

While the risk assessment provides some perspective of the risk associated with over-harvesting the inshore component of the resource relative to historical removals, the larger risk may be that in the absence of an inshore stock assessment, there is no way to relate removals of the inshore component to a fishing mortality rate. Relative to historical catch, and based on available data (trawl, commercial sampling), removals similar to recent levels appear to be sustainable in the short-term, but it is uncertain whether or not these removals are too high for the inshore component to sustain over the long-term.

Removals from the fishery in recent years have been much less than total TAC allocations. The risk assessment projects removals from the inshore component if all TACs in all management areas are fully utilized and compares these removals to actual removals of the inshore component over the past five years and ten years. The Council should consider the risk associated with the

TAC option it selects if the TACs are fully utilized and whether or not this is likely to occur in 2005, given market and fishery conditions.

3.2.2 Impacts of Days Out Management

The four TAC options identified by the Herring Committee/Section at the June 15, 2004 meeting were analyzed to determine the potential impacts of applying a landings prohibition to different values for the Area 1A TAC. This model predicts the closure date for the herring fishery in Area 1A under different "days out" strategies and is utilized annually by the ASMFC and affected States to select the days out landings prohibition for the Area 1A fishery. To analyze the four TAC options identified by the Committee/Section, the model has been modified to use vessel trip report (VTR) data instead of interactive voice response (IVR) data, which are normally used in the annual days out analysis. VTR data are more accurate than IVR data, but the VTR data are not available earlier in the fishing year when the days out provisions are selected by ASMFC and the affected States.

The days out model examines historical catch rates by week from 1994-2003, with adjustments made to the historical catch rates based on current management measures in the fishery (area-specific TACs, split season in Area 1A, etc.). The model predicts the closure date for the 1A fishery under the proposed TACs. For each of the TAC options under consideration, the Herring PDT examined three days out scenarios: 0, 2, and 3 days out of the fishery to determine when the fishery may close in Area 1A (Table 7).

Table 7 Predicted Closure Date for Area 1A Fishery Under Proposed TAC Options (based on 1994-2003 catch rates)

TAC Option	0 Days Out	2 Days Out (status quo)	3 Days Out
TAC Option 1 (60,000 mt)	7-Oct	11-Nov	16-Dec
TAC Option 2 (60,000 mt)	7-Oct	11-Nov	16-Dec
TAC Option 4 (45,000 mt)	26-Aug	30-Sep	28-Oct
TAC Option 7 (55,000 mt)	16-Sep	28-Oct	2-Dec

TAC Options under consideration are summarized in Table 2 p. 5.

In addition, the Herring PDT applied the cumulative 1A catch rate per week (1994-2003) and the relative risk assessment model described in Section 3.2.1 of this document to predict removals from the inshore stock component, assuming the same mixing ratios and seasonal fishing patterns that were applied to the relative risk assessment, for each of the TAC options under consideration and possible days out strategies (Table 8 and Figure 5).

Table 8 Results of Relative Risk Assessment of TAC Options Under Consideration and Possible Days Out Strategies for Area 1A

Mixing Ratios	Summer	0.5	0.6	0.5	0.3	0.3	Median
	Winter	0.2	0.2	0.5	0.3	0.15	
Removals of Inshore Component (mt)	10-year Historical	77,443	80,988	83,129	74,625	72,228	77,443
	5-year Historical	69,106	71,839	74,364	65,393	62,764	69,106
	DAYS OUT						
TAC Option 1	0	56,505	65,145	70,349	58,370	55,572	58,370
	2	68,445	67,778	74,042	64,185	61,386	67,778
	3	73,686	72,245	79,282	70,972	68,174	72,245
TAC Option 2	0	62,101	65,145	84,340	66,765	59,769	65,145
	2	74,042	67,778	88,033	72,579	65,584	72,579
	3	79,282	72,245	93,274	79,367	72,371	79,282
TAC Option 4	0	41,744	47,561	60,789	45,244	39,994	45,244
	2	55,775	51,944	66,275	52,937	47,687	52,937
	3	58,338	53,956	68,838	56,603	51,353	56,603
TAC Option 7	0	48,057	54,428	65,304	51,057	46,557	51,057
	2	62,146	59,209	71,146	59,020	54,520	59,209
	3	68,633	64,922	77,633	67,053	62,553	67,053

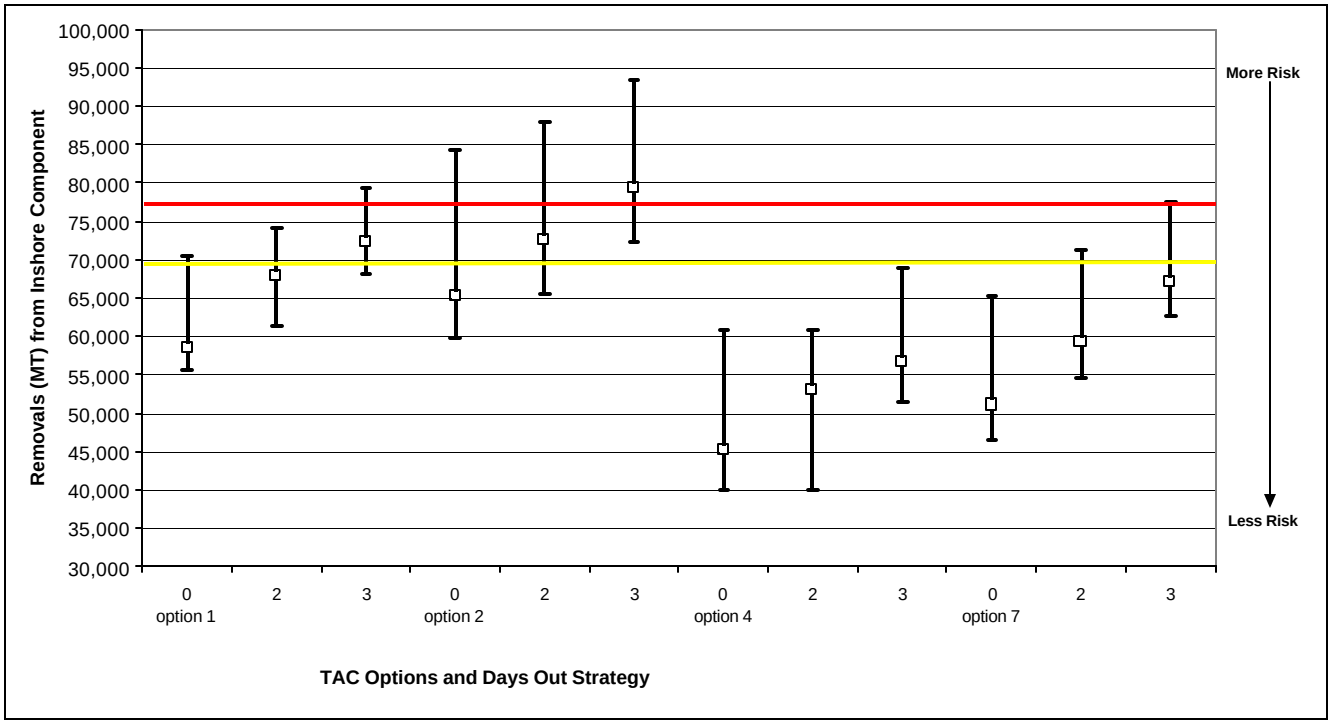
Note: This is a relative risk assessment for the purposes of comparing TAC options and only considers removals of the inshore component of the resource under various strategies for days out of the fishery.

The above analysis assumes that all TACs are fully utilized in all management areas and utilizes the actual five-year and ten-year historical removals from the NB weir fishery. The five-year and ten-year historical averages are different than those in the May 5 PDT/TC Report because they have been updated to reflect removals through 2003, including actual removals from the NB weir fishery through 2003.

Highlighted cells represent scenarios that predict removals of the inshore component that are higher than the ten-year median value.

TAC Options under consideration are summarized in Table 2 p. 5.

Figure 5 Results of Risk Assessment of TAC Options Under Consideration and Possible Days Out Strategies (Relative to Five-Year and Ten-Year Removals of Inshore Component)



Note: Points on the graph represent median levels of removals, and bars represent the range of predicted removals under the various mixing scenarios (see Table 8 for actual values). The lower horizontal line on the graph represents median five-year removals of the inshore component, while the upper horizontal line represents median ten-year removals.

TAC Options under consideration are summarized in Table 2 p. 5.

The extension of the 1A fishery using days out management results in greater removals from the inshore component than if no days out are applied and the fishery closes at an earlier date. All herring caught in Area 1A from August – November are assumed to come from the inshore component of the resource, so extending the fishery through these months produces an overall increase in the proportion of inshore fish that are taken in the 1A fishery across the year. From a biological perspective, therefore, it may be more beneficial to the inshore component of the resource to allow the 1A fishery to close earlier in the fishing year. From a social and economic perspective, however, an earlier closure of the fishery could result in negative impacts on participants and affected communities. The costs and benefits of selecting an appropriate TAC distribution in combination with a days out strategy should be considered.

3.2.3 Sensitivity Runs for NB Weir Fishery Assumption

The PDT/TC also analyzed the proposed TAC options to determine the effects of recent changes in catches of the inshore component from the (Canadian) NB weir fishery. The Committee/Council do not need to specify or predict what the catch in the NB weir fishery may be in 2005, as the FMP already incorporates an assumption of 20,000 mt, and the risk assessment presented in Section 3.2.1 utilizes this assumption. The following sensitivity analysis was conducted to provide some perspective on what removals from the inshore component may be if the NB weir catch is less than 20,000 mt and to illustrate the potential impacts of removals from the NB weir fishery as they relate to the selection of area-specific TACs and days out strategies.

Overall, removals from NB weir fishery have recently declined but are variable among years (see May 5, 2004 PDT/TC Report for a time series of catches from the NB weir fishery). Three assumptions about removals from the NB weir fishery were analyzed (Table 9); (1) 20,000 mt as suggested in the Herring FMP; (2) the most recent 10-year average removals (mean = 17,086 mt: SD = 3,928); and (3) the most recent 5-year average removals (mean = 15,262 mt: SD = 4,740).

Table 9 Results of Relative Risk Assessment of TAC Options Under Consideration and Different Assumptions about Catch in the NB Weir Fishery

Mixing Ratios	Summer	0.5	0.6	0.5	0.3	0.3	Median
	Winter	0.2	0.2	0.5	0.3	0.15	
Removals of Inshore Component (mt)	10-year Historical	77,443	80,988	83,129	74,625	72,228	77,443
	5-year Historical	69,106	71,839	74,364	65,393	62,764	69,106
	NB WEIR CATCH						
TAC Option 1	20,000	71,359	70,691	76,956	67,098	64,300	70,691
	5-year (15,262)	66,621	65,953	72,218	62,360	59,562	65,953
	10-year (17,086)	68,445	67,778	74,042	64,185	61,386	67,778
TAC Option 2	20,000	76,956	70,691	90,947	75,493	68,498	75,493
	5-year (15,262)	72,218	65,953	86,209	70,755	63,760	70,755
	10-year (17,086)	74,042	67,778	88,033	72,579	65,584	72,579
TAC Option 4	20,000	58,689	54,858	69,189	55,850	50,600	55,850
	5-year (15,262)	53,951	50,120	64,451	51,112	45,862	51,112
	10-year (17,086)	55,775	51,944	66,275	52,937	47,687	52,937
TAC Option 7	20,000	65,060	62,123	74,060	61,933	57,433	62,123
	5-year (15,262)	60,322	57,385	69,322	57,195	52,695	57,385
	10-year (17,086)	62,146	59,209	71,146	59,020	54,520	59,209

Note: This is a relative risk assessment for the purposes of comparing TAC options and only considers removals of the inshore component of the resource under various assumptions about catch in the NB weir fishery. The above analysis assumes that all TACs are fully utilized in all management areas and incorporates current management measures into the projections, including two days out of the fishery in Area 1A.

The five-year and ten-year historical averages in the above table are different than those in the May 5 PDT/TC Report because they have been updated to reflect removals through 2003, including actual removals from the NB weir fishery through 2003.

Highlighted cells represent scenarios that predict removals of the inshore component that are higher than the ten-year median value.

TAC Options under consideration are summarized in Table 2 p. 5.

The sensitivity analysis of the NB weir fishery catch suggests a relatively predictable pattern of removals of the inshore stock component. Overall, the variability of removals by the NB weir fishery contributes **less** to the result than the distribution of the area-specific TACs and/or days out strategies. Currently, there are no controls on either catch or effort in the NB weir fishery. From a statistical perspective, it is probable that catches from the NB weir fishery could exceed the 10-year or 5-year averages in the short-term, given the high degree of variability over the last 5-10 years (see standard deviations associated with historical removals from NB weir fishery).

3.2.4 Consideration of Catch-Per-Unit-Effort (CPUE)

Many stakeholders have suggested that despite relatively constant catches, fishing effort in some management areas, particularly Area 1A, has increased over the last several years. The common perception is that increased effort combined with relatively stable catches are indicative of a decline in fish abundance.

However, catch-per-unit-effort (CPUE) is **not** a robust or adequate measure of trends in abundance for Atlantic herring, particularly for the inshore Gulf of Maine spawning component. This is due to:

1) Management actions (TACs, days out, and spawning restrictions), which have changed the catch patterns since FMP implementation;
2) Changes in gear choice (fixed gear to purse seine to midwater trawl), which have changed where and how fish are harvested as well as the effects of weather on the fishery;
3) Changes in vessel size and hold capacity;
4) Intermixing of stock components/uncertainty about stock mixing and the availability of different stock components to the Area 1A fishery;
5) Seasonal and annual changes in fish quality, which affect marketability and targeting strategies in the fishery;
6) The use of refrigerated salt water (RSW) tank systems, which allow for a greater time between catch and offloading; and
7) Increased targeting of Atlantic mackerel, which affects harvester choice on direct herring targeting, particularly during the winter/spring.

From a biological and technical perspective, the utilization of CPUE indices to measure the abundance of schooling fishes (such as Atlantic herring) has been shown to be ineffective and has been rejected in most clupeid assessments (Corten, 2000 and others). This issue will be explored further in the Draft Environmental Impact Statement (DSEIS) for Amendment 1 to the Herring FMP.

4.0 SOCIO-ECONOMIC IMPACTS

4.1 DESCRIPTION OF IMPACTED HERRING FLEETS

There are three sectors of the herring fleet that will be discussed in relation to impacts from the TAC options. These sectors were chosen based on gear type and the region in which the vessels' principal port of landing is located (based on vessel trip reports and the port in which the majority of the vessel's herring landings were identified). The choice of fleet sectors was dictated by the differences in expected impacts from the TAC options.

The **Maine purse seine fleet** consists of five vessels with principal ports of Addison, Prospect Harbor, Rockland, and Stonington ME. This sector made 340 trips and landed 20,256 mt of herring in 2003. The majority of the landings were from vessels with a port designation of Rockland or Stonington ME. Ninety five percent of the landings by this sector came from Area 1A in 2003. Eighty two percent (82%) of the total revenues for this sector came from Atlantic herring in 2003 (see Table 9 in May 5, 3004 PDT/TC Report).

The **North of Cape Cod midwater trawl fleet** (pair and single) consists of 15 vessels with principal ports of Gloucester MA, Newington NH, New Harbor ME, Portland ME, Rockland ME, and Vinalhaven ME. This sector made 720 trips and landed 62,145 mt of herring in 2003. Vessels with a Portland designation landed 26,493 mt (43%), and those with a Gloucester designation landed 15,294 mt (25%). Sixty six percent (66%) of the herring landings by this sector came from Area 1 (5% from Area 1B) in 2003, 14% from Area 2, and 20% from Area 3.

The **South of Cape Cod midwater trawl fleet** (pair and single) consists of eight vessels with principal ports of New Bedford MA, Newport RI, North Kingstown RI, and Point Judith RI. This sector made 181 trips and landed 17,189 mt of herring in 2003. Vessels with a New Bedford designation landed 13,176 mt (77%). Eleven percent (11%) of the herring landings by this sector came from Area 1A in 2003, 10% from Area 1B, 34% from Area 2, and 45% from Area 3.

The existing Downeast Maine weir fishery is not likely to experience negative economic impacts from the proposed 2005 TAC options because catch from this sector of the fishery is low, with reported catches totaling only 1 mt in 2003. However, this sector of the fishery may experience some indirect impacts from a reduction in the Area 1A TAC. During the scoping process for Amendment 1, several fixed gear fishermen from Downeast Maine expressed concern about the fixed gear sector's ability to access the herring resource in Area 1A. They noted that increasing competition for the available resource in Area 1A has limited their ability to participate in the fishery.

Loss of opportunity for fixed gear fishermen to participate in the herring fishery could be the result of increasing gear conflicts, an early closure in Area 1A (before the fish move close enough to shore for the fixed gear to access them), market conditions, and/or changes in conditions that influence the seasonal movement of herring, among other factors. To the extent that opportunities in the herring fishery for the fixed gear sector are related to the timing and

closure of the Area 1A fishery, problems associated with access to the resource for this sector could be exacerbated in 2005, particularly if the TAC in Area 1A is reduced to 45,000 mt and the fishery closes earlier in the year.

4.2 IMPACTS ON MAINE PURSE SEINE FLEET

Status Quo (TAC Option 2)

Since the TACs remain the same under the status quo, there are no economic impacts from this TAC option.

TAC Option 1 (60K-1A, 10K-1B, 20K-2, 60K-3)

Because the Area 1A and 1B TACs are not reduced under this option and almost all of this sector's landings come from Area 1, there are no expected impacts to this sector of the fleet.

TAC Option 4 (45K-1A, 10K-1B, 35K-2, 60K-3)

With a 15,000 metric ton decrease in the combined Area 1 TAC, the impact of this option on this sector could be relatively large. In 2003, the purse seine fleet caught almost 29% of the Area 1 TAC (1% of the Area 1B 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 4,350 mt loss in catch which is worth approximately $623,000 or $125,000 per vessel (five vessels in the sector). On an individual vessel basis, the losses would range from $25,000 to $238,000 per year per vessel. These predictions may represent a "worst-case scenario," as they are based on fishing patterns observed in 2003 (95% of this sector's landings came from Area 1A in 2003) and assume that there is no movement of this gear sector to other areas or other fisheries. It also assumes no increase in the purse seine sector's proportion of Area 1A catch relative to other gear types. In this assessment, the reduction in the Area 1A TAC translates directly into lost revenues for purse seine vessels.

Purse seine vessels would have to either increase their proportion of the herring catch in Area 1A relative to midwater trawlers or move to other areas. Moving to offshore areas may be problematic due to the size of the vessels (see Table 1) and the schooling behavior of the fish in offshore areas. There were no landings from Area 3 by the purse seine fleet in 2003. It may also 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. Four percent (4%) of the purse seine catch was from Area 2 in 2003. If the Maine purse seine vessels move to Areas 2 and 3, the cost to harvest the fish will increase due to increased steaming costs (see the discussion below of increased costs due to longer steam times). The safety of smaller purse seine vessels in offshore areas is an important concern as well.

Since the full 15,000 mt reduction in TAC is in Area 1A, the purse seine fleet will have to rely more on Area 1B. The Area 1B TAC has historically not been reached (50% was utilized in 2003). Since Area 1B is farther from shore than Area 1A, the cost of harvesting herring will increase (see the discussion below of increased costs due to longer steam times). The smallest vessels in the fleet, which fished exclusively in Area 1A in 2003, will be impacted the most to the extent they are unable to fish in Area 1B.

Area 1B will only be able to provide limited relief for vessels impacted by the reduction in the Area 1A TAC because the catch in Area 1B has been at or above 5,000 mt in recent years, with the TAC at 10,000 mt. Since the shortfall of 15,000 mt in Area 1A cannot be made up in Area 1B, the Area 1B season will be shortened (see the general discussion of shorter fishing seasons below).

A decrease in the Area 1 TAC may perpetuate the race for fish between purse seine and midwater vessels and among individual vessels of any gear type. There are a number of potential impacts associated with a more intense race for fish. See below for a description of these impacts.

TAC Option 7 (55K-1A, 5K-1B, 30K-2, 60K-3)

With a 10,000 metric ton decrease in the combined Area 1 TAC, the impact to this sector could be significant. In 2003, the purse seine fleet caught almost 29% of the Area 1 TAC (1% from Area 1B). If the proportion of catch by the purse seine fleet remains the same and the decrease in Area 1 TAC cannot be made up from fishing in other areas, there would be a 2,900 mt loss in catch which is worth approximately $416,000 or $83,000 per vessel (five vessels in the sector). On an individual vessel basis, the losses would range from $17,000 to $159,000 per year per vessel.

Purse seine vessels would have to either increase their proportion of the catch relative to midwater trawlers or move to other areas. Moving to offshore areas may be problematic due to the size of the vessels (see Table 1) and the schooling behavior of the fish in offshore areas. There were no landings from Area 3 by the purse seine fleet in 2003. It may also be impractical to move to Area 2 since the markets they serve are during the summer and fall in Maine and herring are not in Area 2 at that time. Four percent of the purse seine catch was from Area 2 in 2003. If the Maine purse seine vessels move to Areas 2 and 3, the cost to harvest the fish will increase due to increased steaming costs (see the discussion below of increased costs due to longer steam times). The safety of smaller purse seine vessels in offshore areas is an important concern as well.

Since the catch in Area 1B has been at or above 5,000 mt (the new Area 1B TAC) in recent years, the TAC is likely to be reached before the end of the year and will not provide relief to the 5,000 mt decrease in Area 1A.

A decrease in the Area 1 TAC may perpetuate the race for fish between purse seine and midwater vessels and among individual vessels of any gear type. There are a number of potential impacts associated with a more intense race for fish. See below for a description of these impacts.

Table 10 Herring Vessel Characteristics by Principal Gear (for vessels which averaged more than 2,000 lbs per trip)

	Purse Seine	Single Midwater Trawl	Pair Trawl
Number of Vessels	5	7	16
Average Length (ft) (min, max)	59 (43, 79)	80 (38, 128)	102 (67, 149)
Average Gross Ton (min, max)	82 (5, 170)	179 (17, 476)	188 (74, 394)
Average Horse Power (min, max)	483 (333, 580)	1,196 (485, 2,985)	1,253 (450, 2,100)

4.3 IMPACTS ON NORTH OF CAPE COD MIDWATER TRAWL VESSELS (SINGLE AND PAIR)

Status Quo (TAC Option 2)

Since the TACs remain the same under the status quo, there are no economic impacts from this TAC option.

TAC Option 1 (60K-1A, 10K-1B, 20K-2, 60K-3)

The only area TAC that would be reduced under this option is the Area 2 TAC. The most recent year in which the landings from this area were greater than 20,000 mt (the proposed TAC) was 2000 (27,198 mt). In 1999, herring landings from Area 2 were 22,712 mt. The average landings from 2001 – 2003 were 14,300 mt with 2003 landings at 16,079 mt.

Under current market conditions, the new TAC may become constraining if the fishery in 2005 is similar to that in 1999 and 2000. If this is the case, then the Area 2 TAC fishing season could end before the end of the year. See a description of this type of impact below.

Even with a market expansion of 50% (landings up to 150,000 mt), there would still be enough total TAC to meet that need. However, the majority of the expansion would have to come from Area 3. For vessels in the North of Cape Cod midwater trawl sector, which have the ability to fish offshore, it would not involve a significant increase in steaming time to go to Area 3 than to go to Area 2, especially for the Maine-based vessels. For vessels based in NH and MA, increases in steaming time may be occur depending on the relative location of fish in each of the areas. See the discussion of the cost of increased steaming time below.

TAC Option 4 (45K-1A, 10K-1B, 35K-2, 60K-3)

With 66% of this sector's landings coming from Area 1, the 15,000 mt decrease in the Area 1A TAC proposed in this option will shorten the Area 1A season, and likely the Area 1B season (see the discussion of impacts from shortened seasons below). The loss of catch in Area 1A will likely force vessels in this sector to make up the difference in Areas 1B, 2 and 3. An Area 2 TAC of 35,000 mt should not be constraining given recent landings history (see the discussion of

TAC Option 1), which may provide flexibility for this sector to shift harvest into Area 2 or Area 3. Shifting to Areas 1B, 2 and 3 will come at an increased cost, however (see discussion below).

TAC Option 7 (55K-1A, 5K-1B, 30K-2, 60K-3)

This option will have similar impacts to TAC Option 4. However, with a proposed Area 1B TAC of 5,000 mt, the dependence of this section on catch from Areas 2 and 3 will be greater. This may be tempered, however, by the higher Area 1A TAC and greater combined Area 1 TAC than Option 4.

4.4 IMPACTS ON SOUTH OF CAPE COD MIDWATER TRAWL VESSELS (SINGLE AND PAIR)

Status Quo (TAC Option 2)

Since the TACs remain the same under the status quo, there are no economic impacts from this TAC option.

TAC Option 1 (60K-1A, 10K-1B, 20K-2, 60K-3)

The only area TAC reduced under this option is that for Area 2. The most recent year in which landings from this area were greater than 20,000 mt (the proposed TAC) was 2000 (27,198 mt). In 1999, the landings from Area 2 were 22,712 mt. The average landings from 2001 – 2003 were 14,300 mt, with 2003 landings at 16,079 mt.

Under current market conditions, the new TAC may become constraining if the fishery in 2005 is similar to that in 1999 and 2000. If this is the case, then the Area 2 TAC fishing season could end before the end of the year. See a description of this type of impact below.

Even with a market expansion of 50% (landings up to 150,000 mt), there would still be enough total TAC to meet that need. However, the majority of the expansion would have to come from Area 3. For vessels in the South of Cape Cod midwater trawl sector that have the ability to fish offshore, an increase in steaming time is required to go to Area 3. With 45% of their catch already coming from Area 3 and with un-used TAC in that area, a greater reliance on Area 3 is feasible for the sector. The overall harvest costs for the sector will increase due to the increased steam times (see discussion below).

TAC Option 4 (45K-1A, 10K-1B, 35K-2, 60K-3)

With 21% of this sector's landings coming from Area 1, this option's proposed 15,000 mt decrease in the Area 1A TAC will shorten the Area 1A season and is likely to shorten the Area 1B season as well (see the discussion of impacts from shortened seasons below), consequently forcing vessels in this sector to make up the difference in Areas 1B, 2 and 3. An Area 2 TAC of 35,000 mt proposed under this options should not be constraining given recent landings history (see the discussion of TAC Option 1), which provides greater flexibility for this sector to shift harvest to Area 2 or Area 3. Assuming that this sector chose optimal harvest strategies in the past, shifting to other areas will come at an increased cost (see discussion below).

TAC Option 7 (55K-1A, 5K-1B, 30K-2, 60K-3)

This TAC option will have similar impacts to TAC Option 4, except that with a proposed Area 1B TAC of 5,000 mt, the dependence on Areas 2 and 3 will likely be greater. Relative to TAC Option 4, however, the higher Area 1A TAC and greater combined Area 1 TAC proposed in this option may temper some of the increased dependence on other areas.

4.5 FURTHER DISCUSSION OF IMPACTS

4.5.1 Impacts from Intensifying the Race to Fish

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 will likely 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 and competition to catch herring for food (sardines, frozen export) or for bait (primarily lobster).

Recently, the Area 1A TAC has been reached and the fishery has been closed 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 fishery remains open-access at this time, allowing opportunities for increased effort in Area 1A to catch the same or a lesser amount of fish, depending on which TAC option is ultimately selected. It is important to acknowledge that a reduction in the Area 1A TAC is likely to exacerbate problems associated with the open-access nature of this fishery as well as derby fishing. The associated short-term impacts of a reduction in the Area 1A TAC may make it more difficult to develop long-term strategies to address these problems in Amendment 1 to the Herring FMP.

In addition, 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.

4.5.2 Impacts from Increased Steam Time

There are two primary ways an option 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.

4.6 IMPACTS ON PROCESSORS

4.6.1 Description of Processors

4.6.1.1 Sardine Canneries

Individuals who work for Connors Bros. Ltd. at the sardine canneries in Maine and Canada provided the information presented below. Individual Herring PDT members who visited the canneries during 2003 gathered much of the following information. The Herring PDT wishes to thank the individuals at Connors Bros. Ltd. and the canneries for contributing the following information and helping the PDT provide a more comprehensive description of the current herring fishery.

Connors Bros. Ltd. purchased the remaining sardine canneries in the US from Stinson Seafood in 2000. The canneries are located in Bath ME & Prospect Harbor ME. Connors already owned a plant in Blacks Harbor, Canada, and a seasonal cannery in Seal Cove (Grand Manan, New Brunswick Canada). The Stinson canneries in Bath and Prospect Harbor are the only two remaining canneries in the Northeast United States. Years ago, more than 100 canneries existed (mostly along the coast of Maine) and processed close to the same amount of fish as the remaining two canneries. The demise of most of these canneries has been attributed primarily to increasing technology (and associated costs) and changes in the local and regional economy.

The cannery in Bath is the oldest of the existing plants (in terms of modernization) and has undergone renovations to update cutting equipment and fish storage techniques. The Prospect Harbor Plant is currently undergoing extensive renovations and is the site of numerous major capitalization projects. When finished, the Prospect Harbor cannery is expected to be one of the most modern sardine plants in the world.

Cannery Operations

Most herring are either trucked to the canneries from ports located throughout Maine and New England or delivered directly to the cannery (pumped from the fishing vessel into the plant). For transport to the facility, vessels pump fish directly into the trucks. The trucks then deliver to the plants. The fishing companies are paid weekly for the previous weeks catch by Stinsons and/or Connors (depending on destination). Each plant has the ability to process a truckload of herring within two hours of delivery. In an eight-hour shift, five - six truckloads will be delivered to each US cannery on a busy day. The canneries report to the Federal program through dealer weighouts based on the location where the fish are pumped out and delivered.

Once received at the Bath cannery, the fish are graded by width into four size categories: below 8", 8-9.5", 9.5-11", and larger than 11" and are then stored in RSW tanks. The heads and tails are cut off the fish (by cutting machines) and are sold for lobster bait. The precut fish are iced in a brine mixture and sent through the cannery to be packed and cooked. The packing line (for one product) at the plant in Bath can accommodate up to 64 packers who will work for an eight-hour shift, with two packers at each table. Each can is packed by hand, and approximately 1,500-2,000 cases (each containing 100 cans) can be packed per day. (All cans and covers for all of the canneries are manufactured in-house at the can plant in Blacks Harbor.) A good packer can produce approximately 80 cases of pre-cut fish or 40 cases of steaks in one shift. In general, two products (sardines & steaks with various sauces) can be processed concurrently at the Bath facility.

At the Prospect Harbor cannery, the fish are transferred directly to refrigerated salt water (RSW) tanks, where they are held until they are ready to be processed. At that point, the fish are graded into the same size categories as the Bath cannery. Two different grades can run through the cutting facility at one time. About twenty packers work at the Prospect Harbor facility (versus 120 several years ago when all fish were cut with scissors). On a good day, the Prospect Harbor plant has the ability to process about 150 cases (100 cans each) per packer, or close to 2500 cases of sardines per day (average about 2,200 cases per day). When plant modernization is completed with additional product lines the daily capacity will increase in excess of 3000 cases/day. The Prospect Harbor cannery also sells lobster bait (cuttings - heads and tails) to bait dealers and fishermen, which insures a good working relationship with the community's local lobstermen.

After they are packed into cans, the fish are first pre-cooked in steam boxes for about 20-25 minutes and then drained to eliminate excess water and fish oil. Then, sauces are added, and the cans are covered and sealed, washed, and prepared for the second cooking. The second cooking lasts approximately 50 – 60 minutes in new high tech sterilization equipment (retorts) that can hold about 18,000 cans each.

The product is also graded at the canneries by quality control technicians. Product evaluation is done on flavor, texture, and appearance from samples of each lot that is produced.

The Prospect Harbor plant also uses a state-of-the-art "vision system" to externally inspect each can for defects. This expensive new automated equipment in the packaging division has streamlined the packaging step to the point where Prospect Harbor now handles all of the finished product from both canneries and as production grows will add a second shift to handle more production.

Mobile freezer containers are located at the facilities to store frozen product for processing during times when fresh product is not available (for example, when bad weather does not allow for fishing). The canneries operate on a year-round basis as fish are available, but April – early May is traditionally a slow period for business. At the Prospect Harbor cannery, vessels (mostly purse seine) offload at the facility from about June – October, and fish are trucked in (mostly from midwater trawlers) during the remainder of the year. Even though Bath has vessel off load facilities, nearly all of the fish are trucked in.

Product Reliance

FDA requirements are such that the canneries rely on fish to be as fresh as possible. The canneries prefer fish that are delivered within 12 hours of being caught. In addition, the fish must be held at 40° or less from when they are caught until they are delivered to the plant. As a result, the canneries tend to prefer fish that are caught closer to shore (Area 1A) so that the product can be delivered as quickly as possible and maintained at an appropriate temperature. Purchasing fish that are caught on Georges Bank can be risky at times due to the increased distance from shore and the high summertime water temperatures (which is no issue for lobster bait companies). This simply magnifies and further supports the canneries position that in order to remain viable it is extremely important for the canneries to have good access to 1A fish during the spring, summer and fall months.

Historically, all canneries purchased 100% of their product from purse seine vessels and fixed gear (weirs & stop seines); more recently, about 75% of the product delivered to US canneries comes from midwater trawl vessels. This reflects the recent shift in the US fishery from purse seining to midwater trawling (mid- to late 1990s).

Reliance on fish from Canada has been variable in recent years. Canadian product supplies the plants and the Maine lobster bait market as needed when domestic supply is limited or the fish are of poor quality ("feedy"). Similarly, the 4,000 mt Border Transfer allocation supplies the Canadian plants on an as-needed basis.

Processing Capacity

Currently, the two canneries in the U.S. are processing about 200-220 tons of product per day (total), as the fish are available (quality & size dependent). Over the course of one year, the Bath and Prospect Harbor canneries process about 10,000 Mt tons of herring each. In the calendar years 2002 – 2003, due to challenges on the fish acquiring side, the canneries have had problems operating above 60% plant capacity utilization. Capacity at these plants exists to process a total

of 30,000 tons per year if the fish are available. Major capitalization projects are underway at the Prospect Harbor plant that will expand its capacity significantly.

Markets

The majority of the products produced by Connors/Stinsons are sold in the US as well as in other countries around the world. Increasing competition from other countries that process sardines for the global market include: Morocco, Korea, Taiwan, and Poland. Norway and Sweden are also large players on the global market. As a result, US production is relatively small from a global perspective, and markets for US product in Europe and Asia are very limited (due in part to a high tariff in force in the EU). Atlantic herring is the only species processed by Connors Bros., but many species are utilized for sardines globally. Connors/Stinsons are continually expending efforts to find new markets for their products.

Employment

The Bath and Prospect Harbor canneries together employ about 250 benefited employees. The makeup of this workforce includes: management, supervisors, quality control, maintenance, tank room, packing room, sealing room, packaging & shipping.

At the Prospect Harbor cannery, most employees live within one hour of the facility throughout the Downeast Maine region. At the Bath cannery, most employees are local, residing in Bath, Brunswick, and other nearby towns. Some temporary/seasonal employees are hired from Portland ME. Fewer alternative employment opportunities exist around the Prospect Harbor plant as compared to the Bath plant, further supporting the importance of the Prospect Harbor cannery to the local economy and community.

Resource Management

The management team at Connors/Stinsons have recognize the value of sound resource management and have participated actively at many levels to assist in the management of the herring resource. Stinson Seafood volunteered vessel time and allowed an acoustic sounder to be installed in the F/V Western Wave (one of the first boats on the East Coast to do so) to further the spawning biomass estimating research being conducted by the Gulf of Maine Research Institute (formerly Gulf of Maine Aquarium). Since this time additional funds have also been donated to the research collaborative to expand and improve this ongoing research. Tagging studies being conducted by the Maine Dept. of Marine Resources have also been aided physically as well as monetarily. Also all cannery employees have been encouraged to check for tags and have been responsible for many of the tags being returned. In addition, Stinson management personnel have volunteered for advisory councils and other herring management groups during the development of the herring plan in hopes of crafting a well thought out workable plan to insure the future viability of the herring fishery.

U.S. Sardine Canneries – Summary Information

The following estimates are for both the Bath and Prospect Harbor canneries in Maine:

Processing Operations:	All Atlantic Herring, sardines and related products
Capacity:	200-220 tons of product per day; capacity at two plants for about 30,000-40,000 tons annually
Current Operations:	about 20,000-25,000 tons annually (due to fish supply)
Employment:	about 250 individuals

4.6.1.2 Freezer Plants

4.6.1.2.1 The Northern Pelagic Group (NORPEL, New Bedford MA)

The information presented below was provided by NORPEL and Maritime International Inc. Much of the following information was gathered by individual Herring PDT members who visited the NORPEL facility during 2003. The Herring PDT wishes to thank the individuals at NORPEL and Maritime International for contributing the following information and helping the PDT provide a more comprehensive description of the current herring fishery.

The Northern Pelagic Group, LLC (NORPEL) is a new pelagic processing plant based in New Bedford, Massachusetts that opened its doors on December 30, 2002, six months after construction of the facility began. Business planning for the facility started in January/February 2002. Prior to becoming a pelagic processing facility, the property on which NORPEL is located was a lumber yard/home repair store. Approximately $3.5 million was invested to build the processing facility in 2002 (not including investments associated with NORPEL's two dedicated fishing vessels). Additional money had been previously invested by Maritime International, Inc. with improvements to docks, cold storage facilities and the property infrastructure to accommodate NORPEL and their plans.

In general, NORPEL's processing operations are composed of about 70% herring and 30% mackerel. Processing herring can be a year-round business, while processing mackerel occurs primarily during the peak season, December – April. NORPEL began freezing mackerel in early January 2003. During the peak mackerel season in 2003, NORPEL was receiving some fish from about eight vessels in the area.

NORPEL processes herring for both the food and bait markets but concentrates the majority of its operations on the food market. While NORPEL 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.

NORPEL 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 300 tons per day. NORPEL estimates that it could process about 25,000-30,000 mt of fish during 2003, possibly 40,000 mt depending on fish availability, weather, and market conditions.

Committing vessels to serve the plant is a key element of NORPEL's long-term business strategy. Two dedicated midwater trawl vessels are committed to the plant through cross ownership: (1) 163 feet in length with a 400 ton hold capacity and (2) 120 feet in length with a 300 ton hold capacity. These two vessels came to New Bedford from the West Coast in October/November 2002 as part of NORPEL's business plan for consistently supplying product to the new facility. These vessels possess federal permits for the Atlantic herring and squid/mackerel/butterfish fisheries.

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 NORPEL sees as advantageous to everyone involved because the fish are utilized. 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.

Processing Operations

Vessels that catch herring for food markets hold the fish in refrigerated sea water (RSW) tanks (30-31°F) until the fish can be graded at the NORPEL facility. RSW tanks are critical to ensure a food-grade product. If the fish are considered to be acceptable for the food market, then NORPEL purchases them, places them in their own specially designed land RSW tanks (30-31° F), grades them to size, packs them into custom poly-coated cartons, and freezes them. NORPEL has six large RSW holding tanks, which are computer-controlled and capable of holding nearly 300 mt.

There are also blast freezers located in an adjacent facility to supplement operations if larger fish (mackerel) are purchased. The adjacent cold storage facility (Maritime International Inc.) is capable of holding nearly 6,000 mt of processed product to help facilitate on-time deliveries according to customer's schedules.

Once frozen in blocks, the fish are packed into cartons (boxes) of 20-25 kg in size on a conveyor system. The conveyor packs about 15 boxes per minute and one pallet every three minutes. The packing machine operates with two people.

Markets

NORPEL processes herring and mackerel for food markets worldwide. On a global basis, the U.S. fisheries for pelagic species like herring and mackerel are very small. NORPEL is competing for market share with plants that are supplied by enormous pelagic fisheries (West Africa, for example).

The distance between the processing facility in New Bedford and the customers located throughout the world presents some difficulties for the plant. It can take 2-3 weeks for the customer to receive the product once the plant processes it. However, once NORPEL freezes a food-grade product, it has about a 12-month shelf life. In addition, NORPEL's relationship with Maritime International in New Bedford has helped to minimize problems associated with long-distance shipment (see below).

Employment and Economy

NORPEL has provided a boost to the economy in the fishing community of New Bedford. It employs 50-60 individuals over the course of a year, the majority of whom live in or near the community. Approximately 30 employees work each shift (two shifts/day) when the plant is operating at capacity, and this number varies based on the amount of product that needs to be processed at any given time. About 90-95% of the employees are of Central American descent (Guatemala, San Salvador). Six individuals work for the processing facility full-time (engineers, managers).

In addition, the two dedicated fishing vessels employ five crew members each and purchase food, fuel, and other supplies from local businesses. The captains and crew members of the two vessels are local residents who participated in fisheries on the West Coast for a period of time and have now come back to their home communities. The plant offers competitive wages to its employees enabling them to support their families.

Future Plans

NORPEL's future plans include purchasing horizontal plate freezers for larger fish (mackerel) and specialty products. There are no plans for significant expansion of the plant, primarily because the size of the property and the current facility make a significant expansion unrealistic. NORPEL plans to continue to process herring on a year-round basis and expand its markets to match the current processing capabilities of the plant.

Maritime International

Much of the processed product from NORPEL is shipped overseas via Maritime International Inc., which is located adjacent to the processing facility in New Bedford. Overseas shipment occurs in high cube refrigerated containers designed to hold the product at the optimal temperature of –18 degrees Fahrenheit (0°C) to ensure freshness. Maritime International can arrange for either containerized cargo shipments or bulk/tramper carriage of nearly 4,000 mt per shipment. Clients can select either service based on the amount of cargo or product they require.

During the scoping process for Amendment 1, Maritime International provided estimates of financial expenditures associated with NORPEL cargo vessel loading operations. The estimates provided by Maritime International were based on one cargo vessel remaining in port for three days and spending money in the community for transportation, restaurants and entertainment, doctors, propane suppliers, and other associated industries. Estimates of expenditures associated with pilot boat operators, vessel agents, customs agents, lift trucks, courier services, and other items required to prepare the cargo ship for transport were also provided. With a potential of 15

cargo vessels per year, Maritime International estimates expenditures of at least $3.2 million in addition to those associated with processing, storage, container shipments, and local distribution.

NORPEL – Summary Information

Processing Operations:	Approximately 70% herring, 30% mackerel
Plant Capacity:	Approximately 300 tons per day, 200 days per year (60,000 tons)
Current Operations:	20,000 – 30,000 mt
Plant Employment:	50-60 individuals, 6 full-time 10 crew members for 2 fishing vessels

4.6.1.2.2 Cape Seafoods (Gloucester, MA)

The information presented below was provided by Cape Seafoods, Inc. Much of the following information was gathered by individual Herring PDT members who visited the Cape Seafoods facility during 2004. The Herring PDT wishes to thank the individuals at Cape Seafoods for contributing the following information and helping the PDT provide a more comprehensive description of the current herring fishery.

Cape Seafoods is a pelagic processing plant based in Gloucester, Massachusetts that began processing operations in June 2001, six months after leasing space for the facility from the Commonwealth of Massachusetts. Allied Cold Storage is located adjacent to Cape Seafoods and currently offers freezer space for about 4,500 tons of product. Allied also invested in capacity upgrades and added three blast freezers after the first two years of operation of Cape Seafoods. Americold Logistics, a large cold store operator in Gloucester, added new blast freezers and made cold store space available to Cape Seafoods in January 2004.

Cape Seafoods is owned by a group of individual shareholders, and another group owns the two dedicated fishing vessels (Western Sea Fishing Company, see below), although there is some overlap between these groups. Some of the shareholders are related to each other (immediate family), some are local residents, and some are more involved in the day-to-day operations of the vessels and facilities than others.

In general, Cape Seafoods processing operations are composed of about 60% herring and 40% mackerel in terms of volume. While herring is processed in greater quantity, mackerel receives a better price and represents a larger proportion of the facility's revenues than herring. Annual production targets at the facility are currently about 42,000 tons, of which 20,000 – 26,000 tons are typically herring. About 90% of Cape Seafoods operations are focused on processing and exporting a food grade herring/mackerel product. Some portion of product supplies the sardine canneries in Maine. The remainder of fish that comes through the plant (primarily herring) is sold for fresh and frozen bait.

The company started with four processing/packing lines and added two more lines in 2002 that utilize more advanced technology. The capacity of the processing plant is somewhat limited by the capacity of the blast freezers in the local cold storage facilities. As a result, the plant can process about 300 tons per day (one 12-hour shift). In general, the facility processes Atlantic

mackerel during the early part of the year (January – mid /end April) and Atlantic herring from June / July to the end of the year. The plant closes for maintenance on vessels and machinery for about four to six weeks during April and May.

Cape Seafoods is supplied by two dedicated fishing vessels, the Endeavour and the Challenger. These vessels are owned by Western Sea Fishing Company. These vessels were formerly scallop vessels that were upgraded and re-rigged to fish for pelagic species during 2001. They are approximately 145 feet in length, and they employ five crew members each, including the captain. Some crew members work seasonally and/or rotate throughout the fishing year, so over the course of a year, a total of about 15 individuals are employed on these two vessels. Each vessel has six refrigerated salt water (RSW) tanks, and together, the two vessels can hold about 800 mt of fish. In addition to the two dedicated vessels, other boats land herring and mackerel at Cape Seafoods throughout the year. However, the Endeavour and the Challenger are the only two vessels that consistently land pelagic fish in Gloucester on a year-round basis.

Processing Operations and Capacity

The fresh fish is pumped from the vessels' RSW tanks directly into the plant for processing. As part of the processing, fish are graded by size into a number of different weight categories. Herring is packed predominantly in a 125grm to 200grm range, and mackerel is packed into grades ranging from 200grm to 600grm.

Once the fish are packed into cardboard cartons with plastic liners, they are blast frozen and prepared for export. The plant is working with a number of U.S. carton manufacturers to develop a cardboard carton that is suitable for blast freezing for their export markets, rather than having to import cartons from Europe. Refrigerated cargo vessels are chartered by either Cape Seafoods or their customers to pick up product at the facility and ship it overseas. The cargo vessels usually transport between 2,500 and 4,000 mt of product.

Cape Seafoods also ships a large portion of the frozen production in refrigerated shipping containers, each carrying approximately 20 mt. These containers are brought by local trucking companies to the plant and cold stores for loading. Once loaded they are taken back to the shipping terminal in Boston to be loaded onto container ships. Any waste from the processing plant is transported to a protein recovery plant in Canada.

Markets

Atlantic herring processed by Cape Seafoods supplies some established markets in West Africa the Middle East, and Eastern Europe. The company is working towards developing export markets in the Far East which currently buy product from Europe and the Pacific. In addition, there is a substantial demand from bait markets for both fresh and frozen herring. The bait department at Cape Seafoods operates seasonally and supplies both fresh and frozen bait to local lobster and tuna fishermen.

Mackerel is sold to markets in Bulgaria, Romania and the Eastern Block countries. Sales are also made to West Africa, Egypt, the Far East, Europe and, to a lesser extent, Canada. Mackerel consuming Nations world wide have now accepted that top quality, food grade, product is available consistently from the USA. However, the overseas markets for pelagic species can be

volatile at times. Market limitations and competition necessitate that a reliable and consistent product be supplied by Cape Seafoods to customers around the world. Competition comes from well established supply sources in Europe, Norway and elsewhere.

Employment

There are 10-15 crew members on the two dedicated fishing vessels operated by Western Sea Fishing Company. Cape Seafoods employs 10 full-time individuals on a year-round basis, and contracts for temporary employees through an independent labor company in Massachusetts. The Company is intending to add two or three more full time employees in the near future. The year-round employees are mostly local area residents. Health benefits are provided to the company's full-time employees. The plant hires about 20-24 temporary employees every day that production is occurring. In addition, Allied Cold Storage employs six individuals at their State Pier, Gloucester facility, and another 15 individuals are employed to load refrigerated cargo vessels for exporting the product. No layoffs or employment reductions are anticipated in the near future. Cape Seafoods and Western Sea use many local area suppliers for such things as electrical maintenance, building modifications, packaging supplies, food and fuel for the vessels, trucking, freezing and cold storage.

Future Plans

Cape Seafoods may look to expand its processing operations in the future, mostly to service new and still emerging markets for pelagic species. The facility may consider processing of value-added products such as fillets, and others, depending on market conditions and the potential for long-term business opportunities.

Cape Seafoods – Summary Information

Processing Operations:	Approximately 60% herring, 40% mackerel (volume)
Plant Capacity:	Currently 300 mt/day, limited by freezing capacity and storage
Current Operations:	About 42,000 mt
Employment:	10 full-time individuals 20-24 temporary hires on days when the plant is processing 6 full-time individuals at Allied Cold Storage 15 individuals to load cargo vessels (stevedores) 10-15 crew members for 2 fishing vessels

4.6.1.2.3 Lund's Fisheries (Cape May, NJ)

Established in 1954, Lund's Fisheries produces, imports, and trades seafood products from around the world. The company's primary products include Atlantic mackerel, Atlantic herring, loligo squid, illex squid, croaker, sea trout, scup, butterfish, bluefish, menhaden, sea scallops, and conch.

The Lund's facility, located on the water in Cape May, NJ, is one of the largest seafood processing facilities on the Eastern Seaboard. With over 1,200 feet of waterfront the facility has a minimum of 15 vessels landing fish on a daily basis. Lund's produces for local fresh markets such as Boston, New York, Philadelphia, and Baltimore. The Lund's facility is equipped with

blast freezers capable of freezing up to 500 metric tons of fish per day. Lund's is also equipped with automated packing equipment specifically designed for pelagic fish, which allows the company to process 450 metric tons of whole round fish per day (Lund's Fisheries website, www.lundsfish.com).

Herring PDT members have not yet had the opportunity to visit the Lund's facility and collect additional information about the processing operation, employment, etc. This research will be conducted as part of the development of Amendment 1, and additional information about this facility will be provided in the DSEIS for Amendment 1.

4.6.1.3 Bait

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.

Herring is processed and sold for lobster bait in a variety of ways. In Rhode Island, herring bait is sold as whole salted fish. The fish are sold in 200 lb. barrels and are salted in layers using 35 lb. bags of salt. In general, herring are offloaded in large plastic containers. The containers are forklifted to a height even with a conveyer belt, and then layers of herring conveyed into a barrel, with layers of salt between each layer of herring. The bait keeps best in the winter, but can begin to decay after 2-3 days when it gets warm.

The quantity of herring used as bait is considerable. For the year 1996, when 105,00 Mt of herring was landed in the U.S., it has been estimated that on the order of 71,000 tons of herring were utilized as bait (Stevenson 1998). This includes bait taken as leftover product from herring processing.

It is clear that much of the economy and cultural fabric of coastal New England – especially Maine – depends greatly on herring bait to sustain the lobster industry important to this region. With a rocky soil and coastline, large distances between urban centers, and no other major industry or significant agricultural centers, coastal Maine has always relied heavily on its marine resources. As anyone who has traveled the Maine coast can observe, lobster represents the apex of those marine resources. Small-scale truckers, bait shop owners, and related business all participate in the commercial bait venture. Bait can be delivered dockside from trucks traveling up and down the coast. The trucks pick up the bait from canneries and community sites up and down the coast to service smaller bait shops or lobster fishing 'gangs' (Acheson 1987). Island bound and coastal isolated lobster fishermen may also pick up bait directly off vessels, or have it brought out on ferries. In recent years, the shift has been towards vessels landing directly to island ports.

Preliminary investigation by the Herring PDT indicates that lobster vessels in the State of Maine are most dependent on herring for bait and utilize herring for the vast majority of lobster bait. Lobster vessels in Massachusetts and New Hampshire are also very dependent on herring for

bait, but dependency on herring decreases in more southern areas. Information collected by the Herring PDT suggests that lobster vessels fishing outside of the Gulf of Maine, particularly in southern New England and Mid-Atlantic areas, are less dependent on herring for bait and utilize alternative baits more frequently. Lobster vessels in Rhode Island, for example, are more dependent on skates than herring for bait. This issue will be investigated further in the DSEIS for Amendment 1 to the Herring FMP.

4.6.1.3.1 Shafmaster Fishing Co., Little Bay Lobster Co., and Little Bay Fish LLC (Newington, NH)

The information presented below was provided by personnel at Shafmaster Fishing Co., located in Newington, NH. Much of the following information was gathered by individual Herring PDT members who visited the Shafmaster facility during 2004. The Herring PDT wishes to thank the individuals at Shafmaster Fishing Co. for contributing the following information and helping the PDT provide a more comprehensive description of the current herring fishery and the importance of the herring fishery to the lobster industry.

Although generally referred to as "Shafmaster" in this report, the company is a group of three companies located within the same facility – Shafmaster Fishing Co., which manages the fishing fleet and the facility itself; Little Bay Lobster Co., which markets lobsters; and Little Bay Fish LLC (DBA "The Bait Lady"), which handles the purchasing and sale of herring for lobster bait. Shafmaster owns seven offshore lobster boats, two pelagic fishing vessels (pair trawl), and a scallop/dragger combination vessel.

The majority of herring and mackerel handled by Shafmaster are landed by their two dedicated pelagic fishing vessels, the F/V Jean McCausland and F/V Isabelle Taylor. These boats are about 130 feet in length and pair trawl for herring and mackerel in all management areas on a year-round basis, with the exception of some maintenance that occurs during the spring (May/June). Currently, no other fishing vessels land herring at the Shafmaster facility on a regular basis. In general, the two Shafmaster vessels expect to land about 30 million pounds of herring and 15 million pounds of mackerel annually. In addition to the fish landed by their own boats, purchases from other pelagic vessels are trucked to the facility from Portland and Gloucester During calendar year 2003, the Shafmaster operation handled about 26 million pounds (11,793 mt) of herring, approximately 70% of which was landed by the F/V Jean McCausland (the F/V Isabelle Taylor was out of the fishery and in the shipyard being upgraded during that time).

While the vast majority of herring is sold by Shafmaster as fresh or salted lobster bait, much of the mackerel is sold directly to processing plants (Lunds, NORPEL) for food production. The company does not package and/or freeze herring on-site. The processing operation itself consists primarily of pumping the fish from the vessel, across a conveyor, and into a hopper where it is washed, salted, and stored in barrels for sale. Some product is loaded directly into trucks and delivered to the customer, but many customers come to the facility to purchase their bait. Shafmaster sells primarily fresh bait through smaller retail sales branches located in several ports throughout Maine (Little Bay Fish/The Bait Lady) – Portland, Winterport, Boothbay, Lubec, and Vinalhaven. The company owns several (5-6) trucks for transporting product to the sales offices.

Shafmaster purchases salt directly from a couple of dealers and uses millions of pounds of salt annually. The facility makes its own ice, generates its own power, and is self-sufficient and vertically-integrated on many levels of operation and maintenance. In terms of supplies, vessel maintenance, and repairs, very little is outsourced. In addition, the company builds its own lobster traps and has begun to offer custom-made traps for sale to local fishermen.

Markets

The companies represented by Shafmaster focus primarily on the market for lobster bait, with all of their production going to outside sales because their own lobster vessels do not use herring. Their offshore boats prefer a "harder" bait, such as skates and redfish racks, because it tends to hold up better for longer durations in the cold water. Much of the herring that is sold by Shafmaster for lobster bait goes to fishermen in Portland, Boothbay, Gloucester, Lubec, and other pockets of customers located throughout Mid-Coast Maine. The price of herring for lobster bait varies somewhat by port, depending on the availability and convenience of obtaining fresh bait.

In terms of volume and profits, lobster sales represent the largest proportion of business for the Shafmaster companies. Lobsters are sold to markets in New York and Boston, and the company is looking to expand sales to overseas markets. Little Bay Lobster Company owns three trucks that are dedicated to lobster sales.

The market for herring as lobster bait is relatively stable, and the company hopes to increase its share of this market while continuing to provide some catch to pelagic processing facilities. Sales of herring represent less than 20% of the companies' total business in a given year. Individuals at the facility indicated that capacity exists to increase herring operations if the bait market or other markets were to expand.

Employment

In total, the three companies represented by "Shafmaster" employ about 75 individuals in shoreside jobs on a full-time basis. This includes personnel to manage all three businesses, truck drivers, sales representatives, and individuals who work in the sales branches located throughout the region. In addition, the companies hire a few part-time/seasonal employees on an as-needed basis.

The ten boats owned by Shafmaster (7 lobster, 2 pelagic, 1 combination) employ 45 fishermen on a regular basis, with an additional 20 on standby to rotate trips and/or cover for individuals who cannot make a particular fishing trip. The two pelagic vessels (each 130 feet in length) require a crew of 4-5 individuals, including the captain. The full-time engineer aboard each boat can address any maintenance and repair issues as they arise. The offshore lobster vessels require a crew of 4 individuals.

To maintain the fleet and ensure year-round fishing, employees at the company include five full-time individuals dedicated to vessel overhauls, maintenance, and welding services. Lobster vessels rotate through a bi-annual maintenance schedule, while the pelagic vessels are generally

maintained and repaired in the spring (May/June) when herring are considered to be of a lesser quality ("feedy").

Future Plans

Future plans at the Shafmaster facility involve upgrades primarily targeted at increasing sales of lobsters. The facility plans to improve its refrigerated lobster storage tanks during the summer of 2004 by installing a state-of-the-art waterfall system in the pound, which will streamline the handling of lobsters for the purposes of shipping.

Shafmaster – Summary Information

Processing Operations:	Herring salted, packaged, and trucked for lobster bait
Plant Capacity:	Capacity exists to increase operations if markets expand
Current Operations:	About 26 million pounds (11,793 mt) of herring in 2003, with capacity to increase if markets expand
Employment:	75 full-time, shoreside employees 45 full-time fishermen, 20 additional on standby; includes 2 full-time engineers on each of the pelagic fishing vessels

4.6.1.3.2 Other Bait Dealers

The bait industry has changed tremendously in the last five years, resulting in a much more centralized distribution structure. Generally, the herring used for bait goes through a large wholesale dealer to smaller dealers and lobster wharfs along the coast. Several representative bait dealers have been identified and will be further investigated by the Herring PDT during the development of the DSEIS for Amendment 1 to the Herring FMP (Table 11). The PDT also notes that a small proportion of lobster bait is supplied by the sardine canneries as well as the freezer plants in Massachusetts (Cape Seafoods and NORPEL).

Table 11 Representative Lobster Bait Dealers Identified by the Herring PDT

COMPANY	LOCATION
Channel Fish	Boston, MA
The Bait Lady	Newington, NH
Nancy's Shellfish	Portland, ME
Purse Line Bait	Sebasco Estates, ME
O'Hara's	Rockland, ME
Beaver Enterprises Inc.	Rockland, ME
Sunshine Seafoods	Stonington, ME

Additional information about the above facilities will be provided in the DSEIS for Amendment 1 to the Herring FMP.

4.6.1.4 At-Sea Processing

4.6.1.4.1 Sea Freeze Ltd.

The information presented below was provided by personnel at Sea Freeze, Ltd located in North Kingston, RI during a site visit and follow up phone calls carried out by individual PDT members. Some additional information was obtained from the company website. The site visit was carried out in May 2004. The Herring PDT wishes to thank the individuals at Sea Freeze Ltd for contributing the following information and helping the PDT provide a more comprehensive description of the current herring fishery and the importance of the herring fishery to the lobster industry.

Sea Freeze is the largest producer of sea-frozen fish on the east coast of the United States. It supplies sea-frozen and land-frozen fish to domestic and international markets including bait products to longline fleets. Sea Freezes dedicated trawlers are some of the largest freezer trawlers on the east coast. At sea freezing produces a very high quality product as the product is not damaged during loading and unloading. Sea Freeze owns two freezer trawlers that provide all of the catch that is stored at Sea Freeze facilities. Catch is then marketed nationally and world-wide. Fishing operations target illex and loligo squid, mackerel, herring and to a lesser degree, butterfish. The vessels are approximately 140 ft in length with a holding capacity of approximately 280 mt and a daily freezing capacity of 50 mt per day.

Domestic sales account for approximately 30% of total sales and 70% are international. Internationally, Eastern Europe and Asia are two important regions that purchase from Sea Freeze. In both locations imports are used largely used for human consumption. Atlantic mackerel is sold to companies in Canada as baitfish and Illex squid is sold nationally as baitfish for the groundfish, swordfish and tuna fisheries as well as for crab and lobster bait. Zoo's and aquariums also purchase Sea Freeze products as feed for other species.

Illex squid and mackerel are the mainstay of the business accounting for approximately 80% of revenue. Although herring is the least financially valuable of the species it is nevertheless important to the business due to its year round availability and due to the fact that access to it continues after other fisheries have closed. In this respect, herring, for Sea Freeze, is an important back-up fishery when other fisheries become unavailable.

Sea Freeze began its operations in 1985 when it was initially a fishing operation with just a few employees. This company operated one of the first successful US freezer trawlers in the region and over time, cold storage facilities were added and later enlarged (current capacity 7,000 mt). The plant does not include any processing facilities, nor is it invested in the distribution of product. Operations are limited to catching, cold storing and marketing whole fish. The cold storage is used primarily for catch from the dedicated freezer trawlers though from time to time, other vessels unload and store here. Currently, the plant employs approximately 60 people including 10 administrative and managerial staff, 20 crew working rotating shifts, and 15 individuals that work in the storage facility (packing, loading etc.). These employees work full time and employment is generally stable year round. Employee turnover is generally low and when it occurs it is often due to crew seeking land based positions for personal reasons (family time etc.).

The seasonal operation of the plant is as follows:

Illex squid – May to October
Mackerel – January to May
Loligo squid – September to May
Herring – Year-round.

Product supply is lowest during the spring and fall. As a result, these months are dedicated to vessel repairs and maintenance. Sales and distribution occur year-round.

Plant location was selected because of its access to transport mechanisms. The plant is accessible by deep-water port and rail access. Rail access is slower than other forms of distribution but it is significantly cheaper. The plant exists largely independent of the surrounding community (North Kingston). Employees live regionally, though not necessarily locally. Some local distribution of bait occurs in summer months and vessel fuel is purchased locally along with food for the crew. Some of the gear used on the trawlers is produced and repaired on site by a company that rents space from Sea Freeze.

Representatives stated that more and more time is being dedicated to involvement in the management of the species each year. In the past, a small percentage of time was spent on management concerns (attending meetings, etc.), now as much as 50% of key staff time is spent investing in this aspect of the business. Representatives stated that this is one of the new costs of doing business in an increasingly regulated environment.

Regulations in the Loligo fishery were cited as having impacts on the business. Tighter regulations in this fishery has meant that Sea Freeze has had to replace this product with other fish as current restrictions make this fishery less attractive for larger vessels. Also, regulations in other fisheries (such as groundfish) have meant that shifts are occurring between fisheries that also impact on business. Sea Freeze representatives suggested that it is important in this regulatory environment to diversify where possible and not be too dependent on any one species.

Future Plans

Sea Freeze is considering expanding its existing cold storage facilities to accommodate other products in addition to whole fish.

Sea Freeze – Summary Information

Operations: Sea frozen fish and cold storage facilities
Plant capacity: 7,000 mt of cold storage space.
Current operations (approximate numbers per year)

- Illex – 6,000 mt
- Mackerel – 6,000 mt
- Herring – 2,000 mt
- Loligo – 1,000 mt

Employment: 60 full time employees total; 20 fishermen – on rotating shifts, others divided between storage facility and administrative functions.

4.6.1.4.2 Joint Venture Processing

Prior to the 1990s onboard canning and packing of herring into barrels was done by Soviet processor vessels through JVP/IWP agreements. After the fall of communism, these operations ceased in U.S. waters. Since that time, the focus has been on freezing whole herring at sea. Currently, there are International Fisheries Agreements, which is a prerequisite for establishing a JVP or IWP, with Russia, Estonia, Lithuania, Latvia, and Poland. There has been no JVP activity since 2002, and recent IWP operations have focused primarily on mackerel. There are also domestic shore-based and at-sea processors competing for the whole frozen market.

Table 12 summarizes catch/bycatch information reported by foreign processing vessels engaged in JV operations during 2001 and 2002. A total of 364 codends were reported to have been transferred during these JV operations in 2001 and 2002, and the data in Table 12 summarize catch reports from all of these codend transfers. Total catch of herring and mackerel was reported to be 11,229.2 mt.

Table 12 Catch and Bycatch (mt) of All Species Reported from the Transfer of 364 Codends During JV Operations in 2001 and 2002

REPORTED TRANSFER OF 364 CODENDS			
SPECIES CAUGHT	**CATCH MT**	**BYCATCH MT**	**TOTAL MT**
HERRING, ATLANTIC	9,057.5	51.0	**9,108.5**
HERRING, ATLANTIC (MEAL)	385.0		**385.0**
MACKEREL, ATLANTIC	1,677.2	36.7	**1,713.9**
MACKEREL, ATLANTIC (HEADED)	79.5		**79.5**
MACKEREL, ATLANTIC (MEAL)	30.0		**30.0**
REDFISH		0.3	**0.3**
SILVER HAKE (WHITING)		90.8	**90.8**
RED HAKE		6.6	**6.6**
FINFISH UNCL.		7.4	**7.4**
SHARKS		8.3	**8.3**
GRAND TOTAL	**11,229.2**	**201.1**	**11,430.3**

4.6.1.4.3 U.S. At-Sea Processing

U.S. at-sea processing is authorized in the Herring FMP for U.S. processing vessels that exceed current vessel size limits and processing herring in the EEZ. There have been no USAP operations in the herring fishery since the 20,000 mt allocation was specified in 2000. Additional discussion, including information provided by the industry which suggests that there may be intentions to utilize this allocation in 2005, is provided in Sections 2.5 and 0 of this document.

4.6.1.5 Other Processing

Natural pearl essence, extracted from the scales of Atlantic herring, is used to add a pearl effect (a satiny luster that creates a soft, cloud-like luster) to shampoo, fingernail polish and other personal care products and cosmetics. Engelhard Corporation owns and operates the last commercial natural pearl essence plant in the world. Located in Eastport, Maine, the facility employs 10 people (nine year-round and one part-time).

The Eastport plant relies on herring scales provided primarily by purse seine and fixed gear fishermen. The typical yield is 10 to 25 pounds of scales per ton of herring, but this can vary widely. Engelhard contracts independent "runners" to collect totes of scales from fishing ports throughout the Bay of Fundy and the Gulf of Maine.

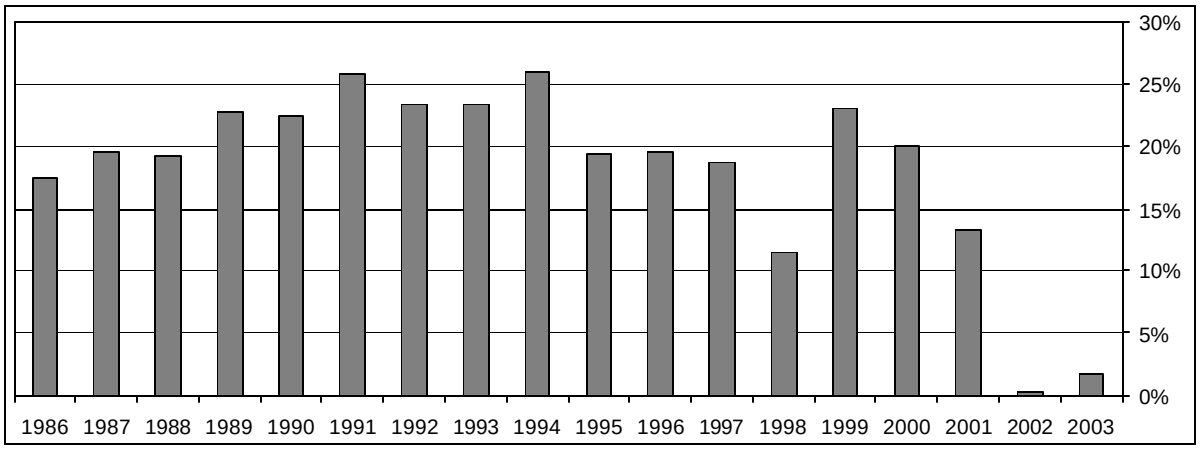
Processing operations at the Eastport facility are seasonal. Operations to extract the pearl essence occur during the summer months, while refining and processing is conducted during the winter. Extraction of natural pearl essence (also known as guanine) occurs in two phases. During the first phase, the scales are tumbled in water to separate the pearlescent crystals. The crystals are washed and stored in a stabilized form, while the nitrogen-rich "spent" scales are given to area farmers, who utilize them as fertilizer.

The second phase is a refining process in which any remaining portentous material and fish oils are removed. The refined crystals are analyzed and packaged for sale prior to being shipped to an Engelhard warehouse in Peekskill, New York.

About 80% of the natural pearl essence refined from herring scales is packaged and sold as an aqueous product to customers worldwide. The balance is dispersed in alcohol for dispersion in organic products. The market for natural pearl essence is diminishing due to the availability and lower price of many synthetic products. Engelhard currently processes one to two million pounds of natural pearl essence a year.

Reliance on herring scales caught by U.S. vessels has diminished significantly in recent years (Figure 6). A much larger proportion of the product purchased by Engelhard comes from Canada, particularly the New Brunswick weir fishery. This is due, in part, to the evolution of the U.S. fishery from fixed gear to purse seines to midwater trawls, as herring scales cannot be collected from midwater trawlers in as high volume as they can be collected from other gears. In 2002 and 2003, Engelhard relied on scales from Canada to process more than 95% of its product.

Figure 6 Percentage of U.S. Herring Scales to Total Scales Purchased by Engelhard, 1986-2003



Source: Engelhard Corporation, 2004.

4.6.2 Impacts of TAC Options on Processors

The following discussion describes the indirect impacts of the TAC options on herring processors. The term "indirect" is used because processors are not directly regulated by the Fishery Management Plan. Impacts to processors result from regulations that are directly applied to businesses in the harvesting sector. Additional discussion of the impacts on processors is provided in Section 4.7.2 of this document (p. 67) and should be referenced accordingly.

Sardine Canneries

As described in Section 4.6.1.1, the sardine canneries require the herring they purchase to be as fresh as possible. This makes them reliant on fish from Area 1A since vessels fishing in that area can deliver fish to the plants soon after they are caught. The options which reduce the Area 1A TAC in 2005 may impact the sardine canneries in three 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 is that it may be difficult for the plant to adjust to irregular deliveries. As described in Section 4.5.1, the canneries may have 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. However, assuming that herring canneries are price takers in a world sardine market and cannot pass on higher input costs by increasing the price of canned product, it is

difficult to predict who will bear the increased harvest costs. The canneries would bear the cost if they pay higher ex-vessel prices, the harvest sector would bear the cost if ex-vessel prices remain the same, or depending on the increase in ex-vessel price, the costs could be shared by each.

Freezer Plants

The impacts on freezer plants are similar to those on canneries but to a lesser extent because freezer plants are not as dependant on Area 1A. Particularly, the issue of freshness is not as significant if the freezer plants can receive a consistent supply of product from vessels 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.

Again, impacts on these processing facilities are discussed in further detail in Section 4.7.2 of this document (p. 67). Long-term economic impacts of the management program on processors will be explored further in the DSEIS for Amendment 1 to the Herring FMP.

4.6.3 Impacts of JVPt and USAP Options

There are two options being considered for the JVPt (JVP/IWP) and USAP allocations that would apply regardless of the choice of TAC options. One option is to stay at status quo with a 20,000 mt allocation to JVPt (10,000 mt JVP – Areas 2 and 3 only – and 10,000 IWP) and a 20,000 mt allocation to USAP (Areas 2 and 3 only). The other option is to set both JVPt and USAP at zero (no JVP, IWP, USAP allocations in 2005).

With TAC options that produce an OY of either 150,000 mt or 180,000 mt, and with catches averaging 106,000 since 1999 and never exceeding 122,000 mt in any recent year, there could be economic consequences of setting either of these categories at zero in 2005. If the markets served by on-shore processors do not expand to the extent anticipated (up to a 50% or 80% increase could occur, depending on the TAC option, before the total TAC would be reached), then economic opportunities for domestic harvesters may be lost by setting JVPt and USAP at zero.

JVP/IWP and USAP operations provide additional outlets for U.S. catcher vessels to sell their 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. In the case of USAP, U.S. processing companies (new or existing) could benefit from this new type of processing that may offer some advantages to shore-based processing. Potential advantages include the ability to move processing operations in response to TAC closures and fishery seasonality, and, from a net national benefit perspective, less permanency of capital.

On the other hand, to the extent that JVP/IWP and USAP operations (run by companies new to the U.S. Atlantic herring fishery) compete with on-shore processing, there could be negative impacts to processors. This would occur if these activities increase substantially and on-shore processors are not able to sell as much product as they could in the absence of a JVPt and USAP allocations.

Additional Background Information Relative to Impacts of JVP and USAP Allocations

The Herring FMP states that when determining USAP, 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 following discussion from the Herring FMP and other related documents is presented below to provide some additional perspective and historical context regarding allocations for JVP and IWP.

Original Herring FMP (JVPt = 40,000 mt; USAP = 0 mt)

The Herring FMP states that the zero amount initially specified for USAP would prevent large domestic processing vessels from entering the fishery in 1999:

> "Under normal circumstances, foreign vessels are prohibited from catching or processing fish in U.S. waters. In limited circumstances, foreign vessels are permitted to process fish caught by U.S. vessels, both in the EEZ and in the internal waters of a state. In the EEZ, these vessels are permitted into the fishery only when it suits the needs of the United States, and are limited to processing fish in excess of the capacity needed for domestic processors…
>
> A key element in the review of JV activities is the impact on domestic processing activity – specifically, on the east coast, shoreside processors since there have not been any large domestic at-sea processors in east coast fisheries. **The underlying concept is that JV activity is only allowed until adequate U.S. processing capacity is developed.** In summary, under strictly controlled, rigorously reviewed circumstances, some at-sea processing by large foreign vessels is possible. The reality is that in recent years the actual performance of herring JVs has been insignificant, and has occurred only in connection with mackerel JVs (confidentiality restrictions prevent listing actual JV herring catches in 1997).
>
> The Council may choose to allocate a portion of the Atlantic herring resource to at-sea processors if it determines that will benefit the herring industry. The Council's initial recommendation to specify USAP at 0 is because of a desire to maintain the status quo in the industry until the effectiveness of the management plan can be evaluated. In contrast to JVs, large domestic processing vessels have a great deal of flexibility once allowed into the fishery. They can compete in the same markets as other processors without restraints. Generally, regulations for domestic vessels are not as restrictive as those for foreign vessels. Once allowed into a fishery, there is the perception that they will have earned permanent "rights" to participate. Unlike the short-term participation of JVs, there is a perception that large domestic processing vessels will seek to become permanent participants in the fishery. In sum, the possible impacts of large at-sea processors in the Atlantic herring fishery are not clearly understood, arguing for a cautious approach to their introduction into the fishery.
>
> Nevertheless, the possibility that a foreign JV may be allowed to process at-sea while a domestic vessel cannot strikes some as inconsistent with the purposes of the MSFMCA. While the MSFMCA encourages the development of

> underutilized species by the U.S. fishing industry, it does not prescribe that all possible sectors must have access to a particular resource. Fishery management councils are allowed considerable discretion in determining the form of the industry that will develop underutilized species and achieve optimum yield. The Council's recommendation to allocate zero metric tons to the at-sea processing sector is consistent with the exercise of that discretion.
>
> The above does not address what some perceive is a fundamental question of fairness. The Council recognizes that in the short term, setting the at-sea processing specification at zero metric tons will appear unfair to some in the industry – particularly while allowing a limited opportunity for foreign JV's. This question must be balanced against the concerns of historic industry participants and their communities, as well as new entrants who have based their investments and business plans on the existing industry structure. These decisions have been based in part on a number of legislative initiatives that have limited the size of vessels that will be allowed in the U.S. fishing industry in the future, and have prevented large domestic vessels from fishing in the mackerel fishery and from catching herring with midwater trawl gear. From their viewpoint, the sudden entry of large domestic at-sea processors is viewed as an unfair change in the planning environment. The initial judgment of the Council is that a lack of experience with large domestic processors argues for a cautious approach when allowing them into the fishery. For initial implementation of the plan, the Council has chosen to limit domestic participation in the fishery to traditional forms – harvesting vessels and at-sea processing vessels less than the proposed size limits, and shoreside processing facilities – supplemented, if necessary, by the temporary opportunity for short-term joint venture activities. National Standard 8 requires the Council to consider the impact of its actions on the sustained participation of fishing communities. Given the lack of information on the impacts of large at-sea domestic processors, the Council has chosen a cautious approach to protect the interests of those communities that are dependent on the herring fishery."

Environmental Assessment, Atlantic Herring Fishery Specifications for 2000 Fishing Year (JVPt = 20,000 mt; USAP = 20,000 mt)

The Council modified the USAP allocation for the herring fishery and set this allocation at 20,000 mt in the specifications for the 2000 fishing year. The economic and social impact analyses of the no action alternative (0 mt for USAP) included the following discussion:

> "The no action alternative may have adverse economic impacts on the herring fishery and fishers…Large domestic processing vessels would not be able to participate in the fishery because the USAP allocation would be set at 0 mt. Not only does this adversely impact the owners and operators of those vessels, it restricts the ability of some vessels to convert into the herring fishery and target herring in Areas 2 and 3. Smaller vessels may be unable to fish in these areas and land enough herring in a suitable condition for existing bait and sardine cannery markets.

> The no action alternative (0 mt for USAP) also interferes with the optimal market allocation of sectors. By artificially limiting one processing sector (offshore processing), it inhibits the ability of the market to use various prices and costs of production to choose an optimal activity level within each sector. The result of this distortion could be higher overall production costs, which would reduce net benefits to the Nation…
>
> The lack of markets for herring may limit some fishermen who want to enter the fishery. Because herring is of relatively low value, it is a high-volume fishery. Smaller vessels may be unable to return to port with enough herring to make this fishery profitable. In addition, if smaller vessels fish offshore and try to bring large catches of herring to port, this may cause safety problems in the industry if the vessels are overloaded…
>
> The (no action) alternative (0 for USAP) does not provide the maximum opportunities for vessels in the groundfish fishery to target herring…The lack of markets and the inability to deliver a quality product from offshore areas without major vessel modifications limit the ability of vessels to convert to the herring fishery. Since foreign vessels are showing little interest in herring joint ventures, a large domestic processing vessel could provide a new market and remove the requirement for smaller vessels to deliver their herring catch to the shore. By eliminating this option, the alternative is limiting the ability of groundfish vessels to seek an alternative in the herring fishery. This will prevent communities suffering from the decline in the groundfish resource from taking advantage of the abundant herring resource. Finally, this alternative will not increase social/human capital in the fishery through increased participation in harvesting herring to supply offshore processing vessels."

4.6.4 Impacts on the Lobster Fishery

The primary potential impact on the lobster fishery is higher prices of bait from localized and periodic declines in herring supplies. These impacts may be tempered, however, by the availability of other sources of bait such as herring from Canada, artificial bait, and byproducts from processing other species.

Since an overall reduction in herring landings from the proposed TAC changes is not expected (i.e., historic production is below the proposed total TAC), it is likely that sufficient quantities of herring will be available to the bait market. For some lobster fishermen in remote locations where the local bait market is traditionally serviced by vessels fishing in Area 1A, this may come at a higher cost if there are spikes in bait prices from localized shortages.

These impacts will be further analyzed in the DSEIS for Amendment 1 to the Herring FMP.

4.6.5 Impacts on the Atlantic Mackerel Fishery

Concern has been expressed about the potential impacts of the TAC options under consideration on the Atlantic mackerel fishery, especially in Area 2. Because herring and mackerel are caught in combination with each other on high-volume, small-mesh trips, there is concern that reducing the Area 2 TAC in particular will negatively affect the mackerel fishery if the mackerel season is still occurring and mackerel vessels are forced to separate their catch and discard any herring that they may catch incidentally (above the 2,000 pound incidental catch allowance once the directed herring fishery in an area closes). Regulatory discarding is an important consideration relative to both economic and social impacts.

It is difficult to predict the impacts of the proposed TACs for 2005 on the mackerel fishery because the herring and mackerel fisheries in Area 2 are still evolving, and it is unclear how much landings of either species may increase in the next year to meet market demands. Based on recent history in both the herring and mackerel fisheries, it does not appear that most of the TAC options will negatively affect the mackerel fishery in the short-term. TAC Option 1, which proposes to reduce the Area 2 TAC to 20,000 mt, could impact the mackerel fishery if the winter herring fishery in Area 2 takes most or all of the available TAC during the early part of the season. This would likely impact the mackerel fishery occurring in late winter (April) and again in December of the same fishing year. The extent of the impacts will depend greatly on the markets for herring and mackerel during the winter.

4.6.5.1 Trends in Herring Landings from Area 2

Table 13 summarizes the catch of Atlantic herring from Management Area 2 by month during 1996-2003. The current TAC for Area 2, which has remained the same since the implementation of the Herring FMP in 2000, is 50,000 mt and has not yet been fully utilized. Over the time series presented in Table 13, landings of herring from Area 2 peaked in 2000 at 27,198 mt, about 55% of the total available TAC. Landings from Area 2 declined in recent years and averaged closer to 15,000 mt from 2001-2003.

Table 13 Atlantic Herring Catch (mt) in Area 2 by Month, 1996-2003

1996	**Month**												
MGMT AREA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**TOTAL**
2	8,088	3,798	3,791	1,257	345	21				50	1,790	4,748	**23,888**
1997	**Month**												
MGMT AREA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**TOTAL**
2	7,229	4,713	3,841	615	5					500	102	4,443	**21,448**
1998	**Month**												
MGMT AREA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**TOTAL**
2	5,965	6,568	2,167	160	187	202	161		237	246	222	126	**16,242**
1999	**Month**												
MGMT AREA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**TOTAL**
2	7,335	9,488	4,504	559	15	8	79	158	0	1	4	560	**22,712**
2000	**Month**												
MGMT AREA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**TOTAL**
2	9,340	9,838	2,358	203	19	0	0	2	23	2	860	4,552	**27,198**
2001	**Month**												
MGMT AREA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**TOTAL**
2	9,129	4,376	447	869	56	100	55	2	96	3	64	623	**15,821**
2002	**Month**												
MGMT AREA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**TOTAL**
2	5,232	4,237	593	79	187	0	1	1	138	1	125	445	**11,038**
2003	**Month**												
MGMT AREA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**TOTAL**
2	4,671	3,101	1,901	378	353	0	1	2	419	37	277	4,939	**16,081**

The Area 2 fishery for herring is predominantly a winter fishery, occurring from December – April. Catches are largest from January – March and again during December of the same fishing year. The winter fishery for herring in Area 2 overlaps with the peak season for the Atlantic mackerel fishery occurring in the same area (January – April). Table 14 summarizes herring landings from Area 2 from January-April as a percentage of the total herring landings from Area 2 during the fishing year. The percentage of the total Area 2 herring catch that is taken from January – April has been somewhat variable over time but has ranged from a low of 63% in 2003 to a high of 96% in 1999.

Table 14 Area 2 Herring Catch, January – April, as a Percentage of Total Herring Catch From Area 2

FISHING YEAR	AREA 2 HERRING CATCH JANUARY – APRIL (MT)	PERCENT OF TOTAL CATCH FROM AREA 2
1996	16,934	71%
1997	16,398	77%
1998	14,860	92%
1999	21,886	96%
2000	21,739	80%
2001	14,821	94%
2002	10,141	92%
2003	10,051	63%

4.6.5.2 Trends in Atlantic Mackerel Landings

The peak season for the Atlantic mackerel fishery, which occurs primarily in southern New England and Mid-Atlantic waters, extends from January – April, during which time 95% or more of the annual landings are taken. Landings of Atlantic mackerel from 1990-2002 relative to the initial optimum yield (IOY) for 2004 are summarized in Table 15. Atlantic mackerel landings have been somewhat variable over time but increased significantly to over 20,000 mt in 2002. Despite this increase in 2002, only a small fraction of the total available OY was taken in this fishery. Clearly, there is potential for significant expansion of this fishery in the future, should the markets for this product increase.

Table 15 Landings of Atlantic Mackerel, 1990-2002, Relative to the 2004 IOY

YEAR	MACKEREL LANDINGS (MT)	% OF TOTAL 2004 IOY (170,000 MT)
1990	9,426.4	5.5%
1991	15,718.4	8.9%
1992	11,785.3	6.9%
1993	4,720.8	2.8%
1994	8,936.4	5.3%
1995	8,439.2	5%
1996	15,603.7	9.2%
1997	14,967.2	8.8%
1998	12,288.2	7.2%
1999	11,882.2	7%
2000	5,578.2	3.3%
2001	12,318.0	7.2%
2002**	21,474.9	12.6%

Source: NMFS Commercial Fisheries Database Website.

*****The EA for the 2004 mackerel specifications, published by the Mid-Atlantic Council, reports that mackerel landings in 2002 were 26,192 mt, which represents 15.4% of OY.***

4.6.5.3 Incidental Catch of Herring in Pelagic/Small Mesh Fisheries

During the development of the limited access alternatives in Amendment 1, the Herring PDT examined vessel logbook data from 2000 to 2002 to show how many trips may be affected by the proposed trip limits of 15 and 25 metric tons associated with the incidental catch permit options. The following information is useful to illustrate the current overlap between the herring fishery and other small mesh (whiting) and pelagic fisheries (squid, mackerel) occurring throughout the region. This information is intended to provide some perspective about whether the Atlantic mackerel fishery may be significantly impacted by a reduction in the Area 2 TAC during the 2005 fishing year.

In Table 16 – Table 18, incidental herring landings are summarized for directed mackerel, squid (loligo and illex combined), and whiting trips. A directed trip is defined as one in which 50% or more of the landings consisted of the species being analyzed. For the mackerel trips, only trips with more than 1 metric ton were examined.

It may be a misconception that a significant amount of herring is landed incidentally on directed trips in the Atlantic mackerel fishery at this time. Table 16 shows that in 2002, nine (9) of the 254 directed mackerel trips greater than 1 mt had greater than 25 mt of herring landed on the same trip. No directed mackerel trips landed between 15 and 25 metric tons of herring, and six (6) trips landed between 0 and 15 mt of incidental herring landings during 2002. In 2001, nearly

all directed mackerel trips landed no herring with the exception of three (3) trips that landed between 0 and 1 mt of herring. In 2000, three (3) of the 95 directed mackerel trips greater than 1 mt landed greater than 25 mt of herring on the same trip. No directed mackerel trips landed between 15 and 25 mt of herring, and two (2) trips had between 0 and 15 mt of incidental herring landings during 2000. Therefore, based on data from recent years, the incidental catch of herring on directed mackerel trips appears to be low. This issue may become more of a concern if/when the Atlantic mackerel fishery expands beyond recent levels.

Table 17 shows that for the directed squid trips, there were only three (3) trips in 2000 in which more than 25 mt of herring was landed. The rest of the directed squid trips during that year as well as all directed squid trips in 2001 and 2002 landed less than 15 mt of herring. Most directed squid trips landed no amount of herring. The trips that did land herring landed less than 600 pounds of herring.

Table 18 shows that all for all the directed whiting trips in 2000 to 2002, none had greater than 15 metric tons of incidental herring landings. Most directed whiting trips had no herring landings. The trips that did land herring landed less than 1.4 mt of herring.

Table 16 Incidental Catch of Herring on Directed Mackerel Trips

	2000	**2001**	**2002**
Number of directed trips with greater than 1 mt of mackerel	95	122	254
Number of trips with herring catch > 0 and < 15 mt	2	3 (maximum of 1 mt of herring)	6
Number of trips with herring catch between 15 and 25 mt	0	0	0
Number of trips with herring catch > 25	3 (maximum of 120 mt of herring)	0	9 (maximum of 109 mt of herring)

Table 17 Incidental Catch of Herring on Directed Squid (Loligo and Illex Combined) Trips

	2000	**2001**	**2002**
Number of directed trips	5,624	3,394	3,377
Number of trips with herring catch > 0 and < 15 mt	32 (maximum of 400 LBS)	26 (maximum of 500 LBS)	8 (maximum of 600 LBS)
Number of trips with herring catch between 15 and 25 mt	0	0	0
Number of trips with herring catch > = 25	3 (maximum of 36 mt)	0	0

Table 18 Incidental Catch of Herring on Directed Whiting Trips

	2000	2001	2002
Number of directed trips	1,777	1,933	1,131
Number of trips with herring catch > 0 and < 15 mt	52 (maximum of 1 mt)	76 (maximum of 625 LBS)	68 (maximum of 1.4 mt)
Number of trips with herring catch between 15 and 25 mt	0	0	0
Number of trips with herring catch > = 25	0	0	0

4.6.5.4 Summary

While current fishery and market conditions suggest that impacts of the proposed TAC options on the mackerel fishery are not likely to be significant, it should be noted that the Atlantic mackerel fishery is considered "underutilized," and a large proportion of the mackerel TAC remains available for utilization in this and future years. Should the mackerel fishery expand considerably, the incidental catch of herring may increase, and impacts on the mackerel fishery may become a more significant concern, especially if the expansion of the mackerel fishery is coincident with a reduction in the TAC for herring in Area 2. The impacts on the mackerel fishery associated with a reduction in the Area 2 TAC relate primarily to loss of revenues from herring and the social impacts associated with regulatory discarding.

Preliminary indications suggest that landings in the mackerel fishery increased considerably in 2003 and are likely to increase in 2004; if this is the case and if this continues through 2005 and beyond, then the overlap of the mackerel and herring fisheries in Area 2 may be of greater concern. This is an issue that should be monitored closely in the future as these fisheries continue to develop. The PDT notes that Amendment 1 to the Herring FMP proposes to authorize the set-aside of a portion of a management area TAC to accommodate incidental catch in the mackerel fishery; this approach may be the best way to monitor and address this issue on a real-time basis, as the need arises.

4.7 ADDITIONAL DISCUSSION OF SOCIAL AND COMMUNITY IMPACTS

General discussion of the social and community impacts of the options under consideration for the 2005 specifications is provided below. Many issues related to social and community impacts are also discussed in Sections 4.1 – 4.5 of this document and should be referenced accordingly (impacts associated with derby fishing, longer steam times, safety considerations, and impacts on processors).

The five purse seine vessels currently participating in the herring fishery were identified in Section 4.1 of this document and are associated with the principal ports of Addison, Prospect Harbor, Rockland, and Stonington ME. Table 19 summarizes landings and trips in 2003 by port and principal gear for midwater and pair trawl vessels averaging greater than 2,000 pounds per trip. The majority of single midwater trawl trips in 2003 landed in Portland ME, followed by

Point Judith RI and Gloucester MA. Almost 1/3 of herring caught by paired midwater trawl vessels were landed each in Gloucester and New Bedford MA. Additional quantities of herring from pair trawl vessels were landed in Portland ME, Rockland ME, Vinalhaven ME, Newington NH, and smaller ports in RI.

Table 19 Landings and Trips by Port of Landing and Principal Gear for Vessels Averaging Greater than 2,000 Pounds per Trip (2003)

State of Landing	Port of Landing		Principal Gear		
			Midwater Trawl	Pair Trawl	Total
CT	New London	Metric Tons	not reported	not reported	
		Number of Trips	< 3 trips	< 3 trips	
MA	Gloucester	Metric Tons	1,041.24	18,432.48	19,473.72
		Number of Trips	12	170	182.00
	New Bedford	Metric Tons		17,591.94	17,591.94
		Number of Trips		141	141.00
ME	New Harbor	Metric Tons	10.82		10.82
		Number of Trips	6		6.00
	Portland	Metric Tons	9,242.91	9,807.98	19,050.89
		Number of Trips	157	111	268.00
	Rockland	Metric Tons		6,074.51	6,074.51
		Number of Trips		95	95.00
	Vinalhaven	Metric Tons		4,444.80	4,444.80
		Number of Trips		66	66.00
NH	Newington (1 pair trip landed in Portsmouth)	Metric Tons	557.82	5,883.47	6,441.29
		Number of Trips	3	55	58.00
NJ	Cape May	Metric Tons		407.25	407.25
		Number of Trips		5	5.00
RI	North Kingstown	Metric Tons	481.31		481.31
		Number of Trips	7		7.00
	Point Judith	Metric Tons	2,272.58	not reported	2,272.58
		Number of Trips	44	< 3 trips	47.00
	Other	Metric Tons	not reported	2,360.54	2,360.54
		Number of Trips	< 3 trips	22	25.00
Totals		Metric Tons	13,883.23	65,450.13	79,333.36
		Number of Trips	232	669	901.00

4.7.1 From a Harvesting Perspective

From a harvesting perspective, purse seine vessels are likely to be most impacted by the proposed reductions in the Area 1A TAC. These vessels are most dependent on Area 1A for fishing and have very limited flexibility to move to other areas in order to compensate for revenues lost by a reduction in the Area 1A TAC. The communities in which these vessels are homeported may experience negative impacts from the reduced TAC in Area 1A as well; however, the purse seine fleet is relatively small, and impacts associated with this fleet are more likely to be experienced at the individual vessel level rather than the community level. There may be some negative impacts to smaller marine-related businesses in the local communities that provide supplies to the purse seine 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 Herring PDT/TC Report). Thirty one individuals were reported to be employed on purse seine operations in 2003.

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 fall primarily into the North of Cape Cod midwater trawl sector (see description in Section 4.1) and land fish primarily in the communities of Gloucester MA, Newington NH, Portland ME, and Rockland ME. Midwater trawl vessels, on average, are 80 feet in length or larger and therefore have more 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 (paired midwater trawl vessels average 100 feet in length). 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 the processing facilities, which are discussed in more detail below.

Herring midwater trawlers reliant on Area 1A would have to fish on Georges Bank and might utilize certain ports in the western Gulf of Maine to a lesser extent. Depending on the extent of the reduction in the Area 1A TAC, 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 GB). In addition to direct economic effects, this could have negative social impacts in fishing communities that are dependent on the lobster fishery, especially in Maine. Potential impacts on the lobster fishery are discussed in more detail in Section 4.6.4 of this document. Other possible direct effects of reductions in the Area 1A TAC include the impact of longer fishing trips (to Georges Bank) on crew satisfaction and family life and increased safety concerns.

Midwater trawl (single) and pair trawl vessels that are reliant on Area 2 could be impacted by a reduction in the Area 2 TAC, depending on how large the reduction may be. The South of Cape Cod midwater trawl fleet is most dependent on Area 2 and includes vessels that land fish primarily in the communities of New Bedford MA, Newport RI, North Kingstown RI, and Point Judith RI. Since the current Area 2 TAC (50,000 mt) has never been fully utilized, and given recent average landings, TAC Option 1 is most likely to negatively affect these vessels in terms of lost revenues. Again, however, single and paired midwater trawl vessels are large enough that they maintain some flexibility to move to other areas and perhaps compensate for some losses associated with the TAC reductions. The extent to which the negative impacts of a reduction in the Area 2 TAC can be mitigated will depend greatly on market conditions and the feasibility of landing quality fish from areas farther offshore. In general, though, impacts on some of the communities in which these vessels land are likely to be associated more with impacts on processing facilities.

Other associated impacts may be experienced by the vessels in the south of Cape Cod midwater trawl sector that participate in the mackerel fishery if a substantial reduction in the Area 2 TAC is concurrent with a significant expansion of the winter mackerel fishery in Area 2. Current conditions in both the herring and mackerel fisheries do not suggest that these impacts are likely to be significant in the short-term, but the nature of impacts is dependent on the degree to which the mackerel fishery in Area 2 expands. If the Area 2 TAC for herring is reduced substantially (to 20,000 mt, for example), the TAC could be reached before the peak season for the mackerel fishery ends (January – April). In this case, mackerel vessels would be required to discard herring they catch above the 2,000 pound incidental catch trip limit. This may be very difficult in a high-volume fishery and may result in negative impacts associated with regulatory discarding. Regulatory discarding is an important social problem, just as it is an ecological problem. Regulatory discarding of otherwise marketable fish leaves fishermen feeling demoralized and disgusted with fishing, which is more than just a job to most fishermen. Fishermen recognize that discarding marketable and oftentimes dead fish does nothing to benefit them or their families, the health of the resource, their hold on markets, or seafood consumers. Fishing is a family business, so the impacts of this are felt throughout the entire family and the entire fishing community. In addition, separating mackerel and herring on-board a pelagic midwater trawl vessel fishing in a high-volume fishery simply may not be possible in all situations.

4.7.2 From a Processing Perspective

While many of the individual vessels in the herring fishery may be able to adapt, at least in part, to reductions in either the Area 1A or Area 2 TAC, there are likely to be impacts on markets for herring, and consequently processors, from reductions in the TACs, particularly in Area 1A. The potential economic impacts of the proposed TAC options on processors is discussed in more detail in Section 4.6.2 of this document (p. 54). 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 and decide to land their product elsewhere), processing plants that rely on herring from these vessels will be impacted

economically, possibly causing a loss of jobs and income to plant workers and associated social impacts on families and communities.

The two remaining U.S. sardine canneries located in Bath and Prospect Harbor ME are likely to be most impacted by a large reduction in the Area 1A TAC, such as the reduction proposed in TAC Option 4 (45,000 mt). Information provided in Section 4.6.1.1 of this document (description of sardine canneries, p. 36) suggests that the sardine canneries are extremely dependent on herring caught in Area 1A. In fact, much of the Area 1A catch is assumed to supply the sardine canneries and the lobster bait market, although some of the catch has supplied freezer plants in more recent years. 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 products (primarily sardines) and may affect the supply of herring to the canneries, particularly later in the year and especially if the TAC in Area 1A is reached early and the fishery closes. In addition to the direct impacts on processors, increased competition between different markets for herring could intensify problems associated with derby fishing in Area 1A. The situation also may be exacerbated if there are price differentials between the markets for lobster bait and food production, as herring sometimes sells at a higher price for lobster bait than for food. This issue will be explored further in the DSEIS for Amendment 1.

To the extent that the supply of herring (in terms of volume and/or consistency) to the sardine canneries is affected, the canneries may experience difficulty maintaining year-round employment opportunities in addition to overall losses in revenues that may occur. Together, the Bath and Prospect Harbor canneries employ about 250 individuals. Individuals who work at the Bath cannery may have better opportunities to seek alternative year-round and/or seasonal employment because of their proximity to Portland and other larger towns. Individuals who work at the Prospect Harbor plant are at a greater disadvantage in terms of seeking alternative or additional employment. Fewer alternative employment opportunities exist around the Prospect Harbor plant, further illustrating the importance of this cannery to the local economy and community. Of the TAC options under consideration, Option 4 is likely to produce the greatest negative impact on the sardine canneries and their local communities, followed by Option 7, Option 1, and Option 2 (status quo).

Two relatively new processing plants – Cape Seafoods (Gloucester MA) and NORPEL (New Bedford MA) – have been established in two of New England's most important fishing communities and provide employment and related benefits that have likely boosted the economy of both communities. New Bedford and Gloucester 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 Gloucester and New Bedford 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 land in Gloucester and New Bedford and 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 Cape Seafoods most, while the options that reduce the Area 2 TAC are likely to impact NORPEL most. The impacts of the proposed TAC options on these processing facilities may be mitigated, in part, by the ability of the dedicated fishing vessels to shift to other fishing areas and increased opportunities in the Atlantic mackerel fishery (mackerel is more valuable than herring). The extent to which the impacts can be mitigated is somewhat uncertain, as it depends on the ability to land a marketable product from other fishing grounds as well as the expansion of the mackerel fishery and its associated markets. While the short-term impacts are not expected to be significant, long-term impacts should be monitored closely and minimized to the extent possible so that these communities maintain their ability to participate in the herring fishery. 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.

4.7.3 Summary

Table 20 provides a very qualitative ranking of the TAC options under consideration from a social and community impact perspective. Overall, TAC Option 4 is likely to result in the most negative impacts due to the proposed 25% reduction in the Area 1A TAC. The Area 1A TAC is the only TAC that is fully utilized on an annual basis, and a 25% reduction in this TAC is expected to affect the greatest number of individuals, vessels, and processors both directly and indirectly. TAC Options 7 and 1 are both expected to result in medium-level impacts relative to TAC Option 4 and relative to the status quo (Option 2), which is not expected to result in any additional impacts. The impacts of TAC Option 7 are associated with the proposed reduction in both the Area 1A and Area 1B TACs but are expected to be much less severe than those associated with Option 4 because the proposed reduction in Area 1A is smaller.

The impacts of TAC Option 1 are associated with the proposed 60% reduction in the Area 2 TAC. The nature and extent of social impacts associated with Option 1 are difficult to characterize because they depend, in part, on the expansion of the herring and mackerel fisheries in Area 2. In the short-term, based on recent conditions in these fisheries, the impacts associated with Option 2 are not expected to be as severe as the impacts associated with reductions in the TAC in Area 1A (Options 4 and 7). However, monitoring the expansion of the pelagic fisheries in Area 2 will be extremely important to ensure that long-term impacts to vessels, processors, and fishing communities can be minimized and/or eliminated. To the extent that these impacts cannot be eliminated over the long-term, the proposed set-asides for incidental catch in the mackerel fishery (Amendment 1) may help to mitigate them.

Table 20 Qualitative Ranking of TAC Options Relative to Potential Social/Community Impacts

TAC OPTION	WHO/WHAT MAY BE IMPACTED?	NATURE OF IMPACTS	OTHER COMMENTS
4 Largest Impact	• Purse seine vessels • Other vessels dependent on Area 1A • Sardine canneries • Other processors in communities adjacent to GOM • Lobster fishery	• Loss in revenues/income • Loss of supply/effects on markets • Price effects • Derby fishing • Longer steam time • Safety considerations	• This option is likely to produce the most negative social and community impacts • Purse seine vessels most reliant on Area 1A and most limited in terms of flexibility • Possible impacts from reduction in Area 2 TAC, but unlikely in the short-term because proposed TAC at level not yet reached
7	• See Option 4	• See Option 4 • See Option 1 for potential impacts from reduction in Area 2 TAC	• Impacts likely to be much less severe than Option 4, esp. for vessels that can shift to other areas • Reduction in Area 1B makes 1B less available as a relief from closure in Area 1A • Possible impacts from reduction in Area 2 TAC, but unlikely in the short-term because proposed TAC at level not yet reached
1	• Vessels most dependent on Area 2 • Processors in communities adjacent to southern New England/Mid-Atlantic • Possible impacts on mackerel fishery	• Loss in revenues/income • Loss of supply/effects on markets • Possible derby fishing – depending on extent of winter fishery for herring and mackerel • Possible regulatory discarding (mackerel fishery) • Longer steam time • Safety considerations	• Almost all midwater trawl vessels – more flexibility to shift to other areas • Extent of impacts associated with mackerel fishery unknown – depends on markets and further expansion of fishery • Short-term impacts on mackerel fishery not expected to be significant
2 No Impact	N/A – Maintains current TACs	N/A – Maintains current TACs	N/A – Maintains current TACs