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1.0 EXECUTIVE SUMMARY

The New England Fishery Management Council is proposing Amendment 12 to the Northeast Multispecies Fishery Management Plan (FMP) to eliminate overfishing on silver hake (whiting) and red hake (ling) and to rebuild the resource within a ten-year period in accordance with the Sustainable Fisheries Act (SFA) amendments to the Magnuson-Stevens Fishery Conservation and Management Act (FCMA). This amendment will also incorporate offshore hake into the multispecies management unit to provide basic protection for the species, improve the information database, expedite the recovery of silver hake stocks, and allow for the development of a sustainable fishery. Silver hake, red hake, and offshore hake will be identified as "small mesh multispecies." The rebuilding program relies primarily on increases in mesh sizes combined with whiting/offshore hake possession limits. Other important elements in the plan include a moratorium on commercial permits to fish for small mesh multispecies (limited access) and implementation of a default measure in Year 4 if the plan is not meeting its fishing mortality objectives.

The proposed action includes the following measures:

- new overfishing definitions for two stocks of silver hake, two stocks of red hake, and offshore hake in accordance with the SFA;
- specification of Optimum Yield (OY);
- a recommendation for whiting stock identification for management purposes, only if it becomes necessary to delineate whiting stocks for management purposes in the future;
- a moratorium on commercial permits to fish for small mesh multispecies, including two categories with different qualification criteria:
  (1) a limited access small mesh multispecies permit category and
  (2) a limited access small mesh multispecies possession limit permit category;
- an open access multispecies permit (formerly the open access nonregulated multispecies permit) that allows a 100-pound incidental catch of small mesh multispecies;
- new measures for the Cultivator Shoal Whiting Fishery, including:
  (1) a modification to the Cultivator Shoal Whiting Fishery season,
  (2) adjustments to the participation requirements for the Cultivator Shoal Whiting Fishery, and
  (3) a whiting/offshore hake possession limit of 30,000 pounds;
- management measures for all areas excluding the Cultivator Shoal Whiting Fishery based on mesh size/possession limit categories for vessels possessing limited access small mesh multispecies permits;
- a codend specification for vessels participating in small mesh multispecies fisheries;
- restrictions on the use of net strengtheners in small mesh multispecies fisheries;
- restrictions on the transfer of small mesh multispecies at sea;
- the addition of measures to the list of measures that may be implemented by a framework adjustment to the Northeast Multispecies FMP, including a Whiting DAS program and a

whiting Total Allowable Catch (TAC), as long as both are accompanied by a full set of public hearings (similar to those conducted in accordance with NEPA);

- designation of Essential Fish Habitat (EFH) for offshore hake;
- the establishment of a Whiting Monitoring Committee (WMC) to annually monitor the progress of the management program and recommend adjustments, as necessary, to ensure that the plan meets its objectives; and
- a default measure to be implemented at the beginning of Year 4 if the management measures (and annual adjustments) do not meet the fishing mortality objectives of the management plan.

The proposed management action will have positive impacts on affected physical, biological, and human environments. The management measures will reduce the level of fishing mortality in small mesh multispecies fisheries to end overfishing on the southern stock of silver hake as well as red hake and to rebuild the stocks to sustainable levels within ten years. Spawning stock biomass for both the northern and southern stocks of silver hake is projected to increase under the proposed management action. Although fishery landings and revenues from small mesh multispecies are projected to decrease in the short term (Years 1 – 4), the long term economic benefits of a rebuilt resource outweigh the short term costs of reducing fishing mortality and exploitation. Increased mesh size, combined with lower fishing mortality rates, should rebuild the age structures of the whiting stocks, promoting landings of larger-sized, more valuable whiting. The negative socio-economic impacts of the Year 4 default measure, if implemented, are expected to be more severe than the measures for Year 1 – 3. However, when compared to the projected impacts of maintaining the status quo for both stocks of whiting, the long term biological, economic, and social impacts of the management action are positive and far-reaching.

This amendment document contains introductory material describing the background, purpose, and objectives of the proposed action, information detailing the proposed action as well as the Council's rationale for choosing such action, and components required under the Magnuson-Stevens Fishery Conservation and Management Act. It also contains the Final Supplemental Environmental Impact Statement (FSEIS), which contains background information on the physical, biological, and human affected environments as well as analyses of the projected biological, economic, and social impacts of the proposed management action. Also presented in this amendment are analyses and information in accordance with the Regulatory Flexibility Act, the Endangered Species Act, the Marine Mammal Protection Act, the Coastal Zone Management Act, and the Paperwork Reduction Act.

2.0 DOCUMENT ORGANIZATION

This document is divided into two volumes.

Volume I contains introductory material describing the background and the purpose and objectives of the proposed action as well as the Final Supplemental Environmental Impact Statement (FSEIS), Regulatory Impact Review (RIR), and Regulatory Flexibility Analysis (RFA). Chapters in the FSEIS are identified by the letter "E" preceding the section number.

Volume II contains the following appendices to the main document:

Appendix I:	*Evaluation of Existing Overfishing Definitions and Recommendations for New Overfishing Definitions to Comply with the Sustainable Fisheries Act (relevant portions only)*
Appendix II:	*EFH Source Document for Offshore Hake, Merluccius albidus*
Appendix III:	*A Bioeconomic Analysis of Whiting Amendment Fishery Management Options (Report to the New England Fishery Management Council)*
Appendix IV:	*Bioeconomic Analysis of Alternative Selection Patterns in the United States Atlantic Silver Hake Fishery (Thunberg et al, 1998)*
Appendix V:	*Comparative Biology of Two Sympatric Hake Species of the Genus, Merluccius, off the Northeastern Continental Shelf of the United States: Offshore Hake and Silver Hake (A Report to the New England Fishery Management Council)*
Appendix VI:	*Southern Gulf of Maine Raised Footrope Trawl 1997 Experimental Whiting Fishery*

Volume III contains public hearing summaries, written comments submitted during public hearings, and written comments submitted during the 45-day NEPA comment period.

3.0 BACKGROUND AND PURPOSE OF THIS AMENDMENT

3.1 BACKGROUND

The history of the Northeast Multispecies Fishery Management Plan through Amendment 9 is summarized in Section 2.0 of the Amendment 7 and Amendment 9 documents.

Silver hake (whiting, *Merluccius bilinearis*) and red hake (ling, *Urophycis chuss*) have been part of the multispecies management unit since their incorporation into Amendment 4 in 1991. At that time, the Council included these species in the multispecies management unit because they are caught by many of the same vessels that land cod, haddock, flatfish, and other species using bottom trawl gear. The Council recognized the correlation between existing groundfish regulations and whiting and red hake landings. Therefore, any regulations implemented for whiting and red hake could undoubtedly impact the management of other regulated groundfish species (cod, haddock, yellowtail flounder, pollock, redfish, white hake, witch flounder, American plaice, winter flounder, and windowpane flounder).

In Amendment 4, the Council proposed a minimum 2.5-inch codend mesh size throughout the range of species managed under the Multispecies Fishery Management Plan in an attempt to curb the increasing fishing pressure on both silver hake stocks and to reduce the mortality of juvenile fish. It was a controversial proposal, especially in southern New England and the Mid-Atlantic where whiting is often fished for with mesh smaller than 2.5-inches and caught in combination with other small mesh/mixed trawl species including squid, butterfish, mackerel, herring, sea bass, and scup. However, the National Marine Fisheries Service disapproved the proposed 2.5-inch minimum mesh restriction because it did not demonstrate a significant effect on preventing overfishing or an accrual of net economic benefits to the Nation over a ten-year period.

To date, the absence of mesh size controls in small mesh and mixed trawl fisheries (except for the Cultivator Shoal Whiting Fishery) has allowed for a less-than-optimal mesh size for directed silver hake fishing. Fishing for not only whiting, but also red hake has been allowed without restriction during times and in areas where the regulated groundfish species bycatch has been determined to be below 5 percent. This exemption applies year-round in southern New England waters and seasonally in two areas in the Gulf of Maine.

Groundfish management measures have not provided adequate conservation for either whiting or red hake stocks, and the recent status of these stocks necessitates more focused conservation efforts. In anticipation of additional whiting restrictions and on the recommendation of its whiting advisors, the Council established a control date for whiting (September 9, 1996) and announced that it might limit future access to the whiting fishery through a moratorium on whiting permits.

3.1.1 Cultivator Shoal Whiting Fishery

Amendment 4 officially designated the Cultivator Shoal Experimental Whiting Fishery as an exempted fishery on a seasonal basis within certain spatial boundaries. This allowed the transition from a successful experimental fishery for whiting to a more permanent fishery designed to enhance revenues for a small mesh fishery in New England. The experimental fishery accomplished its original objectives by demonstrating that silver hake could be caught on Georges Bank without negatively impacting other regulated groundfish species. At the time, the Council had also hoped to divert fishing effort away from regulated groundfish species by providing the Cultivator Shoal as a viable alternative. Today, however, the condition of whiting stocks commands a re-evaluation of the Cultivator Shoal fishery. The Council has assessed the existing Cultivator Shoal Whiting Fishery regulations and is proposing some modifications to reduce fishing mortality of whiting on the Cultivator.

3.1.2 Juvenile Whiting Fishery

In recent years, whiting fishermen and the Council have become increasingly concerned about the health of the resource, especially since an international export market for juvenile whiting developed in the early 1990s. The impact of this juvenile fishery on stock status has not yet been fully measured. On one hand, given the truncated age structure of both silver hake stocks, the juvenile fishery may be detrimental to the resource. On the other hand, juvenile whiting discards historically have been substantial, and increased landings of juvenile whiting may not necessarily represent an increase in exploitation rates. In addition, increased competition (Canadian whiting fisheries, for example) for this market niche is already resulting in lower levels of participation by U.S. east coast fishermen. For more discussion about the juvenile whiting fishery and Spanish export market, see Section E.6.5.7.2.

3.1.3 Inclusion of Offshore Hake in the Multispecies Management Unit

Whiting advisors asked the Council about managing offshore hake (*Merluccius albidus*, blackeye whiting), which they often catch and land in combination with silver hake. Like many other pairs of sympatric hake species around the world, silver hake and offshore hake are very difficult to distinguish from one another by external appearance. Some ports are only beginning to separate silver hake landings from offshore hake landings, and some still do not. Consequently, commercial landings statistics collected since 1955 for silver hake probably reflect some (unknown) quantities of offshore hake. In response to growing concern about how to successfully manage silver hake without managing offshore hake, the Council obtained a report from the Northeast Fisheries Science Center summarizing the available scientific information and noting that very little is known about offshore hake biology or stock status. Despite the lack of more complete scientific information, the Council recognizes that precautionary steps can be taken to provide basic protection for the offshore hake stock, to improve the offshore hake information database, to expedite the recovery of silver hake stocks, and to allow for the development of a sustainable fishery. For these reasons, the Council is proposing to include offshore hake in the multispecies management unit.

3.2 PURPOSE AND NEED FOR MANAGEMENT ACTION

3.2.1 Overfishing

According to the latest *Report on the Status of Fisheries of the United States* prepared by the National Marine Fisheries Service (NMFS) in September 1997, both red hake and the southern stock of silver hake are overfished, and the northern stock of silver hake is approaching an overfished condition (according to current overfishing definitions). The Sustainable Fisheries Act (SFA) amendment to the Magnuson-Stevens Fishery Conservation and Management Act requires the Council to submit management measures within one year to end overfishing and rebuild these stocks within a ten year time period. Other elements of the revised FCMA that affect the management of these stocks include: a new definition for Optimum Yield (OY); new National Standards 8, 9, and 10 that require the Council to address the importance of fishery resources to fishing communities, to minimize bycatch and/or bycatch mortality to the extent practicable, and to promote the safety of human life at sea; and a provision requiring the Secretary of Commerce to report annually to Congress and the Councils on the status of fisheries and identify those fisheries which are overfished or approaching an overfished condition.

3.2.2 Purpose of this Amendment

The purpose of this amendment is:

> to decrease whiting fishing morality rates from the most recent estimates of approximately 1.79 in the north (73% exploitation rate) and 1.5 in the south (66% exploitation rate) to the target fishing mortality rates (Fs) (according to the current overfishing definitions) of 0.36 and 0.34 for the northern and southern stocks of silver hake respectively.

The target fishing mortality rates specified by the current overfishing definitions for both the northern and southern whiting stocks equate to exploitation rates of approximately 25 percent. The Council has selected a target reduction in whiting exploitation of 63% to achieve the fishing mortality objectives for both stocks of silver hake **(Table 1)**.

The Council intends to reach target Fs for whiting within four years and rebuild whiting and red hake stocks within ten years.

While achieving its primary objective, this amendment will also:

- provide basic protection for offshore hake (blackeye whiting, *Merluccius albidus*) pending the development of scientific information on stock status and the potential for overfishing and
- allow for a sustainable fishery that maximizes economic benefits without compromising the health of any of the northeast multispecies resources.

The Council has reviewed existing overfishing definitions for compliance with NMFS proposed guidelines for National Standard 1 of the SFA and is submitting new overfishing definitions for silver hake, red hake, and offshore hake for approval in this amendment (Section 4.2). None of the management measures proposed in this document address the new (proposed) overfishing definitions.

3.2.3 Goals and Objectives

The Council's primary management objective is to reduce fishing mortality (F) on silver hake and red hake over three years to levels that will rebuild and sustain stocks capable of producing MSY on a continuing basis. For the silver hake stocks, this means reducing fishing mortality to a level that will increase the percent maximum spawning potential (%MSP) for the southern and northern stocks to 31% and 42% respectively (the current overfishing definition threshold). The fishing mortality rate corresponding to the %MSP is 0.36 for the northern stock and 0.34 for the southern stock (**Table 1)**. Since the most recent estimates of F are near 1.5 for both stocks, reducing F to %MSP levels will require a decrease in whiting exploitation rates of approximately 63 percent.

Table 1 Target (Silver Hake) Fishing Mortality Rates and Exploitation Reductions

Stock Area	Time Period	Current Fishing Mortality Rate (F)	Current Exploitation Rate (U)	Current Overfishing Definition	Overfishing Definition Exploitation Rate	Target Reduction in Exploitation
Northern	1992-1995	1.53	0.68	$F_{31\% MSP}$ = 0.36	0.25	63 %
	1993-1995	1.79	0.73	$F_{31\% MSP}$ = 0.36	0.25	66 %
Southern	1992-1995	1.42	0.65	$F_{42\% MSP}$ = 0.34	0.25	62 %
	1993-1995	1.51	0.67	$F_{42\% MSP}$ = 0.34	0.25	63 %

The Council has chosen 0.36 and 0.34 as target fishing mortality rates for the northern and southern stocks respectively. These target fishing mortality rates are below recent estimates of $F_{0.1}$ for both stocks, and the Council is confident that achieving the targets will ensure that overfishing of both silver hake and red hake has ceased.

The current red hake overfishing definition is based on moving averages of NEFSC survey abundance estimates. In general, red hake is caught in combination with silver hake and other small mesh species. Although current fishing mortality rates for red hake are unknown, they are estimated to be high due to a substantial (unknown) amount of discarding at sea. Despite the lack of available information on red hake stock status, the Council recognizes the need to end overfishing on red hake by minimizing discards and reducing waste in small mesh and mixed trawl fisheries. The Council is currently unable to specify any overfishing targets for red hake, but measures implemented in this amendment to address silver hake should end overfishing on red hake. Impact analyses presented in this document assess the potential effects of the management measures on red hake and demonstrate that significant reductions in red hake exploitation are also expected from the proposed management action. The Council will monitor the status of red hake stocks closely in combination with silver hake and will adjust this plan to ensure that overfishing on red hake is ceased and that the stocks rebuild. As more data become available to estimate fishing mortality and spawning stock biomass, the Council will adjust the plan to meet new targets (if necessary).

In addition to reducing fishing mortality on silver hake to levels required by the current overfishing definition, the Council adopts a second objective of rebuilding the spawning stock biomass (SSB) of both silver hake and red hake to levels capable of sustaining MSY on a continuing basis. Unfortunately, current estimates of stock size are unavailable due to the absence of any silver hake Virtual Population Analysis (VPA) since 1990. Stock sizes estimated from VPA are therefore only available through 1989. Without an estimate of current stock size, it is difficult to project future spawning stock sizes. However, analyses presented in this document address the potential for silver hake spawning stock biomass to increase and demonstrate that significant increases in SSB, particularly in the southern stock, are expected to result from the proposed management action.

The Council is proposing to establish a Whiting Monitoring Committee (WMC) to annually monitor the progress of the proposed management program and to make recommendations for annual adjustments, as appropriate, to ensure that this plan meets its objectives. The WMC objectives and process are specified in Section 4.14.

3.2.4 Discussion

The following characterizes both the quantity and quality of available information on silver hake stocks, outlines the process used to determine the target reductions in exploitation, and provides the Council's rationale for aiming to reduce whiting exploitation by 63 percent.

<u>SAW/SARC 17 Assessment</u>

The most recent peer-reviewed stock assessment for silver hake evaluated at SAW/SARC 17 (Autumn 1993). An age-based analytical assessment (VPA) was presented at SAW/SARC 17 but was rejected for a number of reasons including questions about stock structure, shifts in resource distributions, poor estimates of discarding, inadequate port sampling, and poor performance of the analytical model as indicated by statistical diagnostics.

In the SAW/SARC 17 assessment, instantaneous total morality (Z) and fishing mortality (F) were estimated using stratified catch (number) per tow information from the NEFSC spring and autumn survey series. For the most recent time period in the assessment (1989 – 1992), total instantaneous mortality for the northern stock area was estimated as 0.64 from the spring survey and 0.99 from the autumn survey (geometric mean = 0.80; Table A7; NOAA/NEFSC 1997). Corresponding fishing mortality rates, estimated by subtracting an assumed natural mortality of 0.4, were 0.24 (spring survey), 0.59 (autumn survey), and 0.40 (geometric mean). For the most recent time period in the assessment (1989 – 1992), instantaneous mortality for the Southern stock was estimated as 1.54 from the spring survey and 1.59 from the autumn survey (geometric mean = 1.56; Table B7; NOAA/NMFS 1994). Corresponding fishing mortality rates were 1.14 (Spring), 1.19 (Autumn), and 1.16 (geometric mean).

<u>Current Estimates</u>

The Whiting Plan Development Team (PDT) updated survey-based estimates of instantaneous total and fishing mortality rates estimated during SAW/SARC 17. The PDT estimated fishing mortality rates by estimating total mortality (z) from survey catch at age indices and subtracting an assumed and constant natural mortality rates (m = 0.40). Fishing mortality rates (F) are on a logarithmic, not an arithmetic scale, so calculating the percent reduction in catch (including discards) from fishing mortality rates is misleading. Fishing mortality rates were translated to exploitation rates to estimate the percent decrease in catch for comparison to the *current* overfishing definition. The exploitation rate is defined as the proportion of the population at the beginning of a given time period that is caught during the time period. Exploitation rates are based on an arithmetic scale, allowing for a direct translation of required reductions in fishing mortality rates into required percent reductions in catch (landings and discards). Although the NEFSC surveys were conducted in Autumn 1996, Spring 1997, and Autumn 1997 the aging structures (otoliths) collected on these surveys have not been aged. With survey catch at age indices through 1996, the Whiting PDT was able to estimate total and fishing mortality rates through 1995.

Instantaneous total mortality (Z) rates were calculated from the NEFSC spring and autumn surveys. Fishing mortality rates were estimated by subtracting the assumed natural mortality rate (0.4) from the estimated instantaneous total mortality rate estimates. The PDT estimated total instantaneous and fishing mortality rates for both a three (1993 – 1995) and four (1992 – 1995) time period **(Table 1)**.

Estimates of Fishing Mortality

Estimates of total mortality and fishing mortality rates were remarkably consistent between surveys and time periods. Total and fishing mortality rates were significantly higher during the most recent time period than those reported for earlier time periods (1989 – 1992). For the northern stock, fishing mortality was estimated as 1.526 for the 1992 – 1995 period and 1.793 for the 1993 – 1995 period. For the southern stock, fishing mortality was estimated at 1.419 for the 1992 – 1995 period and 1.511 for the 1993 – 1995 period **(Table 3)**. Resulting exploitation rates ranged from 0.65 to 0.73, depending on the stock area and time period considered. The resulting high levels of fishing mortality in the most recent years of the analysis result from an increasingly truncated age distribution in both stocks of silver hake. In general, large incoming year classes disappear before they reach age 3 indicating a high level of total instantaneous mortality occurring in both stocks.

1996 – 1998 Information

While it was not possible for the PDT to estimate fishing mortality and exploitation rates for 1996 – 1998, the PDT did examine length frequency distribution plots from the Autumn 1996, Spring 1997, and Autumn 1997 NEFSC research vessel surveys **(Figure 1 – Figure 4)**. If there had been a shift in the exploitation pattern during the most recent time period, this would likely be reflected by a significant shift in the length frequency distributions relative to earlier surveys. Lower total mortality rates would be reflected by a broadening of the length frequency distribution and the appearance of larger (and presumably) older fish. If total mortality rates have been reduced, broadening of the length frequency distribution would be expected to occur rapidly because of the high growth rates of silver hake. The PDT was unable to detect any change in the truncation of the length frequency distribution graphs for the Autumn 1996, Spring 1997, or Autumn 1997 surveys for either the northern or southern stock areas indicating that high levels of total mortality continue to exist in these stocks through the end of 1997.

Recent Fishing Mortality Rates Relative to the Current Overfishing Definition

The fishing mortality rates for both the 1992 – 1995 period and the 1993 – 1995 period clearly exceed the overfishing definitions for both the northern and southern stocks of silver hake. Current overfishing definitions are $F_{31\% MSP} = 0.36$ for the northern stock and $F_{42\% MSP} = 0.34$ for the southern stock. To translate target reductions in fishing mortality rates into arithmetic scale reductions in landings, it is necessary to translate the F's corresponding to the overfishing definitions into exploitation rates. The exploitation rates corresponding with the overfishing definitions are approximately equal to 0.25 for both the northern and southern stocks of silver hake. The target reductions in exploitation are consistent between stocks and between time periods, ranging from 62 to 66% from the base period considered (either 1992 – 1995 or 1993 – 1995) **(Table 1)**.

Monitoring Ability

The ability to monitor fishing mortality rates for silver hake is clearly hindered by the inability to produce an analytical age-based assessment for these stocks. Survey-based estimates of total instantaneous and fishing mortality are based on highly variable estimates of mean numbers at age in the NEFSC Spring and Autumn surveys. Recognizing the highly variable nature of the surveys, mortality estimates are calculated for blocks of three to five years to temper the influence of the results of individual surveys. If survey-based estimates of total and fishing mortality remain the only available tools to assess the stock, managers must recognize that it will not be possible to provide annual updates of progress in reducing fishing mortality. There will likely be a 1-2 year lag from the time that fishing mortality is actually reduced to or below the target level before this survey based method is capable of detecting reductions in total mortality. An updated stock assessment as well as updated fishing mortality rates for both silver hake stocks should aide in monitoring the effectiveness of the proposed management action.

Figure 1 Length Frequency Distribution Plots for the Gulf of Maine/Northern Georges Bank Stock of Silver Hake, 1993 – 1997: NEFSC Spring Survey

Figure 2 Length Frequency Distribution Plots for the Gulf of Maine/Northern Georges Bank Stock of Silver Hake, 1993 – 1997: NEFSC Autumn Survey

Figure 3 Length Frequency Distribution Plots for the Southern Georges Bank/Mid-Atlantic Stock of Silver Hake, 1993 – 1997: NEFSC Spring Survey

Figure 4 Length Frequency Distribution Plots for the Southern Georges Bank/Mid-Atlantic Stock of Silver Hake, 1993 – 1997: NEFSC Spring Survey

4.0 PROPOSED ACTION

This section provides a description of the management measures contained in Amendment 12 to the Northeast Multispecies FMP.

4.1 IDENTIFICATION OF SMALL MESH MULTISPECIES

Since the proposed moratorium on commercial permits eliminates the open access nonregulated multispecies permit and replaces it with a new open access multispecies permit (see Section 4.5), silver hake, red hake, and ocean pout will no longer be identified as "nonregulated multispecies." With the implementation of this amendment, silver hake, red hake, and offshore hake will be identified as "small mesh multispecies," a subset of Northeast multispecies (all species in the multispecies management unit). Fishing for/possessing on board small mesh multispecies will be limited to vessels possessing one of the limited access small mesh multispecies permits described in Section 4.5 or an open access multispecies permit described in Section 4.6. Ocean pout will remain an open access multispecies, and none of the management measures proposed in this amendment address fishing for ocean pout.

4.2 DEFINITIONS OF OVERFISHING FOR SILVER HAKE, OFFSHORE HAKE, AND RED HAKE

The Council's Overfishing Definition Review Panel has evaluated existing overfishing definitions and developed recommendations for new definitions (as needed) to bring FMPs into compliance with the Magnuson-Stevens Act and the Sustainable Fisheries Act. The Panel has recommended to the Council the overfishing definitions described below based on NMFS guidelines and using the best scientific information available. In cases where the Panel was unable to recommend an overfishing definition, the Whiting PDT developed one. The overfishing definitions will not be considered effective until they are approved by NMFS. This amendment does not contain management measures based on the following overfishing definitions.

Whether a stock is overfished will depend on either the stock size (biomass, B) or the rate of fishing (fishing mortality, F), or both. A stock is considered "overfished" when its biomass is less than that which can produce maximum sustainable yield (B_{MSY}) on a continuing basis. "Overfishing" occurs when F exceeds $F_{threshold}$. The $F_{threshold}$ is less than or equal to the fishing mortality rate that can produce maximum sustainable yield (F_{MSY}) and varies with stock size based on whether the biomass is above or below (and how far below B_{MSY}). For stocks with biomass levels below B_{MSY}, $F_{threshold}$ is the fishing mortality rate that allows the stock to rebuild to B_{MSY} in a maximum rebuilding time period, not to exceed ten years.

For a complete description of the methodology employed by the Panel as well as the Panel's final recommendations, see **Appendix I,** *Evaluation of Existing Overfishing Definitions and Recommendations for New Overfishing Definitions to Comply with the Sustainable Fisheries Act (relevant portions only)*.

4.2.1 Silver Hake

For setting a maximum fishing mortality threshold, the Council recommends that $F_{0.1}$ (0.41 and 0.39 for the northern and southern stocks of silver hake respectively) be used as a proxy for F_{MSY}. The Council also recommends that the stratified mean survey weight per tow during 1973-1982 be used as an acceptable biomass target until satisfactory estimates of B_{MSY} are available. The exploitation history of the two stocks indicates that fishing mortality fluctuated around $F_{0.1}$ from 1973 to 1982. The value of $F_{0.1}$ is conditional, based on the estimated selection pattern of the fishery (the proportion of various ages of fish available for harvest).

Table 2 Overfishing Definition Reference Points for Silver Hake

STOCK	SFA THRESHOLDS	SFA TARGETS
Northern Silver Hake	$F_{0.1}$ = (0.41) B = None	F below $F_{0.1}$ B = 1973-1982 weight per tow = 6.63
Southern Silver Hake	$F_{0.1}$ = (0.39) B = None	F below $F_{0.1}$ B = 1973-1982 weight per tow = 1.56

Discussion: Although it is not possible to estimate MSY from stock-recruitment functions for either the northern or southern stocks of silver hake, some generalities can be drawn from the survey index. Fishing mortality appears to have substantially increased over the survey time-series **(Table 3)**, and the age structure of the stocks has become severely truncated over time (see Section 3.2.4 and **Figure 5**). Since the survey does not indicate a period of time when silver hake stocks were relatively un-exploited, the Council recommends that the survey weight per tow values from 1973 to 1982 would serve as an acceptable proxy for B_{MSY} conditions for both stocks until more satisfactory estimates of B_{MSY} become available.

Due to the exploitation pattern for silver hake, F_{MAX} (3.7 and 1.3 for the northern and southern stocks respectively) is not an acceptable proxy for F_{MSY} because these high values would ultimately reduce spawning stock biomass and recruitment success, thus reducing total yield. For setting a maximum fishing mortality threshold, the Council recommends that $F_{0.1}$ (0.41 and 0.39 for the northern and southern stocks respectively) be used as a proxy for F_{MSY}. The exploitation history of the two stocks also indicates that fishing mortality fluctuated around $F_{0.1}$ from 1973 to 1982.

Fishing at $F_{0.1}$ may not guarantee the full recovery of stock biomass to B_{MSY} levels within a ten year time period, especially if juvenile whiting continue to be targeted for the Spanish export market. The value of $F_{0.1}$ is conditional, based on the assumed selection pattern of the fishery (the proportion of various ages of fish available for harvest). The development of a fishery for juvenile fish could imply lower yield associated with F_{MSY} than the yield resulting from a fishery only harvesting adults. Therefore, while $F_{0.1}$ may serve as a maximum fishing mortality threshold, the Council recommends that target fishing mortality rates for both stocks be risk averse and well below $F_{0.1}$ as long as juvenile whiting are targeted. (The regulations proposed in this amendment could significantly curtail the amount of juvenile whiting available for harvest.)

Table 3 Survey-based Estimates of Fishing Mortality for Silver Hake, Calculated from the Number of Age 4+ Fish in Year t+1 Versus the Number of Age 3+ Fish at Year t

	NORTHERN STOCK			SOUTHERN STOCK		
YEARS	**Spring Survey[1]**	**Autumn Survey[2]**	**Geometric Mean**	**Spring Survey[2]**	**Autumn Survey[2]**	**Geometric Mean**
1974 – 1977	1.19	0.05	0.24	0.56	0.23	0.36
1978 – 1982	0.80	0.27	0.46	0.32	0.10	0.18
1983 – 1987	0.79	0.44	0.60	0.68	0.56	0.62
1988 – 1992	0.79	0.61	0.69	1.08	1.28	1.18
1993 – 1995	1.57	2.05	1.79	1.26	1.81	1.51

1 Spring Survey estimates of F: $\ln(\Sigma$ 3+ for years i to j / Σ 4+ for years i+1 to j+1) – 0.40

2 Autumn Survey estimates of F: $\ln(\Sigma$ 2+ for years i-1 to j-1 / Σ 3+ for years i to j) – 0.40

Figure 5 NEFSC Autumn Survey Abundance Estimates for Silver Hake – Older Individuals (Age 3+)

4.2.2 Red Hake

4.2.2.1 Gulf of Maine/Northern Georges Bank Red Hake

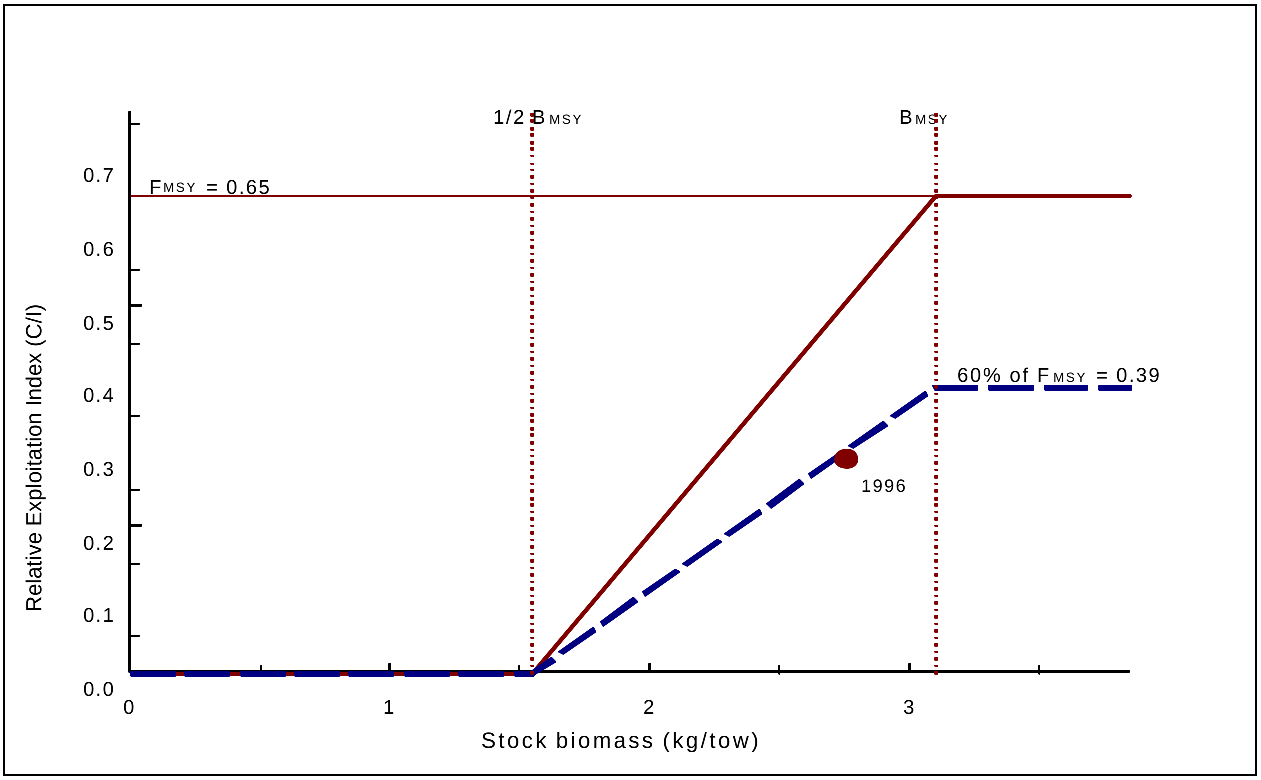
Based on the available data, 2,000 metric tons (mt) appears to approximate MSY, and the median survey biomass from 1978 to 1996 (3.1 kg/tow) approximates B_{MSY}. Given these proxies, threshold F_{MSY} that corresponds to F_{MSY} would then be 0.65 (2/3.1). Based on guidance for choosing a minimum biomass threshold in the National Standard guidelines and on choosing targets for extremely uncertain estimates of F_{MSY} (Restrepo et al. 1988), the Council recommends a minimum biomass threshold that is ½ of the B_{MSY}-proxy and a fishing mortality target that is 60% of the F_{MSY}-proxy (**Table 4** and **Figure 6**).

Table 4 Overfishing Definition Reference Points for the Northern Stock of Red Hake

	THRESHOLD	TARGET
Maximum Sustainable Yield	2,000 mt	
Fishing Mortality (catch/survey biomass)	0.65	0.39
Stock Biomass (kg/tow)	3.1	1.6

Figure 6 characterizes the recommended control law for northern red hake derived from the proposed proxy reference points. The fishing mortality threshold should be F_{MSY} (0.65) when the fall survey index is greater than 3.1 kg/tow (B_{MSY}-proxy) and would decrease linearly to zero at 1.6 kg/tow (1/2 of the B_{MSY}-proxy). Target F should be defined as 60% of the F_{MSY} proxy (F_{MSY} = 0.39) when the fall survey index is greater than 3.1 kg/tow and would decrease linearly to zero at 1.6 kg/tow.

Figure 6 Control Law for the Northern Stock of Red Hake

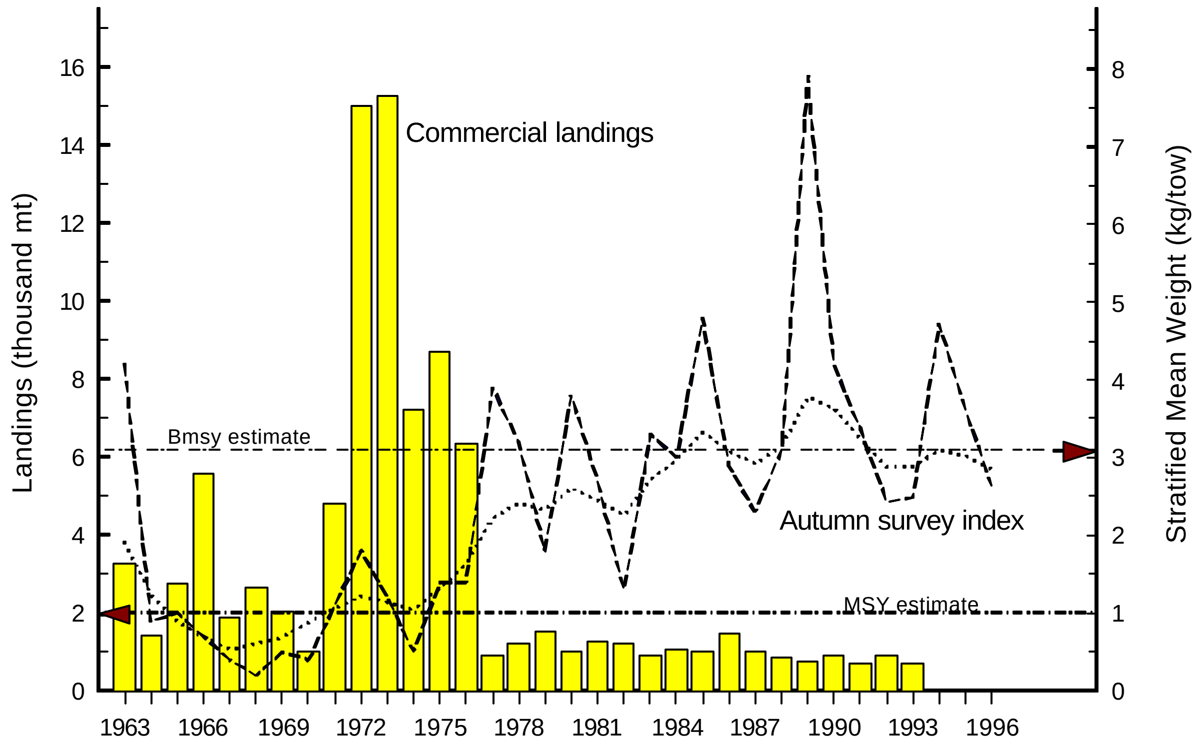


The figure above represents the proposed control law for the northern stock of red hake. The maximum fishing mortality threshold is F_{MSY} and the minimum biomass threshold is ½ of the proxy value for B_{MSY}.

Discussion: Analytical estimates for stock biomass, fishing mortality, or MSY-reference points could not be estimated for northern red hake. The landings and survey biomass data had insufficient dynamic range over the time-series to give reliable estimates of MSY from a surplus production model **(Figure 7)**. In lieu of an analytic estimate, trends in landings were visually examined and MSY and B_{MSY} estimates were chosen that appear to be sustainable. MSY was chosen at a level that appeared to cause declines in stock size when landings exceeded it. Conversely, increases in stock biomass were also apparent when landings were less than the chosen value. A B_{MSY}-proxy value was chosen based on the survey biomass trends and the exploitation history. When stock biomass was greater than the chosen value, it was attributed to short-term fluctuations or sampling variability when the relative exploitation rate was at a low relative to average levels. If the relative exploitation rate was extremely low, the B_{MSY}-proxy value was chosen at a lower level than the survey biomass levels during that time because stock biomass would be expected to be between B_{MSY} and the carrying capacity.

Figure 7 Total Commercial Landings And Survey Biomass for the Northern Stock of Red Hake, 1963-1996

The survey biomass index is smoothed to show trends in stock biomass. Landings since 1993 have not been prorated by stock area due to changes in the data collection program.



4.2.2.2 Southern Georges Bank/Mid-Atlantic Red Hake

Southern red hake is in an overfished condition when the three-year moving average weight per individual in the autumn survey falls below the 25th percentile of the average weight per individual from the autumn survey time series 1963-1997 (0.12) AND when the three-year moving average of the abundance of immature fish less than 25 cm falls below the median value of the 1963-1997 autumn survey abundance of fish less than 25 cm (4.72).

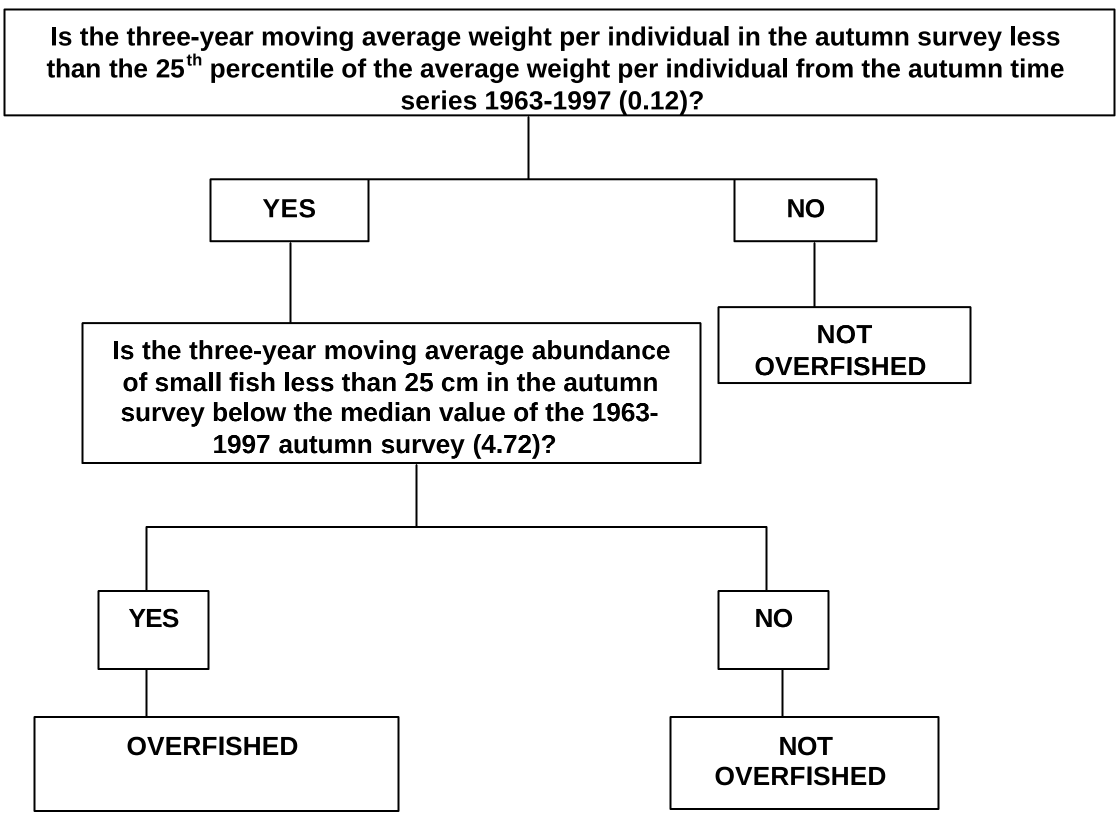
The biological thresholds and targets included in the southern red hake overfishing definition are listed in **Table 5**.

Table 5 Overfishing Definition Reference Points for the Southern Stock of Red Hake

	THRESHOLD	TARGET
Maximum Sustainable Yield	Not estimable	
Fishing Mortality (F)	Weight distribution less than 0.12 AND recruitment less than 4.72	Not specified
Stock Biomass (B)	Not specified	Not specified

The proposed overfishing definition for southern red hake is represented graphically in **Figure 8** below:

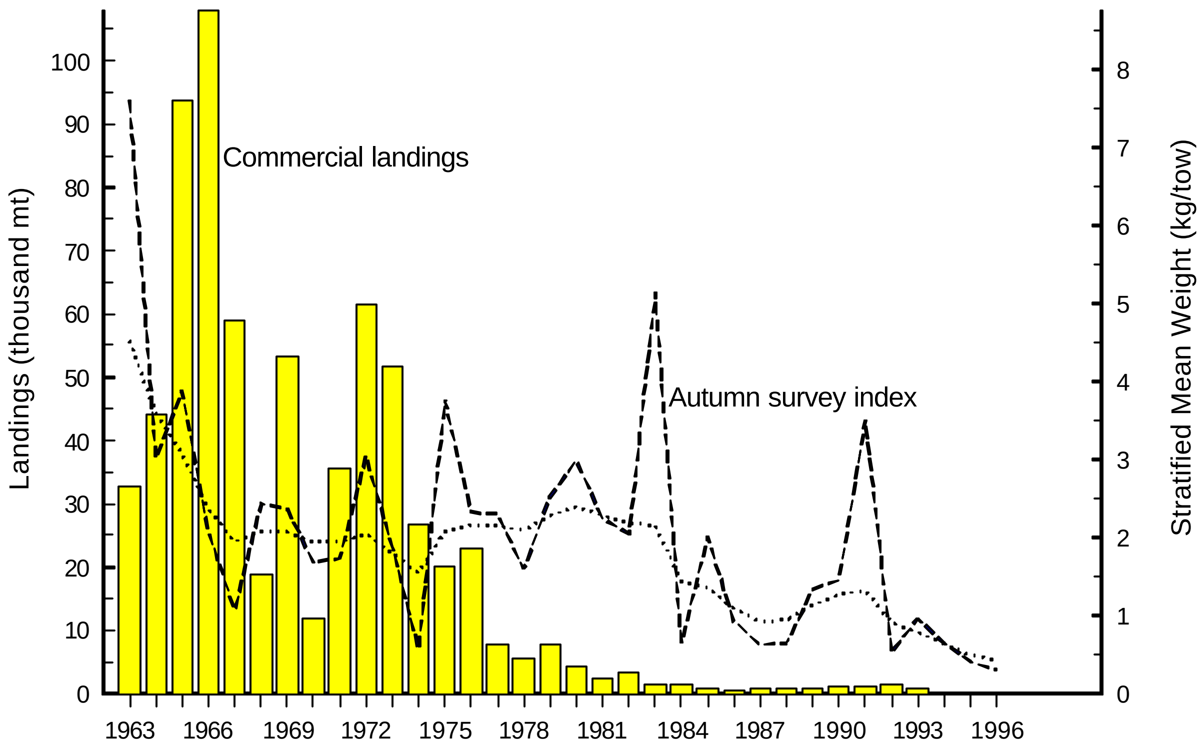
Figure 8 Graphical Representation of the Proposed Overfishing Definition for the Southern Stock of Red Hake



Discussion: Analytical estimates for stock biomass, fishing mortality, or MSY-reference points could not be estimated for southern red hake. The landings and survey biomass data had insufficient dynamic range over the time-series to give reliable estimates of MSY from a surplus production model **(Figure 9)**. In lieu of an analytic estimate, trends in landings were visually examined in an attempt to derive MSY and B_{MSY} estimates that appear to be sustainable. Inspection of the landings and survey biomass, however, did not reveal any value of MSY that appeared to stabilize stock biomass at higher levels. Since 1980, landings have been low, yet the stock continued to decline.

Figure 9 Total Commercial Landings and Survey Biomass for the Southern Stock of Red Hake, 1963-1996

The survey biomass index is smoothed to show trends in stock biomass. Landings since 1993 have not been prorated by stock area due to changes in the data collection program.



4.2.3 Offshore Hake

Offshore hake is in an overfished condition when the three year moving average weight per individual in the autumn survey falls below the 25th percentile of the average weight per individual from the autumn survey time series 1963-1997 (0.236) AND when the three year moving average of the abundance of immature fish less than 30 cm falls below the median value of the 1963-1997 autumn survey abundance of fish less than 30 cm (0.33).

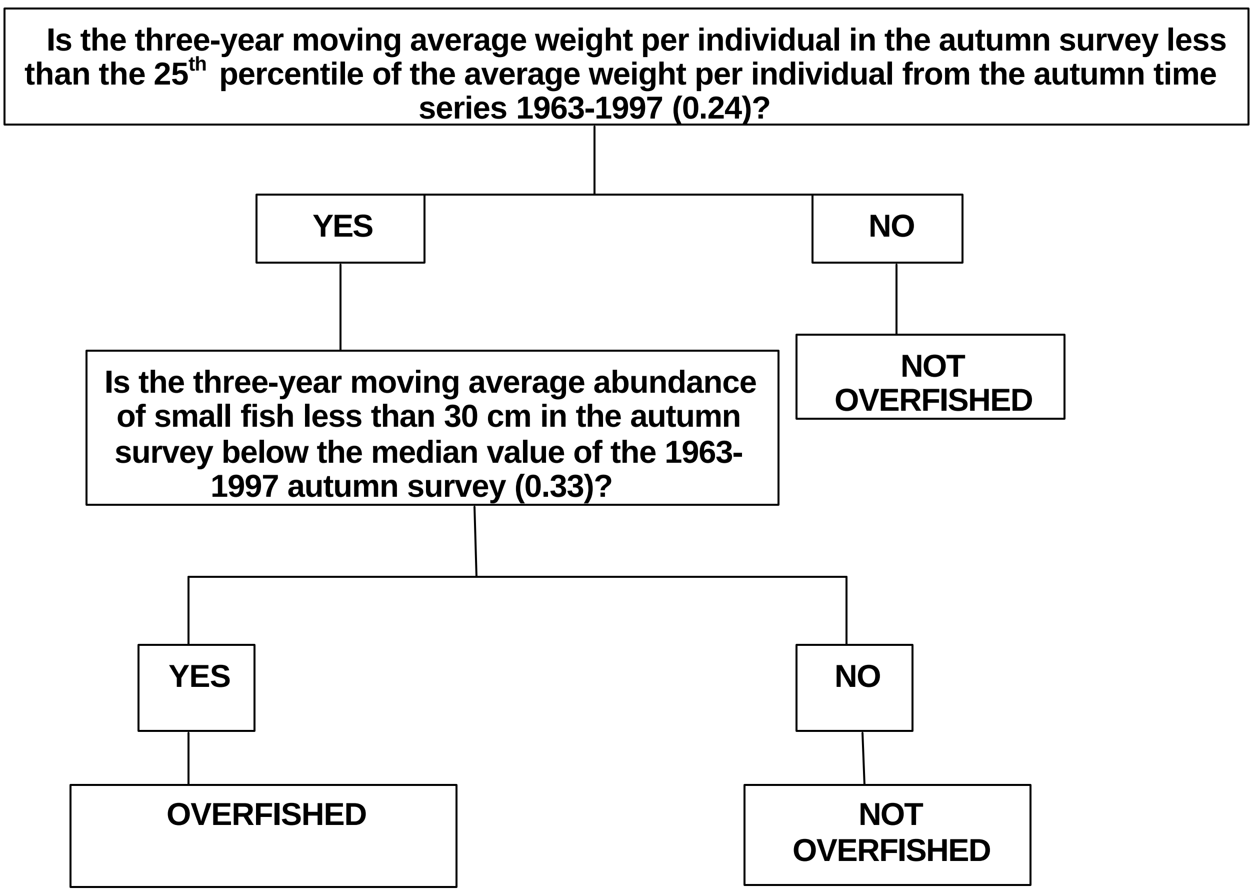
The biological thresholds and targets included in the offshore hake overfishing definition are listed in **Table 6.**

Table 6 Overfishing Definition Reference Points for Offshore Hake

	THRESHOLD	TARGET
Maximum Sustainable Yield	Not estimable	
Fishing Mortality (F)	Weight distribution less than 0.24 AND recruitment less than 0.33	Not specified
Stock Biomass (B)	Not specified	Not specified

The proposed overfishing definition for offshore hake is represented graphically in **Figure 10** below:

Figure 10 Graphical Representation of the Proposed Overfishing Definition for Offshore Hake



Discussion: Data quality for offshore hake is very poor. Three sources of information are important for estimating or choosing biological reference points as proxies for B_{MSY} and F_{MSY}. The following information was not available for evaluating reference points for offshore hake that could serve as proxy values:

A. The survey does not appear to give a reliable estimate of relative abundance and biomass (see **Figure 11**). Survey abundance and biomass data would be useful to estimate a minimum biomass threshold (weight per tow), average recruitment (number per tow), and total mortality. Since the NEFSC spring and fall surveys sample only the periphery of the geographic distribution of offshore hake, relative abundance can be equally affected by changes in availability to the survey as it would by changes in stock abundance. Climatic variability could be a primary cause affecting availability, since offshore hake appear to prefer higher water temperatures than do silver hake. Availability may also be a function of fish size, since each age group may have different responses to its environment.

B. Current estimates of fish age appear to be unreliable. Age estimates from 464 samples collected during the early 1960s are highly variable for a given length and do not appear to be suitable to estimate growth parameters (F. Almeida, pers. comm.). The methodology for aging these historic samples were moreover inconsistent with accepted, modern practices.

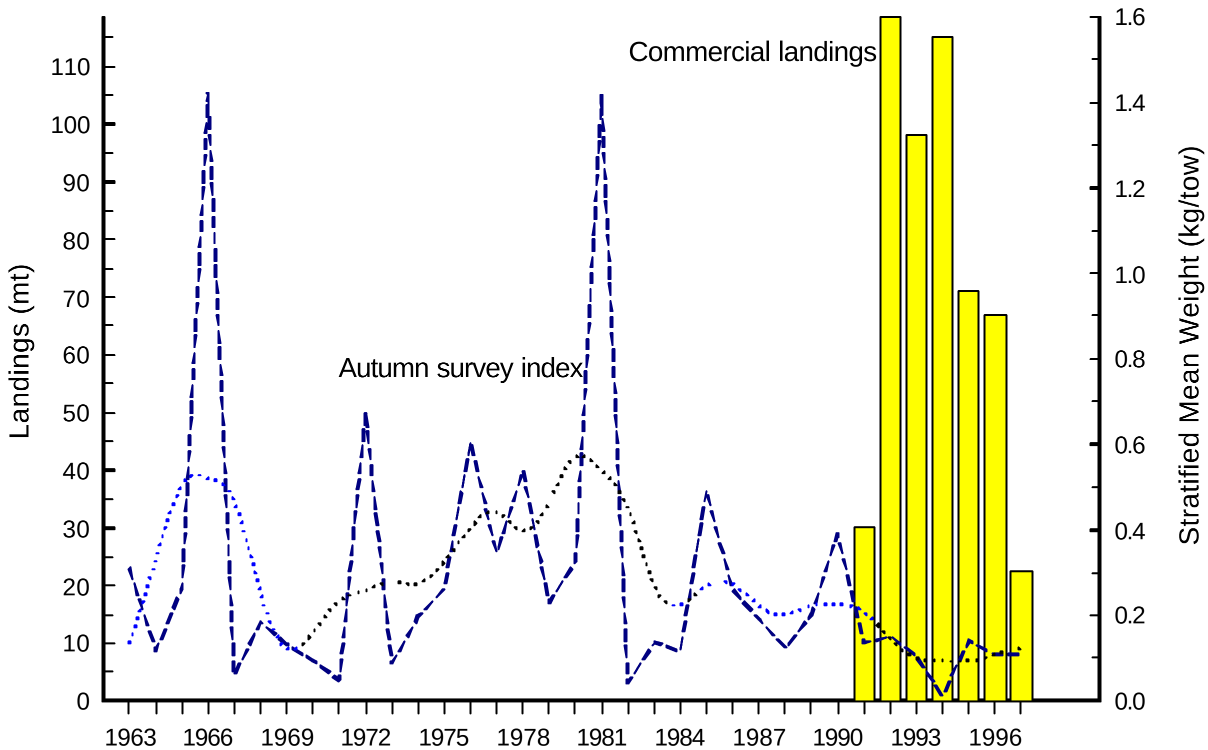
Modern age structures have been collected, however, and serious effort should be directed toward aging several hundred samples over the widest possible range of lengths. This limited effort would allow us to estimate $F_{0.1}$ and F_{MAX} via yield-per-recruit analysis. In some cases, the Overfishing Definition Review Panel has found these reference points to be acceptable as target or threshold fishing mortality rates.

If estimates of maturation at age are also available, then %SPR reference points (e.g. $F_{40\%}$) can be calculated as well. These reference points are pretty useless unless estimates of current fishing mortality (status criteria) are also available. Mean length from exploitable sizes of offshore hake, however, could be used to estimate fishing mortality (Beverton and Holt, 1956).

C. Commercial landings are suspect and sea sampling on trips catching offshore hake are rare. Some landings designated as silver hake may actually be offshore hake and (to a lesser extent) vice versa. This mixing and the way the fishery for offshore hake is prosecuted on the periphery of the distribution makes the use of long-term landings an unsuitable proxy for MSY.

Figure 11 Total Commercial Landings and Autumn Survey Indices for Offshore Hake, 1963-1997

The survey biomass index is smoothed to show trends in stock biomass.



The Council proposes the offshore hake overfishing definition based on a visual examination of landings data and the survey biomass time-series. The reference points were chosen by the Council based on a subjective evaluation of natural variability and a tolerance of risk.
The objectives of the offshore hake overfishing definition are:

- to enable the Council to monitor the stock status and detect any downward trends in the population despite the inability to estimate MSY or a reasonable MSY proxy,
- to protect against dramatic changes in the population resulting from fishing pressure,
- to prevent surprise circumstances where the fishery would be considered overfished without any warning, and
- to prevent an incorrect determination of overfishing.

This overfishing definition is designed to detect the onset of overfishing through the identification of two prevalent symptoms of a declining stock: reduction in the mean size of fish in the population due to truncation of the size and age distribution, and reduced abundance on incoming recruitment. Weight data, however, can be indicative of both a recruitment event and/or a gradual stock decline accompanying a high fishing mortality rate. In this light, the Council recommends that the overfishing definition be based on survey weight and abundance, but also risk averse rates of change that safely characterize fishing pressure on offshore hake. The Council is proposing a two-tier determination of overfishing based on not only the average weight per individual, but also abundance of pre-recruit fish. The size of pre-recruit fish is determined by the size at 50% maturity for females in the population. The L_{50} (length at 50% female maturity) used to define pre-recruits for offshore hake is 30 cm. This way, the status determination criteria cannot indicate that overfishing is occurring when a recruitment event may actually be responsible for the lower average weight per individual.

4.3 SPECIFICATION OF OPTIMUM YIELD

National Standard 1 requires that FMPs achieve "on a continuing basis, the optimum yield from each fishery for the United States fishing industry." The term "optimum," with respect to yield from a fishery, is defined as the amount of fish which:

(A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;
(B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and
(C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Optimum yield (OY) for silver hake, offshore hake, and red hake will therefore be the amount of fish that results from fishing under the set of rules designed to achieve the plan objectives. It is the amount of fish caught by the fishery when fishing at target fishing mortality rates (F_{target}) at current biomass levels (B_t), or when fishing in a manner intended to maintain or achieve biomass levels biomass capable of producing maximum sustainable yield (MSY) on a continuing basis. Expressed as an equation:

$$OY = F_{target} \text{ x } (B_t)$$

For a rebuilt stock, B_t is always greater than B_{MSY} (stock biomass capable of sustaining MSY over time). F_{target} is the target level of fishing mortality and is set safely below F_{MSY} (the fishing mortality rate capable of producing MSY over time) to prevent overfishing and ensure that OY can be achieved on a continuing basis. For an overfished stock, B_t is the current stock biomass level estimated or projected from the most recent assessment, and F_{target} is the fishing mortality rate objective that will achieve the desired rebuilding. If the current F, F_{target}, or B_t is unknown, proxy control rules are applied and the long-term potential yield may be a satisfactory proxy for OY.

The target fishing mortality rate (F_{target}) is the rate that will achieve the plan objectives with an acceptable degree of safety or precaution. Factors to be considered in setting F_{target} will be calculated through periodic stock assessments and include the stock size relative to B_{MSY}, the current age structure of the population and recruitment, as well as projected growth and recruitment characteristics of the stock. The Council may also consider social and economic characteristics in setting F_{target} provided the stock rebuilding projections are within the Council's range of precaution.

For an overfished stock, for example, the Council would set a target rate to rebuild the stock within a maximum time, usually not to exceed ten years. On a rebuilt stock, the Council should set F_{target} safely below the threshold level that will produce MSY. In setting target fishing mortality rates, the Council must balance maximizing short-term economic yield and providing for sustained participation of communities in the fishery against the risk or cost of allowing the biomass to decline to levels below B_{MSY}. Thus, the Council will consider social, economic, and ecological factors in setting the F_{target} in addition to considering the risk of not achieving stock recovery in an acceptable time period, or the risk of the rebuilt stock becoming overfished at any given time.

OY, therefore, is not a fixed amount but varies with the status of the stocks in the fishery, but it cannot be above a level that would exceed F_{MSY}. It is a quantity that represents the yield resulting from fishing at target levels on a rebuilt stock or stock complex, or the yield resulting from fishing at target levels designed to rebuild the stock in a specified time frame.

4.4 STOCK IDENTIFICATION FOR MANAGEMENT PURPOSES

The Council's recommendations for measures to be included in Amendment 12 do not specify different management measures for the northern area and the southern area. There is no need for a whiting stock delineation line for management purposes at this time. However, the Cultivator Shoal Whiting Fishery will remain a separate management area and will be managed independently.

If whiting stock identification for management purposes becomes necessary, the Council recommends that the delineation be based on a line drawn southward from Cape Cod at 70°00'. South of Cape Cod, the area west of 70°00' would be considered the southern management area, and the area east of 70°00' would be considered part of the northern management area. Whiting stock identification may be implemented and/or modified in the future through a framework adjustment to the Northeast Multispecies FMP (see Section 4.12).

4.5 MORATORIUM ON COMMERCIAL PERMITS – LIMITED ACCESS

This plan implements a moratorium on commercial permits to fish for small mesh multispecies (whiting, offshore hake, and red hake). Fishing for small mesh multispecies will be limited to vessels possessing either a limited access small mesh multispecies permit, a limited access small mesh multispecies possession limit permit, or an open access multispecies permit (see Section 4.6).

4.5.1 Limited Access Small Mesh Multispecies Permit

To qualify for a limited access small mesh multispecies permit, a vessel must meet one of the following criteria:

A. Currently possess (on date of final rule publication) ***and*** possessed on or before the 9/9/96 control date a valid multispecies permit (limited access or open access) ***and*** landed a total of at least 50,000 pounds of whiting, offshore hake, red hake, and/or ocean pout between January 1, 1980 and December 31, 1997, inclusive.

B. Currently possess (on date of final rule publication) ***and*** possessed on or before the 9/9/96 control date a valid multispecies permit (limited access or open access) ***and*** possessed a whiting experimental fishery permit (raised footrope trawl and/or separator trawl) ***and*** landed a total of at least 1,000 pounds of whiting, offshore hake, red hake, and/or ocean pout during its participation in the experimental fishery between January 1, 1980 and December 31, 1997, inclusive.

4.5.1.1 Sunset on Landings Criteria for Limited Access Small Mesh Multispecies Permit

Five years from the date of plan implementation (at the beginning of Year 6), unless otherwise extended, the landings criteria requirements for the limited access small mesh multispecies permit will be eliminated for those vessels that possess a valid limited access multispecies permit on the date of final rule publication as well as five years later. During Year 5, the Council will initiate reconsideration of this landings criteria "sunset" and determine, based on guidance from the Whiting Monitoring Committee, whether action should be taken to extend the qualification criteria for limited access multispecies permit holders beyond the beginning of Year 6.

4.5.2 Limited Access Small Mesh Multispecies Possession Limit Permit

To qualify for a limited access small mesh multispecies possession limit permit (to possess 2,500 pounds of combined small mesh multispecies), a vessel must currently possess (on date of final rule publication) ***and*** have possessed on or before the 9/9/96 control date a valid multispecies permit (limited access or open access) ***and*** landed at least one pound of whiting, offshore hake, red hake, and/or ocean pout between January 1, 1980 and December 31, 1997, inclusive.

4.5.3 Limited Access Permit Restrictions

All limited access small mesh multispecies permit holders are subject to similar limitations and conditions as limited access multispecies permit holders, described in the Northeast Multispecies FMP (appeals, changes in ownership, replacement vessels, vessel upgrading, etc.).

4.6 INCIDENTAL CATCH ALLOWANCE FOR NON-QUALIFIERS – OPEN ACCESS MULTISPECIES PERMIT

This permit will replace the current open access non-regulated multispecies permit. The incidental catch allowance for those who obtain an open access multispecies permit will be 100 pounds combined of small mesh multispecies (whiting, red hake, offshore hake) and unlimited amounts of ocean pout. In addition, a vessel that wants to retain one Atlantic halibut may do so if it possesses this open access permit.

4.7 CULTIVATOR SHOAL WHITING FISHERY

4.7.1 Cultivator Shoal Whiting Fishery Season Change

The Cultivator Shoal Whiting Fishery season will begin on June 15 and end on September 30 of each year.

4.7.2 Adjustment to Requirements for Participation in the Cultivator Shoal Whiting Fishery

While enrolled in the Cultivator Shoal Whiting Fishery, a vessel will be allowed to fish for small mesh multispecies in other designated small mesh areas provided that it complies with the Cultivator Shoal Whiting Fishery regulations (minimum 3-inch mesh and 30,000 pound whiting/offshore hake possession limit), no matter where it fishes.

4.7.3 Additional Management Measures for the Cultivator Shoal Whiting Fishery

There will be a 30,000 pound whiting/offshore hake possession limit for vessels fishing in the Cultivator Shoal Whiting Fishery (the current 3-inch minimum mesh requirement will remain the same).

4.8 MANAGEMENT MEASURES FOR ALL AREAS EXCLUDING THE CULTIVATOR SHOAL WHITING FISHERY

For all areas excluding the Cultivator Shoal Whiting Fishery, the following management measures apply:

To retain small mesh multispecies, qualified vessels (those possessing a limited access small mesh multispecies permit) will have the option to choose from the following mesh size/possession limit categories:

A. Vessels electing to use mesh smaller than 2.5-inches are allowed to possess/land combined whiting and offshore hake up to 3,500 pounds.
B. Vessels electing to use a minimum 2.5-inch mesh are allowed to possess/land combined whiting and offshore hake up to 7,500 pounds.
C. Vessels electing to use a minimum 3-inch mesh are allowed to possess/land combined whiting and offshore hake up to 30,000 pounds.

A vessel electing to fish under mesh size/possession limit categories (B) and (C) above will be required to obtain a letter of authorization from the Regional Administrator to do so for a minimum of 30 consecutive days (similar to the current requirements for participation in the

Cultivator Shoal Whiting Fishery). However, a vessel that informs the Regional Administrator may exit the mesh size/possession limit category for which it is authorized after a minimum of seven consecutive days. If the vessel exits the chosen category after a minimum of seven consecutive days, it may not re-apply for another authorization to fish under either category (B) or (C) for the remainder of the 30 consecutive days. For the remainder of the 30 consecutive days, the vessel will be limited to the whiting/offshore hake possession limit associated with the smallest mesh size (3,500 pounds), no matter what mesh size the vessel uses to fish for small mesh multispecies.

A vessel that does not receive a letter of authorization from the Regional Administrator will be assumed to fish for small mesh multispecies with mesh smaller than 2.5-inches and will be required to comply with the associated whiting/offshore hake possession limit (3,500 pounds). A vessel may fish for small mesh multispecies with a mesh size greater than that for which it is authorized, but if it does, it is still subject to the whiting/offshore hake possession limit associated with the mesh size for which it is authorized. A vessel possessing mesh on board smaller than that with which it is authorized to fish for small mesh multispecies must have the net properly stowed according to provisions similar to those for multispecies vessels. After a minimum of 30 consecutive days, a vessel that has obtained a letter of authorization from the Regional Administrator may change mesh categories by informing the Regional Administrator, withdrawing from the mesh category in which it is authorized, and obtaining a new letter of authorization (if necessary) to fish for small mesh multispecies in a different mesh size/possession limit category.

Vessels participating in the northern shrimp fishery may continue to retain combined whiting and offshore hake equal to the amount of shrimp on board, but not to exceed 3,500 pounds. However, these vessels will be required to possess either a limited access small mesh multispecies permit, a limited access small mesh multispecies possession limit permit, or an open access multispecies permit in order to retain whiting and offshore hake while participating in the northern shrimp fishery. Those vessels possessing either a limited access small mesh multispecies possession limit permit or an open access multispecies permit may retain more small mesh multispecies than their permit allows **only** when fishing in the northern shrimp fishery, and in no case will this amount exceed 3,500 pounds.

4.9 CODEND SPECIFICATION

In terms of management measures for small mesh multispecies, minimum mesh size is measured by the inside stretch of the net. Nets can consist of either square or diamond mesh. For a vessel less than or equal to 60 feet in length overall, the minimum mesh to retain small mesh multispecies must be applied to a minimum of the first 50 meshes (100 bars in the case of square mesh) from the terminus of the net. For a vessel greater than 60 feet in length overall, the minimum mesh to retain small mesh multispecies must be applied to a minimum of the first 100 meshes (200 bars in the case of square mesh) from the terminus of the net. This specification does not apply to vessels that fish with mesh smaller than 2.5-inches and are subject to other codend specifications for other small mesh fisheries (loligo squid, for example).

Discussion: Public comments about the proposed codend specification (160 meshes) suggested that it may not be appropriate given both the average size of most whiting vessels (excluding those that fish on Cultivator Shoal) and the way mesh is usually purchased (in intervals of 100 or 50 meshes). The Whiting Advisory Panel proposed that the codend should be defined as 100 meshes or 1/3 of the terminus of the net, and both the Committee and the Council supported this recommendation until significant enforcement issues were identified. Based on enforcement concerns associated with relating the codend to the entire length of the net, the Council re-specified the codend in a manner that still addresses concerns about vessel size as well as wasted mesh when nets are purchased.

4.10 USE OF NET STRENGTHENERS

A vessel that obtains a letter of authorization from the Regional Administrator to fish for small mesh multispecies with either a minimum 2.5-inch or 3-inch mesh (see Section 4.8) may not use a net strengthener while fishing for small mesh multispecies. A vessel that chooses to fish for small mesh multispecies with a mesh less than 2.5-inches may use a net strengthener while fishing for small mesh multispecies, provided the vessel complies with the net strengthener provisions specified in other small mesh fisheries (loligo squid, for example).

Discussion: Many vessels in southern New England and the Mid-Atlantic participate in high volume, small mesh fisheries. Some participants in these fisheries use strengtheners to prevent their nets from breaking while they are hauling them back. During public hearings, some people testified that net strengtheners are a necessary part of the traditional mixed trawl fishery in southern New England and the Mid-Atlantic. Since there are significant concerns about the impact of a strengthener on the effectiveness of the inside (regulated) mesh, the Council agreed to provide vessels with the option to use strengtheners **only** in fisheries where they traditionally have used them, and this does not include "directed" whiting fisheries. Historically, some vessels participating in the loligo squid fishery have relied on net strengtheners, and the Council intends to allow these vessels to continue using strengtheners without providing the incentive for vessels that have never used strengtheners to begin using them. If this were to happen, the conservation benefits resulting from fishing for small mesh multispecies with larger mesh could be compromised.

4.11 TRANSFER OF SMALL MESH MULTISPECIES AT SEA

A vessel will be allowed to transfer up to 500 pounds of combined small mesh multispecies at sea per trip provided that it obtains a letter of authorization from the Regional Administrator to do so. The transferring vessel will be required to possess either a limited access small mesh multispecies permit or a limited access small mesh multispecies possession limit permit, and the receiving vessel will be required to possess a written receipt for any small mesh multispecies purchased at sea. 500 pounds will be deducted from a transferring vessel's whiting/offshore hake possession limit on every trip regardless of whether or not the transfer at sea occurs. This deduction will be noted on a transferring vessel's letter of authorization from the Regional Administrator.

This transfer provision is not intended to impact joint venture processing (JVP) or domestic processing operations occurring in other fisheries throughout the region.

4.12 ADDITIONAL FRAMEWORK ADJUSTMENT LANGUAGE

This amendment is an amendment to the Northeast Multispecies (Groundfish) FMP. Management measures that may be implemented through a framework adjustment (as specified in the Multispecies FMP) are therefore applicable to the management of small mesh multispecies. In addition, the Council proposes that the following items be added to the list of measures that can be implemented through a Framework Adjustment to the Multispecies FMP:

- a whiting quota (and appropriate seasonal adjustments) for vessels fishing in the northern management area with mesh smaller than the minimum mesh in combination with a separator trawl/grate (the grate fishery, if applicable in the future); in this context, "quota" is a total allowable landings limit for vessels participating in this fishery that results in a prohibition or restriction on additional landings when exceeded;
- modifications or adjustments to whiting grate/mesh configuration requirements (ex. required bar spacing or mesh configuration),
- adjustments to whiting stock boundaries for management purposes,
- modifications to requirements for fisheries exempt from the minimum mesh requirements for small mesh multispecies (if applicable), and
- season adjustments, declarations, and participation requirements for the Cultivator Shoal Whiting Fishery.

In addition, the following management measures may be implemented through a framework adjustment to the Multispecies FMP provided that they are accompanied by a full set of public hearings (similar to those conducted for an amendment):

- a Whiting Days at Sea (DAS) effort reduction program and
- a whiting Total Allowable Catch (TAC), either by region or for the entire fishery.

Discussion: The addition of these measures as items that may be implemented through a framework adjustment to the Multispecies FMP is intended to provide the Council with the flexibility it needs to manage this complex system on a real-time basis. The framework adjustment process enables the Council to develop and analyze appropriate management actions over the span of at least two Council meetings (vs. about a year with an amendment). The Council provides the public with advanced notice of the availability of both the management proposals and the analysis as well as an opportunity to comment on them prior to and during the second Council meeting. However, the Council has determined that some measures are more controversial than others and would require more public input (Whiting DAS and Whiting TACs); therefore, the Council concluded that implementation of these particular measures through a framework adjustment should be accompanied by a full set of public hearings. This process would still be much shorter than that to implement a full plan amendment. Annual adjustments implemented through frameworks often result in more timely management of the fishery as a whole.

4.13 IDENTIFICATION OF ESSENTIAL FISH HABITAT FOR OFFSHORE HAKE

4.13.1 Introduction

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act, known as the Sustainable Fisheries Act (SFA), emphasized the importance of habitat protection to healthy fisheries and strengthened the ability of the National Marine Fisheries Service (NMFS) and the Councils to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. This habitat is termed "essential fish habitat" (EFH) and is broadly defined to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity."

The essential fish habitat (EFH) provisions of the Sustainable Fisheries Act of 1996 require the Council to:

(1) describe and identify the essential habitat for the species managed by the Council;
(2) minimize to the extent practicable adverse effects on EFH caused by fishing; and,
(3) identify other actions to encourage the conservation and enhancement of EFH.

The regulatory text of the Interim Final Rule (*Federal Register* Vol. 62 No. 244, December 19, 1997) directs the Council to describe EFH in text and with tables that provide information on the biological requirements for each life history stage of the species. The regulatory text of the Interim Final Rule also directs the Council to present the general distribution and geographic limits of EFH for each life history stage in the form of maps. These maps are presented as fixed in space and time, but they encompass all appropriate known temporal and spatial variability in the distribution of EFH. The EFH maps are a means to visually present the EFH described in the amendment.

There are two distinct but related components of the process to comply with the guidelines of the Interim Final Rule: (1) developing the text description of essential fish habitat; and, (2) identifying the geographic extent of essential fish habitat. Together, they provide a picture of the EFH for Council-managed species.

The Council has identified the essential fish habitat for the species it manages. In October 1998, EFH provisions were submitted for all existing Council plans in one document that amended these Council management plans.

4.13.2 EFH for Silver Hake and Red Hake

The essential fish habitat for whiting and red hake is described and identified in the Essential Fish Habitat Amendment to the Council's fishery management plans (Amendment 11 to the Northeast Multispecies FMP), submitted to the Secretary on October 7, 1998. The EFH amendment addresses all elements required by the EFH provisions of the Sustainable Fisheries Act. This includes the description and identification of whiting and red hake EFH, the threats to EFH from fishing and non-fishing activities, and the conservation and enhancement measures to protect EFH for whiting and red hake.

4.13.3 EFH for Offshore Hake

This amendment to the Northeast Multispecies FMP includes the essential fish habitat description and identification for offshore hake, *Merluccius albidus*. All other elements required by the EFH provisions of the Sustainable Fisheries Act are addressed in the EFH amendment (Amendment 11 to the Northeast Multispecies FMP). The applicable provisions of that document that relate to offshore hake are incorporated into this FMP amendment by reference. This includes the threats to EFH from fishing and non-fishing activities and the conservation and enhancement measures to protect EFH for offshore hake.

All available information on environmental and habitat variables that control or limit distribution, abundance, reproduction, growth, survival, and productivity of offshore hake are summarized in text and in tables in **Appendix II,** *EFH Source Document for Offshore Hake, Merluccius albidus*. Because these fish are limited to deep water, relatively few offshore hake have been sampled by either the NMFS bottom trawl survey or the NMFS MARMAP ichthyoplankton survey. The modern scientific literature is fairly limited and historic information is nonexistent as this species was not differentiated from whiting prior to about 1955. Commercial landings data only differentiate offshore hake since 1991. The Council considered the small population of offshore hake occurring in U.S. waters, the lack of a directed U.S. fishery for this species, and other relevant information in developing its designation.

This section includes a one-page text description of the essential fish habitat for each life history stage of offshore hake and a series of maps representing the Council's EFH designations for each life history stage. The EFH maps reflect all information included in the Council's designations, including the historic range of the species and areas identified by the fishing industry. The captions accompanying maps for the EFH designations describe the information reflected in those designations and provide the Council's rationale for selecting the preferred alternatives. The sets of maps representing the alternative designations from which the Council chose are provided in Section E.5.2.2.3. The sets of maps for the other alternatives include only the "raw" distributions as reflected in the NMFS bottom trawl and MARMAP surveys. The process used by the Council to develop the set of alternatives is explained in detail in the omnibus EFH amendment.

Essential Fish Habitat Description
Offshore hake (*Merluccius albidus*)

In its *Report to Congress: Status of the Fisheries of the United States* (September 1997), NMFS did not consider the status of offshore hake; however, this species is not thought to be overfished. Essential Fish Habitat for offshore hake is described as those areas of the offshore waters (out to the offshore U.S. boundary of the exclusive economic zone) that are designated in **Figure 12 - Figure 15** and meet the following conditions:

> **Eggs:** Pelagic waters along the outer continental shelf of Georges Bank and southern New England south to Cape Hatteras, North Carolina as depicted in **Figure 12**. Generally, the following conditions exist where offshore hake eggs are found: water temperatures less than 20°C and water depths less than 1250 meters. Offshore hake eggs are observed all year and are primarily collected at depths from 110 - 270 meters.
>
> **Larvae:** Pelagic waters along the outer continental shelf of Georges Bank and southern New England south to Chesapeake Bay as depicted in **Figure 13**. Generally, the following conditions exist where offshore hake larvae are found: water temperatures less than 19°C and water depths less than 1250 meters. Offshore hake larvae are observed all year and are primarily collected at depths from 70 - 130 meters.
>
> **Juveniles:** Bottom habitats along the outer continental shelf of Georges Bank and southern New England south to Cape Hatteras, North Carolina as depicted in **Figure 14**. Generally, the following conditions exist where offshore hake juveniles are found: water temperatures below 12°C and depths from 170 - 350 meters.
>
> **Adults:** Bottom habitats along the outer continental shelf of Georges Bank and southern New England south to Cape Hatteras, North Carolina as depicted in **Figure 15**. Generally, the following conditions exist where offshore hake adults are found in highest abundance: water temperatures below 12° C and depths from 150 - 380 meters.
>
> **Spawning Adults:** Bottom habitats along the outer continental shelf of Georges Bank and southern New England south to the Middle Atlantic Bight as depicted in **Figure 15**. Generally, the following conditions exist where spawning offshore hake adults are found: water temperatures below 12° C and depths from 330 - 550 meters. Offshore hake are most often observed spawning throughout the year.

The Council acknowledges potential seasonal and spatial variability of the conditions generally associated with this species. The Council also acknowledges that there may be areas not surveyed by the NMFS bottom trawl survey (areas deeper than 200 meters) that are also essential fish habitat for offshore hake.

Figure 12 EFH Designation for Offshore Hake Eggs

The EFH designation for offshore hake eggs is based upon alternative 2 for offshore hake eggs. This alternative was selected to be representative of the areas most likely to support offshore hake eggs in relatively high concentrations. The light shading represents the entire observed range of offshore hake eggs.

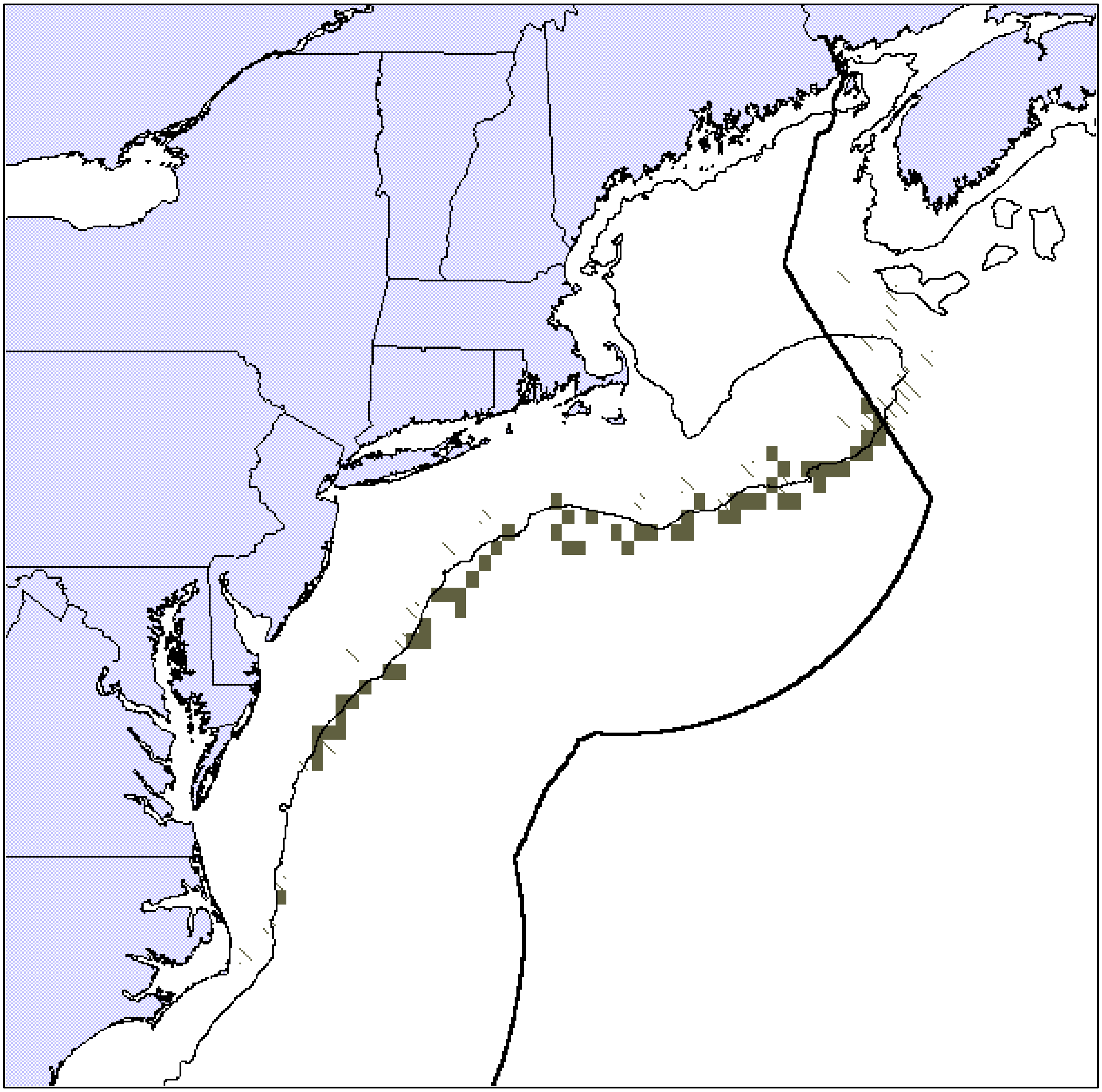


Figure 13 EFH Designation for Offshore Hake Larvae

The EFH designation for offshore hake larvae is based upon alternative 2 for offshore hake larvae. This alternative was selected to be representative of the areas most likely to support offshore hake larvae in relatively high concentrations. The light shading represents the entire observed range of offshore hake larvae.

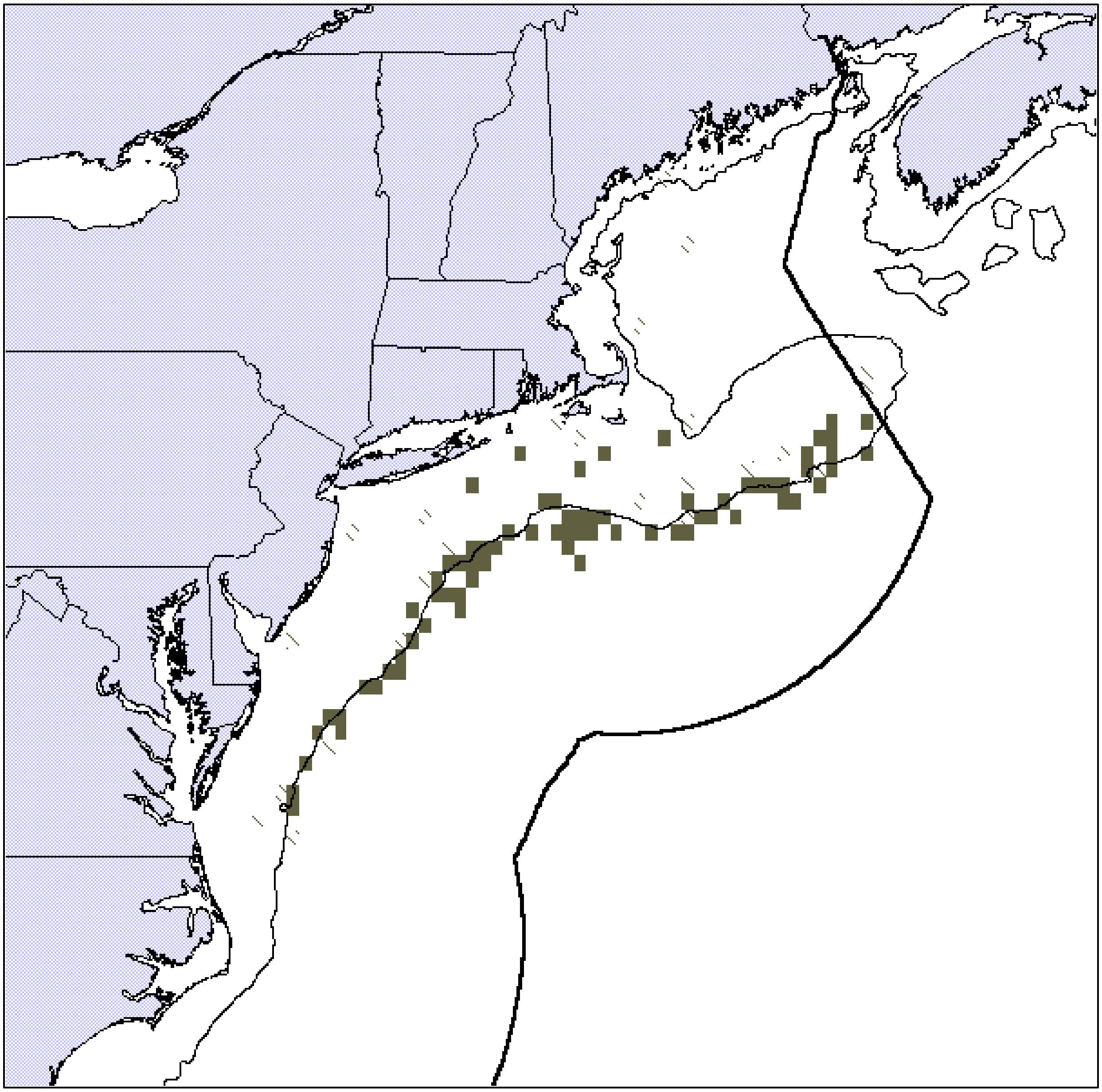


Figure 14 EFH Designation for Offshore Hake Juveniles

The EFH designation for juvenile offshore hake is based upon alternative 2 for juvenile offshore hake. This alternative was selected to be representative of the areas most likely to support juvenile offshore hake in relatively high concentrations. The light shading represents the entire observed range of juvenile offshore hake.

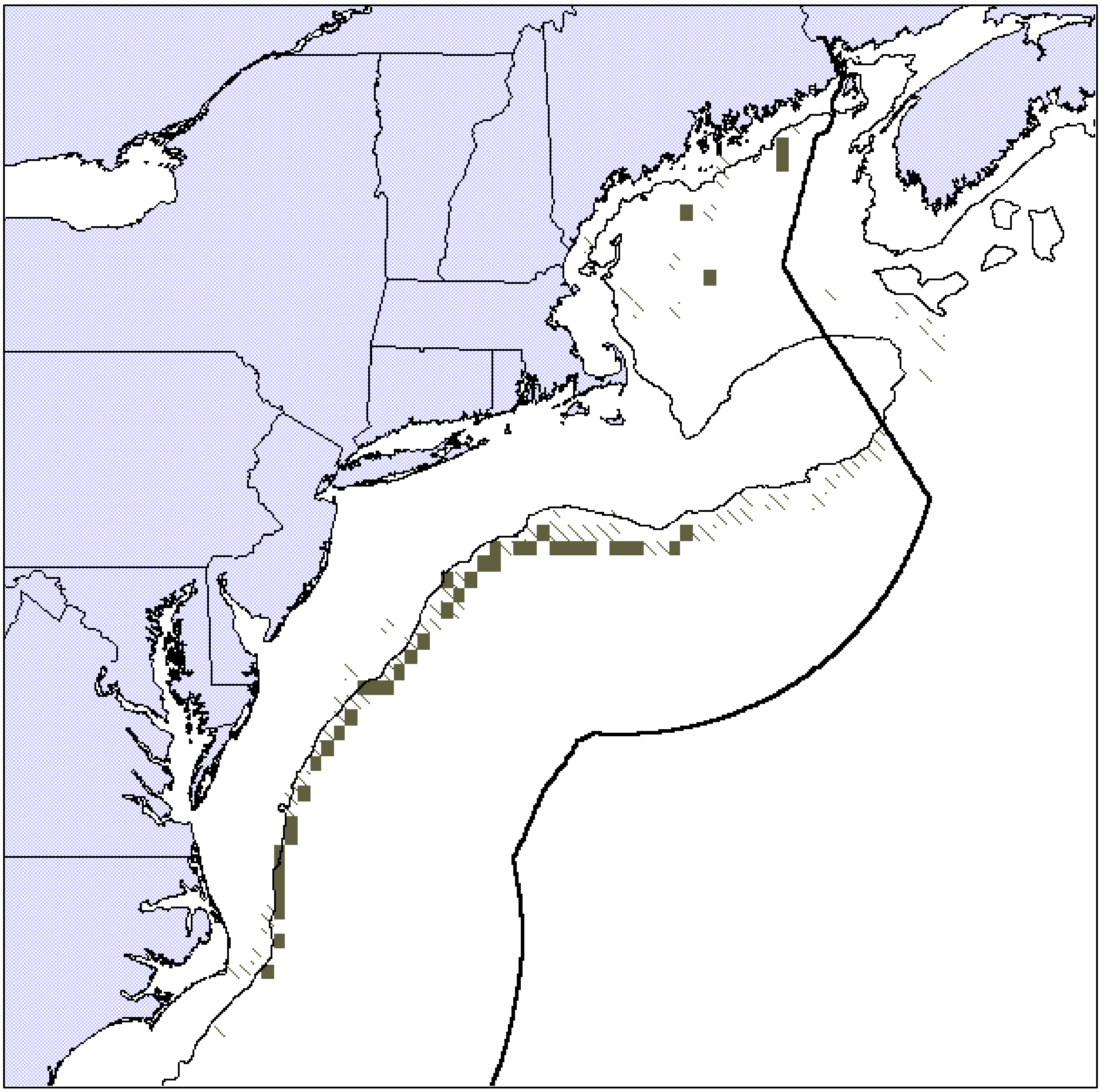
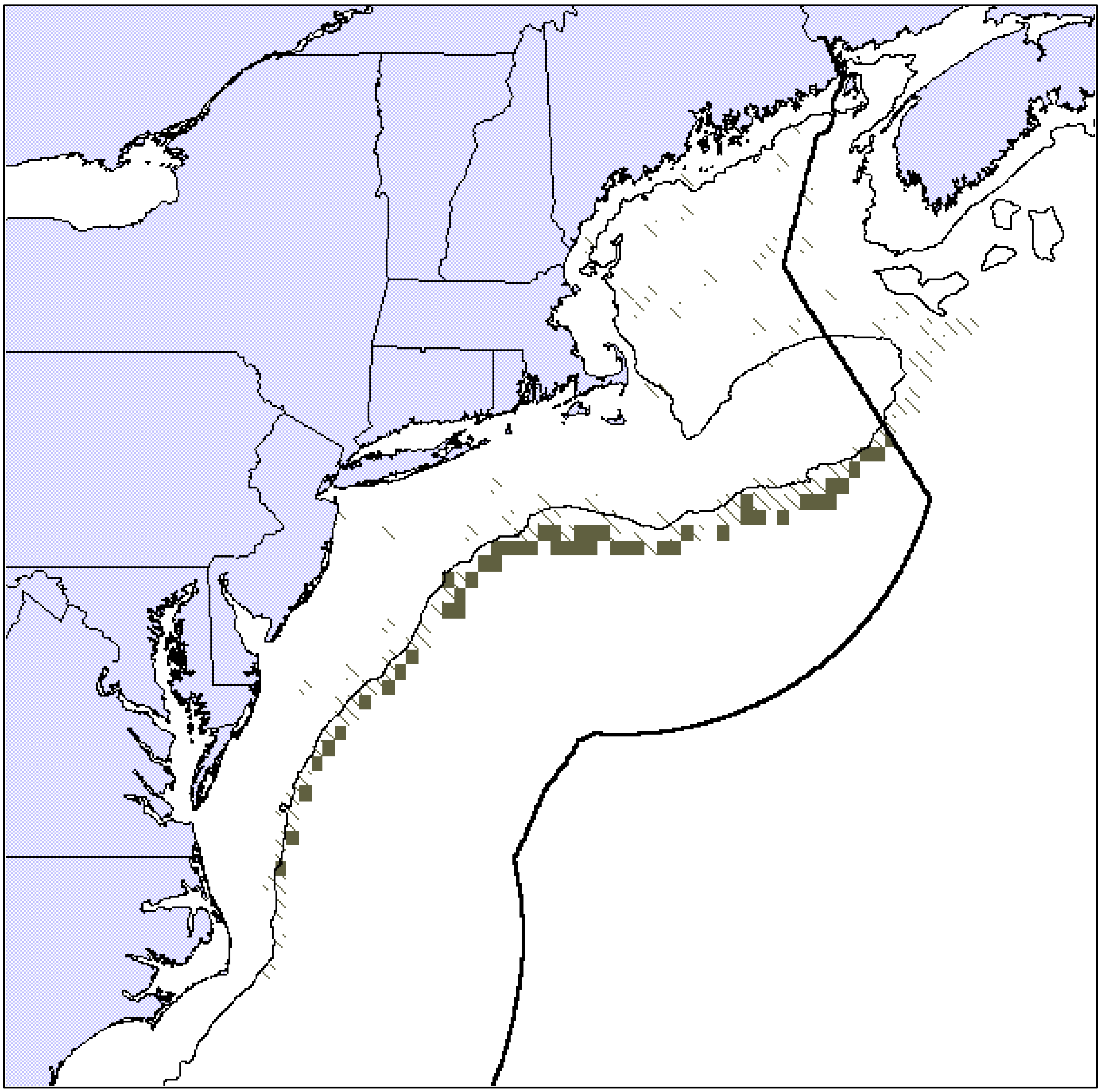


Figure 15 EFH Designation for Offshore Hake Adults

The EFH designation for adult offshore hake is based upon alternative 2 for adult offshore hake. This alternative was selected to be representative of the areas most likely to support adult offshore hake in relatively high concentrations. The light shading represents the entire observed range of adult offshore hake.



4.14 PLAN MONITORING AND ANNUAL ADJUSTMENTS

A separate Whiting Monitoring Committee (WMC) will be established to monitor the progress of this plan on an annual basis. The role, structure, and process for the WMC will be identical to the Multispecies Monitoring Committee (MMC). The only difference is that the WMC will contain at least three industry representatives: at least one from New England, one from southern New England, and one from the Mid-Atlantic region.

4.14.1 WMC Objectives

The WMC will develop options for Council consideration on any changes, adjustments, additions, or other measures necessary to achieve the goals of this amendment. Target fishing mortality rates have been specified for both stocks of silver hake, intended to be achieved within the first four years of the management plan. If the Year 1 – 3 management measures do not reduce fishing mortality to target levels, the default measure, implemented at the beginning of Year 4, ensures that the plan will meet the specified targets within the intended time frame. The WMC will monitor whiting exploitation and fishing mortality during Years 1 – 3, primarily to ensure that fishing mortality does not at any time increase. In addition, the WMC may recommend annual adjustments in hopes of reducing fishing mortality rates to target levels during Years 1 – 3, before the implementation of the default measure becomes necessary.

The WMC will review available data pertaining to catch and landings, discards, trawl survey results, stock assessments, updated estimates of fishing mortality, and any other relevant information.

4.14.2 WMC Process

A. The WMC will annually provide the Council with a report/review, based on new information received since the last review, as to whether the FMP amendment is meeting its objectives pertaining to small mesh multispecies. If the amendment is not meeting its objectives pertaining to small mesh multispecies, the report would include management options that enable it to meet its objectives. Because of issues related to the timing of plan implementation, the WMC will not meet during Year 1. Rather, the WMC will meet for the first time during October/November, 2000 to conduct a comprehensive Year 1/ Year 2 review and make recommendations for annual adjustments to be implemented at the beginning of Year 3 (May 1, 2001).

B. The range of options developed by the WMC may include any of the management measures in the Multispecies FMP applicable to small mesh multispecies. The range of options developed by the WMC during the Year 3 review will include an option for the default measure to be implemented at the beginning of Year 4 (if necessary).

C. After receiving the report, the Council will submit to the NMFS Regional Administrator a framework adjustment or amendment which should enable the FMP amendment to meet its objectives pertaining to small mesh multispecies.

D. If the Council fails to submit a recommendation to the Regional Administrator by February 1, then the Regional Administrator may publish as a proposed rule one of the options reviewed and not rejected by the Council, provided that the option meets the amendment objectives and is consistent with other applicable laws.

4.14.3 Discussion

Progress towards achieving the conservation objectives of this amendment will be monitored using Northeast Fisheries Science Center (NEFSC) survey indices. Individual survey points, however, may be highly variable, and will require interpretation relative to the general survey trends during the years following the implementation of this amendment. A Monitoring Committee will be useful in interpreting the individual survey points and relating the results to the objectives of this management plan pertaining to small mesh multispecies.

In addition, current scientific information about whiting, offshore hake, and red hake is incomplete and outdated. In order to more accurately assess the true condition of the resources, a benchmark stock assessment for all three species, among other things, is critical. The Council is uncomfortable with implementing a management plan to reduce whiting exploitation by 63% based on the available information for these species. Since both the southern stock of whiting and red hake are currently considered overfished, the Council is implementing a suite of management measures to end overfishing and begin stock rebuilding. The management measures for Years 1, 2, and 3 are intended to reduce exploitation by at least 50% of the required amount, and additional reductions should result from annual adjustments to these measures. The Council anticipates that updating the information database for these species will be extremely important during the first three years of the management plan. The Council expects that the WMC can meet annually to review updated information and recommend adjustments to the management plan so that the Year 4 default measure (Section 4.15) never becomes necessary for either stock.

4.15 DEFAULT MEASURE

The default measure (to be applied on a stock specific basis and implemented at the beginning of Year 4) if the plan is not meeting its objectives, as determined in the third year review by the Whiting Monitoring Committee, is as follows:

The default measure establishes a Regulated Mesh Area with a 3-inch minimum mesh requirement for all fishing activities. Vessels participating in any fishery in the Regulated Mesh Area may not use less than the minimum 3-inch mesh unless they are fishing in an approved, exempted small mesh fishery. An example of an exempted small mesh fishery may be a loligo squid or herring fishery occurring in a particular area during a specified time of year. “Exempted fisheries” are defined through individuals or groups proposing the exemption by gear, time, area, and species.

The National Marine Fisheries Service will approve small mesh fisheries that may be exempt from the 3-inch minimum mesh requirement based on a determination that the rate of small mesh multispecies catch (combined whiting, offshore hake, and red hake) in these fisheries is less than 10% of the total catch. NMFS is expected to utilize the same process and criteria it currently uses to specify groundfish exempted fisheries, with the only exception being the allowable level of anticipated small mesh multispecies incidental catch for an exempted fishery (10% instead of 5%). However, exempted small mesh fisheries will still be required to meet the small mesh exemption criteria for regulated species bycatch (less than 5%). The northern shrimp fishery in the Gulf of Maine will be defined as an exempted small mesh fishery if the default measures are implemented in the northern area.

Qualified vessels (those possessing a limited access small mesh multispecies permit) that use a minimum 3-inch mesh while fishing in the Regulated Mesh Area will be allowed to possess/land combined whiting and offshore hake up to 10,000 pounds. Vessels possessing a limited access small mesh multispecies possession limit permit, vessels participating in exempted small mesh fisheries, and vessels possessing an open access multispecies permit will be allowed to possess/land combined small mesh multispecies up to 100 pounds.

The default measure will remain in place until the targets (F and B) for the whiting stock in question are achieved.

4.15.1 Discussion

Whiting PDT analysis indicates that it may be very difficult to meet the conservation objectives of this amendment without decreasing the amount of whiting caught (and discarded) with small mesh (less than 2.5-inches), particularly on vessels targeting squid and other small mesh species in New England and Mid-Atlantic waters. This default measure guarantees that whiting, offshore hake, and red hake incidental catch in all fisheries will be reduced to less than 10% of a vessel's total catch. Vessels will be prohibited from fishing with smaller mesh unless fishing in a certified exempted fishery. This measure could severely restrict small mesh/mixed trawl fishing in southern New England and Mid-Atlantic waters. There may be very few times and areas where fisheries can meet the exempted fishery criteria. This is one reason why the Council is confident that the default measure will achieve the objectives of the management plan.

In addition, fishing under a combined whiting and offshore hake possession limit of 10,000 pounds will be economically infeasible for a majority of "directed" whiting vessels, particularly larger-sized vessels. Whiting is a species often caught in high volume fisheries, and historically, vessels commonly landed over 100,000 pounds of whiting per trip. 10,000 pounds of whiting can not sustain a directed fishery. This measure almost completely eliminates participation in both the Cultivator Shoal Whiting Fishery and offshore whiting fisheries along southern Georges Bank. A vessel may not be able to cover the expense of a trip if it can only retain up to 10,000 pounds of whiting and offshore hake. Although the default measure has been analyzed to reduce whiting exploitation by over 50% within a year, the Council predicts that it will produce even more conservation benefits, which cannot be quantified through a trip limit/spreadsheet analysis. Many of these benefits will result from a substantial decrease of discarded (and often not accounted for) whiting in small mesh, mixed trawl fisheries. Other benefits will result from the choice to no longer make trips to fish for small mesh multispecies during a time when a vessel may have historically fished for these species (the spreadsheet analysis is based on observed trips where whiting and offshore hake were caught between 1995 and 1997).

The Council chose this measure as the default measure because this is the alternative that was preferred during public hearings as a measure to reduce whiting exploitation to target levels in the southern management area. Based on comments received during public hearings as well as current information about stock status, the Council determined that it may be more appropriate to provide the industry with the opportunity to modify their strategies for small mesh fishing before implementing a measure that could have severe economic consequences for many fisheries. The Council agreed that this default measure will be a logical choice to achieve the plan objectives (if it becomes necessary). As more information becomes available, the Council may reconsider this default measure and modify it (as appropriate) to assure that target fishing mortality levels will be achieved and that the whiting stock in question will rebuild to sustainable levels.

5.0 CONSISTENCY WITH THE MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

5.1 NATIONAL STANDARDS

Section 301 of the Magnuson-Stevens Fishery Conservation and Management Act (FCMA) requires that FMPs contain conservation and management measures that are consistent with the ten National Standards. The following section summarizes, in the context of the National Standards, the analyses and discussion of the proposed action that appear in various sections of this amendment document.

(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

New definitions of overfishing and a description of optimum yield are contained in Sections 4.2 and 4.3 respectively.

Optimum yield is defined as the yield produced by the target fishing mortality rate when the stock is at target level. Target fishing mortality rates for both stocks of silver hake are based on the current overfishing definitions and are below current estimates of $F_{0.1}$. New overfishing definitions are based on a maximum fishing mortality and a minimum biomass threshold. Where it is not possible to estimate MSY, the Council adopted a proxy for MSY. Where it is not possible to estimate a proxy for MSY, the Council adopted reference points based on survey weight and abundance as well as risk averse rates of change that safely characterize fishing pressure. As information becomes available to estimate MSY or MSY proxies, the Council will reconsider the overfishing definition reference points and the specification of OY in the context of the national standard guidelines published on May 1, 1998.

The rebuilding projections for whiting under the proposed management action (Section E.7.2.1.3) project substantial increases in SSB within a ten-year time frame. However, it is currently unknown whether the projected significant increase in SSB resulting from the proposed management action implies that the stocks will achieve rebuilding to MSY levels. There are a few reasons for this. First, stock sizes (used to initialize the projections) are unknown due to the lack of a currently accepted analytical assessment (VPA). This is why the projection results are expressed in values of SSB, yield, revenues, etc., corresponding to percent change in median quantities from the initial projection year. Second, biological reference points for SSB levels consistent with MSY have not yet been determined for either whiting stock. See **Appendix I**, *Evaluation of Existing Overfishing Definitions and Recommendations for New Overfishing Definitions to Comply with the Sustainable Fisheries Act (relevant portions only)* for further discussion.

(2) Conservation and management measures shall be based upon the best scientific information available.

Section E.6.2 of this amendment document describes the data the Council used to describe small mesh multispecies fisheries and to evaluate the potential impacts of management measures on these fisheries. In addition, the Council considered information and analyses provided by scientific and technical groups including the Overfishing Definition Review Panel and the Whiting Plan Development Team. It considered information provided by the Whiting Advisory Panel and other fishing industry representatives, particularly where systematically collected data are unavailable or incomplete. For example, the majority of the information contained in Sections E.6.5.6 and E.6.5.7 (the recreational fishery and the marketing sector) was collected through interviews with industry representatives throughout the region.

It is important to recognize the lack of updated information about whiting and red hake stock status as well as other data and research needs critical to meeting the objectives specified in this management plan. The data considerations specific to this amendment are discussed in Section E.6.2.5.

(3) To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

To avoid whiting stock uncertainty issues, and because the target reductions in exploitation are approximately equal across both identified whiting stock areas, the Council chose to apply the same management measures to the range of the species (see Section 4.8). The Cultivator Shoal Whiting Fishery has been managed separately since it was identified as an exempted fishery in 1991. To the extent possible, the Whiting Monitoring Committee will assess the status of all components of small mesh multispecies stocks to ensure that individual stocks do not become overfished.

(4) Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

The management measures proposed in this amendment do not discriminate between residents of different states. Specifically, the proposed moratorium qualification criteria are not based on state residency, and the measures themselves do not change the way fishing privileges are allocated among small mesh multispecies fishermen. However, fishermen in different areas may be affected by the management measures more than others, depending on their level of economic dependence on small mesh multispecies. Vessels in New York and Rhode Island, for example, are likely to be more affected by the proposed management action because they have historically landed the largest proportion of small mesh multispecies.

(5) Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

This amendment promotes overall efficiency in the fishery by reducing fishing mortality to long term sustainable levels. As whiting stocks rebuild, landings and fishery yields are projected to increase, especially for the currently overfished southern stock. Lower fishing mortality rates an increased age-at-entry to the fishery (resulting from increased mesh sizes) are expected to rebuild the populations' age structures and promote the landing of larger, more valuable whiting (see Sections E.7.2.1.3 and E.7.3.1.2). The Council considered efficiency in the utilization of fishery resources when developing the proposed management action, and none of the proposed measures have economic allocation as its sole purpose.

(6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

The Council accounted for variations in fisheries, fishery resources, and catches by developing three mesh size/possession limit categories for vessels to choose from (Section 4.8). Vessels may choose which mesh they would like to use to fish and retain small mesh multispecies, and they may change their chosen category after a minimum of seven days. This approach maximizes opportunities in the fishery and flexibility for the fleet while reducing fishing mortality and whiting exploitation. Changes in fisheries occur continuously, both as the result of human activity (for example, new technologies or shifting market demand) and natural variation (for example, oceanographic perturbations). With this amendment, the Council is establishing a process to annual review and adjust the management measures according to such variations (Section 4.14).

(7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

The Council considered the costs and benefits of a range of alternatives to achieve the conservation goals of this plan. It considered the potential costs of management action to the industry relative to the costs associated with maintaining the status quo. Short term costs associated with the management action should be compensated by long term gains in yield and revenues, particularly in the southern stock (Section E.7.3.1.2). The Council also considered administrative and enforcement costs associated with the management alternatives and chose the least complex option that achieves the objectives of the management plan with minimal costs to administration or enforcement.

(8) Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

The Council considered the importance of fishery resources to affected communities and provided those communities with continuing access to small mesh multispecies fishery resources to the extent possible, but not at the expense of compromising the conservation objectives of management measures. The proposed moratorium qualifies vessels from all fishing communities that have demonstrated participation in small mesh multispecies fisheries (Section E.7.4.2.1.1). The Council recognizes that the proposed action may have an impact on fishing communities, especially those with a demonstrated dependence on small mesh multispecies.

The small mesh multispecies fishing industry was actively involved in this amendment development process. In fact, after reviewing the alternatives contained in the public hearing document, the Whiting Advisory Panel met and developed another management alternative based on a combination of the proposed alternatives. The Council adopted the Advisory Panel proposal with the addition of a default measure to ensure that the plan would meet its objectives. The proposal for Years 1 – 3 minimize adverse effects on fishing communities. While the impacts of the default measure, if implemented, are likely to be more severe, they are short-term relative to the implications of maintaining the status quo and allowing fishing mortality to remain high on both stocks of whiting.

The Council has developed an ongoing process of monitoring and adjusting management measures in which members of affected communities actively participate. Public comments, in conjunction with socio-economic analyses, help the Council to identify and select measures which minimize the adverse impacts on affected communities to the extent practicable. Three industry representatives will be members of the Whiting Monitoring Committee, one from each affected region.

(9) Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

This amendment minimizes bycatch in small mesh multispecies fisheries by providing vessels with an incentive to use larger mesh and rewarding them with a larger whiting/offshore hake possession limit. As the mesh size used to target whiting increases, the incidental catch of other small mesh species decreases (although this varies spatially and seasonally). Vessels intending to target whiting will likely choose a larger mesh size in order to make the trip profitable. In addition, this amendment minimizes the discard of small mesh multispecies bycatch caught in non-directed small mesh fisheries (squid, for example) by allowing vessels to retain some amount of whiting they may catch incidentally.

(10) Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

This amendment proposes no management measures that may cause fishermen to compromise their safety in order to fish. For the most part, the management measures proposed for Years 1 – 3 maximize the flexibility of fishermen to choose where and how they want to fish. To the extent possible, this amendment minimizes the danger of human life at sea while achieving the mortality objectives of the plan.

Updated safety information about fisheries in the New England and Mid-Atlantic regions is provided in Section E.6.5.9.

5.2 OTHER REQUIRED PROVISIONS OF THE FCMA

Section 303 of the FCMA contains 14 additional required provisions for FMPs, which are discussed below. Any FMP prepared by any Council, or by the Secretary, with respect to any fishery, shall:

(1) contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States, which are-- (A) necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery; (B) described in this subsection or subsection (b), or both; and (C) consistent with the National Standards, the other provisions of this Act, regulations implementing recommendations by international organizations in which the United States participates (including but not limited to closed areas, quotas, and size limits), and any other applicable law;

Section 4.0 of this document contains a description of the proposed management measures intended to end overfishing and rebuild stocks of whiting and red hake. Section 5.1 contains a discussion of this amendment's consistency with the national standards.

(2) contain a description of the fishery, including, but not limited to, the number of vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location, the cost likely to be incurred in management, actual and potential revenues from the fishery, any recreational interest in the fishery, and the nature and extent of foreign fishing and Indian treaty fishing rights, if any;

This combined document contains a comprehensive description of the fishery, including, but not limited to, a brief history of the fishery, historical and recent landings and revenue information, fishing vessel information, descriptions of the marketing and processing sectors, description of the recreational fishery, and projections of the costs likely to be incurred in management. Much of this information is contained in Sections E.6.4 and E.6.5. The impacts of the proposed management are presented in Section E.7.0.

(3) assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specification;

New definitions of overfishing and a description of optimum yield are contained in Sections 4.2 and 4.3 respectively.

New overfishing definitions are based on maximum fishing mortality and minimum biomass thresholds. Where it is not possible to estimate MSY, the Council adopted a proxy for MSY. Where it is not possible to estimate a proxy for MSY, the Council adopted reference points based on survey weight and abundance as well as risk averse rates of change that safely characterize fishing pressure. As information becomes available to estimate MSY or MSY proxies, the Council will reconsider the overfishing definition reference points and the specification of OY in the context of the national standard guidelines published on May 1, 1998. A description of the data considerations specific to this amendment is provided in Section E.6.2.5.

(4) assess and specify-- (A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield specified under paragraph (3); (B) the portion of such optimum yield which, on an annual basis, will not be harvested by fishing vessels of the United States and can be made available for foreign fishing; and (C) the capacity and extent to which United States fish processors, on an annual basis, will process that portion of such optimum yield that will be harvested by fishing vessels of the United States;

Optimum yield is specified in Section 4.3. For further information, see above discussion.

(5) specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter fishing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors;

See Section E.6.2 for a discussion of the amendment's data considerations and the Council's participation in stock assessments and the Atlantic Coastal Cooperative Statistics Program (ACCSP).

(6) consider and provide for temporary adjustments, after consultation with the Coast Guard and persons utilizing the fishery, regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safe conduct of the fishery; except that the adjustment shall not adversely affect conservation efforts in other fisheries or discriminate among participants in the affected fishery;

The framework adjustment process allows for temporary and/or real-time adjustments to management measures to address these issues as they arise. Section 4.12 proposes additional items that may be implemented through a framework adjustment to the Multispecies FMP.

(7) describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat;

Amendment 10 to the Northeast Multispecies FMP addresses the essential fish habitat requirements for silver hake and red hake. This amendment document describes and identifies EFH for offshore hake in Section 4.13.

(8) in the case of a fishery management plan that, after January 1, 1991, is submitted to the Secretary for review under section 304(a) (including any plan for which an amendment is submitted to the Secretary for such review) or is prepared by the Secretary, assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan;

Obtaining updated stock assessment information for all three small mesh multispecies is critical to achieving the objectives of this management plan. The data considerations specific to this amendment are identified in Section E.6.2.5.

The Council is working closely with the National Marine Fisheries Service to coordinate the reporting of scientific information in a timely manner so that it coincides with the annual plan review and adjustment process. Since small mesh multispecies are part of the multispecies complex, annual plan review and adjustments will occur along the same timeline as other multispecies stocks.

The Council also provides input to the development of the ACCSP (Section E.6.2.4) and other scientific assessment work described in Section E.6.2.

(9) include a fishery impact statement for the plan or amendment (in the case of a plan or amendment thereto submitted to or prepared by the Secretary after October 1, 1990) which shall assess, specify, and describe the likely effects, if any, of the conservation and management measures on-- (A) participants in the fisheries and fishing communities affected by the plan or amendment; and (B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants;

The analyses contained in the FSEIS assess the potential biological impacts of the management measures as well as the potential economic and social impacts on the human environment. This includes the impacts on current fishery participants, impacts participants in other fisheries, impacts on small commercial fishing entities, impacts on seafood dealers, and impacts on important small mesh multispecies ports. The fishery impact statement is included in Section E.7.0 of this combined amendment document.

The Council developed the measures proposed in this amendment in consultation with the Mid-Atlantic Fishery Management Council (MAFMC). One member of the MAFMC is a member of the Whiting Committee. In addition, scoping meetings were held in New Jersey and New York (as well as other New England ports). Public hearings were held in Tom's River, New Jersey, Riverhead, New York, and Newport News, Virginia (as well as other New England ports).

(10) *specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery;*

Section 4.2 proposes new overfishing definitions for two stocks of silver hake, two stocks of red hake, and offshore hake. Where possible, the reference points in the proposed overfishing definitions are based on maximum fishing mortality and minimum biomass criteria. If these reference points could not be estimated, the Council developed risk averse overfishing definitions based on rates of change in survey levels that may be indicative of overfishing. For further discussion, see Section 4.2 and **Appendix I**, *Evaluation of Existing Overfishing Definitions and Recommendations for New Overfishing Definitions to Comply with the Sustainable Fisheries Act (relevant portions only).*

The management measures proposed in this amendment are intended to end overfishing on the southern stock of silver hake as well as on red hake and to rebuild the biomass of these stocks to sustainable levels within a ten-year time frame. Analyses indicating that the management measures are projected to achieve the reductions required to end overfishing are contained in Section E.7.2.2.

(11) *establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority-- (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided;*

Vessels that qualify for a limited access small mesh multispecies permit will be required to submit Vessel Trip Reports (logbooks) as they have since 1994. NMFS uses VTR information in conducting stock assessments. In addition, the Council and the National Marine Fisheries Service are both participating in the ACCSP (Section E.6.2.4), which is a long term effort to improve the collection and utility of fisheries data, including bycatch information.

This management plan contains measures intended to reduce bycatch in small mesh multispecies fisheries and to minimize the mortality of unavoidable bycatch, discussed in the context of National Standard 9, Section 5.1.

(12) *assess the type and amount of fish caught and released alive during recreational fishing under catch and release fishery management programs and the mortality of such fish, and include conservation and management measures that, to the extent practicable, minimize mortality and ensure the extended survival of such fish;*

This amendment proposes no recreational fishery management measures. Information suggests that participation in recreational whiting and red hake fisheries has decreased to very small levels. The Council intends to promote the re-emergence of recreational whiting and ling fisheries, particularly in the southern New England and Mid-Atlantic areas, by implementing a management program to end overfishing and rebuild the stocks. If it becomes necessary in the future, the Council may implement management measures for the recreational fishery and a catch and release program to assess the type and amount of fish caught and released alive during recreational fishing.

(13) include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors;

This amendment document contains an extensive description of the commercial and recreational fishing sectors and quantifies the trends in landings by these sectors of the fishery. The history of small mesh multispecies fisheries is described in Section E.6.5.1. Commercial landings information by state and by port is provided in Section E.6.5.2. Information specific to small mesh multispecies fisheries throughout New England and the Mid-Atlantic is provided in Section E.6.5.3. The sociocultural characteristics of the fishery as well as port-specific fishery information is provided in Section E.6.5.5. The recreational whiting and red hake fisheries are described in Section E.6.5.6.

(14) to the extent that rebuilding plans or other conservation and management measures which reduce the overall harvest in a fishery are necessary, allocate any harvest restrictions or recovery benefits fairly and equitably among the commercial, recreational, and charter fishing sectors in the fishery.

The Council has adopted management measures that apply equally to all sectors of the commercial fishery. If it becomes necessary in the future, the Council may develop management measures to address the recreational sector of the fishery.

6.0 RELATIONSHIP TO OTHER APPLICABLE LAW

6.1 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

E.1.0 FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (FSEIS)

E.2.0 TABLE OF CONTENTS

A Table of Contents for the FSEIS can be found at the beginning of this integrated document. Section heading numbers for those sections contained in the FSEIS are preceded with the letter "E" for identification purposes.

E.3.0 INTRODUCTION AND BACKGROUND

The background of this amendment is discussed in Section 3.0 of this combined document.

E.3.1 LIST OF AGENCIES CONSULTED

In developing the proposed measures and in reviewing the analysis of impacts contained in this FSEIS, the Council consulted with NMFS, the Mid-Atlantic Fishery Management Council, the Atlantic States Marine Fisheries Commission, the U.S. Fish and Wildlife Service, and state marine fisheries agencies in New England and the Mid-Atlantic through their participation in both Whiting Committee and Council meetings. In addition, staff from the NMFS Northeast Regional Office and the Northeast Fisheries Science Center, as well as technical personnel from Maine, Massachusetts, New York, and New Jersey participate on the Whiting Plan Development Team (PDT).

Non-governmental organizations, conservation groups, and fishing industry associations are involved in the public process either through the Whiting Advisory Panel or mail notifications of public meetings. The Council informs the interested public of meetings and of the proposed action and review of environmental documents through notice in the *Federal Register* and by mail notification (about 1,650 persons). About 134 interested parties receive notices for all whiting-related meetings. The Council also distributed notices of important Whiting Committee meetings to all groundfish interested parties (about 850).

In order to receive adequate public comment about the proposed actions and the analyses of environmental impacts contained in this document, the Council held seven public hearings throughout the affected region. These hearings were conducted in Portland (Maine), Provincetown and Gloucester (Massachusetts), Tom's River (New Jersey), Riverhead (New York), Narragansett (Rhode Island), and Newport News (Virginia).

E.3.2 MAJOR CONCLUSIONS

The proposed management action will have positive impacts on affected physical, biological, and human environments. The management measures are projected to reduce the level of fishing mortality in small mesh multispecies fisheries to end overfishing on the southern stock of silver hake as well as red hake and to rebuild the stocks to sustainable levels within ten years. Spawning stock biomass for both the northern and southern stocks of silver hake is projected to increase substantially under the proposed management action. Although fishery landings and revenues from small mesh multispecies are estimated to decrease in the short term (Years 1 – 4), the long term economic benefits of a rebuilt resource outweigh the short term costs of reducing fishing mortality and exploitation. Increased mesh size, combined with lower fishing mortality rates, should rebuild the age structures of the whiting stocks, promoting landings of larger-sized, more valuable whiting.

The negative socio-economic impacts of the Year 4 default measure, if implemented, are expected to be more severe than the measures for Year 1 – 3. However, when compared to the projected impacts of maintaining the status quo for both stocks of whiting, the long term biological, economic, and social impacts of the management action are positive and far-reaching.

E.3.3 AREAS OF CONTROVERSY

NOAA Administrative Order 216-6 outlines the requirements of the NEPA with respect to fishery management plans and amendments. It states that controversy "refers to a substantial dispute which may concern the nature, size, or environmental effects, but not the propriety of a proposed action." In this context, the Council recognizes the following areas of controversy over the proposed action:

A. Lack of Updated Stock Status Information

   The most significant area of controversy stems from uncertainties associated with the scientific basis of this management plan. The data considerations specific to this amendment are discussed in Section E.6.2.5. The lack of recent estimates of both whiting stock size and current (post-1995) fishing mortality rates generated uncertainty in the analytical models that cannot be resolved at this time. More discussion of this problem is provided in Section E.7.2.1.

B. Assumptions about Production Losses Resulting From Increases in Mesh Size

   One of the critical assumptions embedded in the analysis is the relationship between losses in production and changes in mesh size. Given the available data, the Whiting PDT developed its best estimate of the joint effects of possession limits and mesh changes under the proposed management action. The PDT recommended that the model apply an assumption that each ½-inch increase in mesh size would result in a 15% reduction in retention of marketable species. Increasing to 2.5-inch mesh results in a 15% reduction, and increasing to 3-inch mesh results in a 30% reduction. However, industry advisors expressed concern about the PDT's mesh selectivity assumption. To address these concerns, three additional analyses were performed in order to determine the sensitivity of the exploitation reduction estimates to the assumed relationship between production losses and mesh changes. Due to the importance of squid in the southern New England mixed trawl fishery, squid losses are assumed to be at twice the rate of the assumed loss of whiting, red hake, offshore hake, and other small mesh species. The PDT assumption for production losses at 2.5-inch mesh (15%) was set to 20% and 25%, and the PDT's assumed production loss at 3.0-inch mesh (30%) was set to 40% and 50%. Combining these alternatives with assumed squid loss rates results in the three trials indicated in **Table E.61**. These sensitivity trials were performed for both the analysis of expected reductions in exploitation and the analysis of fishery impacts.

E.3.3.1 Issues to be Resolved

The Council published a Notice of Intent to prepare a Supplemental Environmental Impact Statement for this amendment on February 10, 1998 (50 CFR Part 648). This action formally initiated the process of determining the scope of issues to be addressed and of identifying significant issues related to the proposed amendment that could affect the human environment. Based on public comment, both written and received at Council and Whiting Committee meetings, the Council identified the following issues which it considered in developing the alternatives. These issues also factor into the Council's decision on which alternatives to submit as the final Fishery Management Plan amendment. The issues are:

A. Moratorium on Commercial Permits to Fish for Small Mesh Multispecies

   As with all management programs that limit access to a fishery, there is some disagreement about the need for a limited access system in small mesh fisheries as well as the appropriate qualification criteria. In this case, however, a majority of the industry agrees that access to small mesh species fisheries should be limited, and much of the controversy stems from differing opinions about the extent to which access should be limited (i.e. qualification criteria). Some view the proposed criteria as favoring different sectors of the industry, while others feel that the criteria are too restrictive.

   Discussion and Mitigation: The Council considered several options for moratorium qualification criteria in attempting to capture both current and historical participants in the fishery. The proposed qualification criteria represent a compromise between various interests in the fishery. See Section E.5.2.2.1.2 for more discussion.

B. Identification of Silver Hake, Offshore Hake, and Red Hake Spawning Stocks, Spawning Areas, and Spawning Times

   Because adequate information is not available, the Council made assumptions about the distribution of whiting, red hake, and offshore hake stocks. A better understanding of stock structure and spawning behavior would lead to better management of the resource.

   Discussion and Mitigation: The Council opted not to implement spawning and/or juvenile area closures as a management tool in this amendment. See Section E.5.2.2.2.2 for more discussion.

C. Inability to Estimate MSY or MSY Proxies for Some Stocks Addressed in this Amendment

   The lack of biological information about all three species resulted in the development of risk-averse overfishing definitions, some of which specify neither MSY nor a proxy thereof.

   Discussion and Mitigation: Where adequate information was not available to estimate MSY, the Council developed a proxy for MSY. Where adequate information was not available to develop a proxy for MSY, the Council took a precautionary approach and developed risk-averse overfishing definitions intended to detect the onset of overfishing before the stock becomes overfished. As more information becomes available, the Council will reconsider the proposed overfishing definitions and amend them to more closely resemble overfishing definitions of other stocks in relation to the requirements of the Sustainable Fisheries Act (those which contain minimum biomass and maximum fishing mortality rate thresholds). For further discussion, see Section 4.2 and **Appendix I**, *Evaluation of Existing Overfishing Definitions and Recommendations for New Overfishing Definitions to Comply with the Sustainable Fisheries Act (relevant portions only)*.

D. Small Mesh Multispecies Incidental Catch in the Loligo Squid and Southern New England Mixed Trawl Fisheries

There is disagreement as to how to resolve issues relating to the connection between small mesh multispecies (whiting and red hake) and other small mesh, mixed trawl fisheries (primarily squid, mackerel, and butterfish). While small mesh multispecies are managed by the New England Council through the Northeast Multispecies FMP, squid, mackerel, and butterfish are managed by the Mid-Atlantic Fishery Management Council. The relationship between whiting and squid fisheries is indisputable, and the New England Council found it difficult to resolve issues relating to whiting conservation without addressing issues relating to the management of other small mesh species, particularly in the Mid-Atlantic region.

Discussion and Mitigation: The Council considered these issues in developing this amendment. While the management measures contained in this amendment are intended to minimize incidental catch and discards of small mesh multispecies in non-targeted fisheries, the Council recognizes that until these issues are addressed through the management of other small mesh species (squid, for example); incidental catch issues may hamper the effectiveness of any management plan directed at ending overfishing on small mesh multispecies. In addition, the Mid-Atlantic Fishery Management Council was actively involved in the development of the management measures proposed in this amendment.

E.4.0 PURPOSE AND NEED FOR ACTION

Section 3.2 of this combined document discusses the purpose of and need for management action, including the goals and objectives of this amendment.

E.5.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

E.5.1 DESCRIPTION OF THE PROPOSED ACTION

The proposed action is described in Section 4.0 of this integrated document.

E.5.2 ALTERNATIVES TO THE PROPOSED ACTION

The following section contains a description of the alternatives to the proposed action that the Council considered and rejected as well as a discussion of the Council's rationale for selecting the proposed action.

E.5.2.1 No Action (Status Quo)

Under the No Action alternative, the Council would not develop an amendment to the Multispecies FMP to address overfishing of silver hake and red hake and to provide basic protection for offshore hake. Fishing for these species would remain virtually unregulated except for current restrictions in the Cultivator Shoal Whiting Fishery and the Regulated Small Mesh Areas in the Gulf of Maine. Whiting, red hake, and ocean pout would remain non-regulated multispecies, and offshore hake would not be incorporated into the multispecies management unit.

It appears that selecting the No Action alternative would not fulfill the requirements of the Sustainable Fisheries Act with respect to overfished stocks. The potential biological, economic, and social impacts of taking no action at this time are discussed in Sections E.7.2.1.2, E.7.3.1.2.1, and E.7.4.1 respectively.

E.5.2.2 Alternatives Considered and Rejected by the Council

E.5.2.2.1 Summary of the Alternatives Taken to Public Hearings

Below is a description of the preferred and non-preferred alternatives that the Council considered during public hearings. The proposed management measures for Amendment 12 represent a combination of both the preferred and non-preferred alternatives. The discussion below characterizes the choices and compromises the Council faced (based on impact analyses and comments received during public hearings) as well as the Council's rationale for selecting the final management measures to be included in Amendment 12 to the Northeast Multispecies FMP.

The potential impacts of the alternatives taken to public hearings, including the No Action alternative, are discussed in the Amendment 12 Draft EIS (formerly Amendment 11) as well as in **Appendix III,** *A Bioeconomic Analysis of Whiting Amendment Fishery Management Options, a Report to the New England Fishery Management Council*.

E.5.2.2.1.1 Stock Identification for Management Purposes

During public hearings, the Council proposed to delineate northern and southern whiting stocks for management purposes by using the boundary between the Gulf of Maine/Georges Bank and southern New England Regulated Mesh Areas. Offshore hake would have been managed as part of the southern stock, and the Cultivator Shoal Whiting Fishery would have been managed independently. The Council requested comments on the appropriateness of the proposed stock delineation line during public hearings.

<u>Discussion and Rationale</u>

The generally accepted theory is that there are two major U.S. stocks of silver hake, a Gulf of Maine/Northern Georges Bank stock and a Southern Georges Bank/Mid-Atlantic stock, although questions about where the stocks are divided and how much mixing occurs between them as well as with Canadian/Scotian Shelf stocks of silver hake remain unanswered. It is unlikely that these stocks are reproductively isolated, but it is not known to what extent exchange occurs. In fact, some problems with the most recent whiting stock assessment in 1993 stemmed from stock uncertainty issues, ultimately leading to a rejection of the assessment by the Stock Assessment Review Committee until these (and other) questions can be resolved.

In general, public comments about the proposed stock delineation (Gulf of Maine/Georges Bank Regulated Mesh Area line) indicated that it may be more appropriate to separate whiting management areas by fishing strategies or by what people perceive as "inshore" and "offshore" whiting fisheries. Recommendations, including those from the state of New York and the Mid-Atlantic Fishery Management Council (MAFMC), supported whiting stock delineation based on a line drawn southward from Cape Cod at 70°00'. South of Cape Cod, the area west of 70°00' would be considered the southern management area, and the area east of 70°00' would be considered part of the northern management area. Others recommended that no whiting stock delineation be specified at this time because additional lines often create additional management complexities and more confusing regulations. These individuals also suggested that whiting stock delineation for management purposes should not be necessary as long as the target reductions in exploitation are similar for both stocks. The Whiting Committee and the Council considered these recommendations while bearing in mind the following:

- scientific stock identification uncertainty,
- the potential complexity of the management plan in question,
- the need to reduce whiting exploitation by an equal amount across both stocks in order to reach target fishing mortality levels, and
- the National Marine Fisheries Service (NMFS) recommendation to minimize additional management boundary lines in an already complex system of fisheries regulations.

The Council concluded that, at this time, whiting stock identification for management purposes is unnecessary (see Section 4.4). For the purpose of this amendment, whiting management areas do not need to reflect whiting stock boundaries, especially since the same management measures will be applied to both the northern and southern areas for the first three years of the proposed management program. If the default measure is applied on a stock specific basis at the beginning of Year 4 (see Section 4.15), then the Council agrees that the recommended stock delineation line (70° 00') may represent the most practical way to separate different small mesh multispecies fisheries for management purposes.

E.5.2.2.1.2 Moratorium on Commercial Permits/Limited Access

During public hearings, the Preferred Moratorium Alternative consisted of a three-tier qualification system designed to accommodate the concerns of different whiting fishermen participating in unique and localized fisheries. Tier A of the Preferred Alternative qualified vessels to fish only in designated seasons and areas in the northern management area (Small Mesh Areas 1 and 2, shrimp exemption area, and Experimental Separator Trawl area) with lower levels of historical participation (1,000 pounds over the qualifying time period). Tier B of the Preferred Alternative qualified vessels to fish in all management areas (northern management area, southern management area, and Cultivator Shoal) if they landed a total of at least 100,000 pounds of whiting, offshore hake, red hake, and/or ocean pout during the specified time period. Tier C of the Preferred Alternative qualified vessels to fish in the Cultivator Shoal Whiting Fishery only.

Because of suggestions that the recent decline of whiting resources (over the last decade) led to a decline in the ability of vessels to target whiting, the Council wanted to consider several qualification time periods in order to ensure that both current and historical participants would be included under a moratorium on commercial permits. Non-Preferred Alternative 1 (as referred to in the Amendment 11 Draft EIS) expanded the qualifying time period in the Preferred Alternative to include the 1980s. During public hearings, the Council favored the Preferred Alternative over Non-Preferred Alternative 1 because a shorter qualifying time period is easier to administer, and the Council favored the Preferred Alternative over other Non-Preferred Alternatives because the Preferred Alternative seemed to accommodate the widest range of interests within a naturally diverse fishery.

Non-Preferred Alternatives 2 and 3 (as referred to in the DEIS) were very similar in nature. They included an eleven-year qualifying time period to account for vessels with historical participation that may not be currently participating in small mesh multispecies fisheries for various reasons. They both accommodated vessels with an established interest in the commercial whiting fishery while still maintaining some level of access to the fishery for other vessels in New England and the Mid-Atlantic. Instead of denying vessels any opportunity to participate, Non-Preferred Alternatives 2 and 3 proposed different levels of access for vessels with different levels of historical participation in small mesh multispecies fisheries.

Non-Preferred Alternative 2 incorporated a limited access permit system with a commitment to re-open directed small mesh multispecies fisheries to additional participants as the stocks recover. Under Non-Preferred Alternative 2, once the stocks are considered "rebuilt" (according to the overfishing definition reference points), those vessels possessing a limited access small mesh multispecies possession limit permit would be eligible to apply for the "directed" limited access small mesh multispecies permit. By contrast, Non-Preferred Alternative 3 did not provide an opportunity for vessels that obtain limited access small mesh multispecies possession limit permits to re-enter directed small mesh multispecies fisheries. Non-Preferred Alternative 3 was the most restrictive of the moratorium alternatives that the Council considered during public hearings.

Non-Preferred Moratorium Alternative 4 granted more vessels access to small mesh multispecies fisheries than any other moratorium option the Council considered. It ensured that vessels that possess/have possessed any multispecies permit and have landed one pound of whiting, red hake, offshore hake, and/or ocean pout would be granted access to small mesh multispecies fisheries. Non-Preferred Alternative 4 most accurately reflected the Council's intent at the time of the September 9, 1996 control date publication in the Federal Register. The qualification criteria in Non-Preferred Alternative 4 was similar in nature to the multispecies limited access qualification criteria implemented through Amendment 5. Vessels could qualify for a limited access multispecies permit based on one pound of whiting (or offshore hake), red hake, or ocean pout landings. Non-Preferred Alternative 4, in turn, would provide the same opportunity in small mesh multispecies fisheries for those vessels, supporting the longstanding Council philosophy that vessels should not lose their commercial fishing permits simply because they have not used them recently ("use it or lose it").

<u>Discussion and Rationale</u>

The Council is facing the challenge of reducing the exploitation of whiting by approximately 63% while maintaining a level of commercial fishing capable of sustaining an industry. Throughout the development of Amendment 12, the Council never supported "open access" to small mesh multispecies fisheries, nor did it support granting access to vessels that never demonstrated any interest in fishing for small mesh multispecies. Another challenge the Council faced is how to determine the appropriate level of landings and period of time that accommodate both active and historical small mesh multispecies fishery participants for a moratorium on commercial permits. Difficulties arose in concurrently addressing the two challenges described above.

In general, the proposed moratorium supports the notion that the viability of the industry that has depended on small mesh multispecies should be protected, instead of the notion that all vessels should be allowed to participate in small mesh multispecies fisheries at levels that may be consistent with those of non-directed/incidental catch fisheries. The Council constructed a two-tier system of access to small mesh multispecies fisheries in order to protect the interests of those fishermen who depend on fishing for whiting as well as to maintain access to the fishery at some level for other commercial vessels that may catch small mesh multispecies in different fisheries throughout New England and the Mid-Atlantic.

The Council crafted the proposed moratorium and selected it instead of the Preferred Alternative (from public hearings) because of the complexity inherent in the proposed three-tier permit system as well as the perceived inequities associated with qualifying vessels to fish for the same species in different areas with different permits. The proposed moratorium is a combination of several elements of the Preferred and Non-Preferred Moratorium Alternatives considered at public hearings. These elements include, but are not limited to:

- a commitment to re-open "directed" fisheries to additional participants when the stocks recover (see Section 4.5.1.1);
- different levels of access for vessels with different levels of historical participation in small mesh multispecies fisheries (Sections 4.5.1 and 4.5.2); and
- an extended qualifying time period to accommodate vessels that may not have fished recently (since 1990) for small mesh multispecies due to stock decline, particularly inshore.

Most comments on the Preferred and Non-Preferred Moratorium Alternatives were supportive of the elements listed above, no matter what moratorium alternative was ultimately chosen. Disagreement stemmed from determining the number of and the propriety of different levels of access to small mesh multispecies fisheries as well as the appropriate qualification criteria and qualifying time period. The proposed moratorium represents a compromise among various sectors of an extremely diverse industry.

The Council chose to extend the qualifying time period backwards to 1980 based on an overwhelming majority of public comments which indicated that there may be a substantial number of traditional small mesh fishermen who would not qualify for a permit unless the landings criteria covered a longer time period. This may occur for various reasons. First, declines in whiting productivity (particularly inshore), market fluctuations, and increased groundfish regulations may have created a situation where recent landings (since 1990) would not qualify many vessels that have fished for small mesh multispecies. In fact, public comment indicated that these circumstances may have provided the impetus for many fishermen to exit the whiting fishery altogether during the 1990s. Second, similar circumstances in and around the Gulf of Maine have allowed directed whiting (and other small mesh) fisheries to re-emerge only recently (since 1995). Aside from two seasonal Small Mesh Areas in the western Gulf of Maine, an experimental grate fishery and an experimental raised footrope trawl fishery have been the only opportunities for small- and medium-sized vessels to fish for small mesh multispecies in the Gulf of Maine or along northern Georges Bank since 1995.

The Council concluded that the circumstances described above command an alternative approach for granting limited access small mesh multispecies permits, not only for historical small mesh fishery participants, but also for more recent whiting experimental fishery participants. In turn, the Council decided also to extend the time period for qualification beyond the September 9, 1996 control date. The objective of extending the time period through December 31, 1997 is to qualify those fishermen who have expressed a clear intent to participate in small mesh multispecies fisheries by investing both time and money into whiting experimental fisheries and by showing participation through landing at least 1,000 pounds of small mesh multispecies during the experiment.

While the control date was implemented to help the Council distinguish currently established small mesh multispecies fishermen from speculative entrants to the fishery during the development of management measures, it did not require that entrants after September 9, 1996 be excluded from the fishery if a limited access permit system was implemented. The Council chose to use the control date language in order to prevent first-time entrants from receiving a limited access small mesh multispecies permit. In addition to meeting the landings requirement, a vessel will be required to possess a multispecies permit on the date of final rule publication as well as on or before the 9/9/96 control date in order to qualify for a limited access small mesh multispecies permit (or possession limit permit). Vessels receiving limited access small mesh multispecies permits will not be new entrants to the fishery, but rather vessels that have already expressed their intent to participate in small mesh fisheries. In addition, all limited access small mesh multispecies permit holders (and possession limit permit holders) will be a subset of current multispecies permit holders (as of the date of final rule publication).

The Council intends for additional entrants to be granted access to small mesh multispecies fisheries once overfishing has ended and stock recovery can be assured. Historically, whiting and red hake were considered "alternative" fisheries for vessels trying to avoid targeting regulated groundfish species. Now, as fishing pressure has increased, the Council recognizes the necessity to limit access to small mesh multispecies fisheries in order to provide the backbone for a sustainable management plan that rebuilds the resource. However, because these stocks were once considered part of "alternative" or "underutilized" fisheries, their market potential has not been fully realized, especially domestically. Other "hake" fisheries (Pacific coast and Canadian hake fisheries, for example) are starting to realize the economic potential for these species and are beginning to both fill markets for these species that New England and Mid-Atlantic fishermen currently supply and develop new markets, domestic and international, with significant growth potential for whiting and red hake products.

The Council wants to ensure that New England and Mid-Atlantic fishermen have as much opportunity to capitalize on new and expanding markets for small mesh multispecies, especially as U.S. East Coast whiting stocks recover. Therefore, the proposed moratorium incorporates a limited access permit system with a commitment to allow additional participants in small mesh multispecies fisheries once the management plan can be determined to meet its objectives. The "sunset" on the landings criteria is intended to assure that added participation will be considered. To ensure that the relaxation of the qualification criteria does not occur unless the Council affirms that it should, the Council is formally required to reconsider the "sunset" after four years and provide a recommendation, based on stock status and guidance from the Whiting Monitoring Committee, as to whether the landings criteria should "sunset" or continue. This guarantees that, if the stocks are able to support increased effort in the future, the Council will consider allowing more entrants into the fishery before it considers increasing possession limits or implementing other measures directed at opportunities for current participants.

E.5.2.2.1.3 Incidental Catch Allowance for Non-Qualifiers – Open Access Multispecies Permit

The Council considered two alternatives for an open access multispecies permit (to replace the existing open access nonregulated multispecies permit) during public hearings. The Preferred Alternative allowed vessels to retain 100 pounds of combined small mesh multispecies with an open access multispecies permit. The Non-Preferred Alternative allowed vessels to retain 100 pounds of each of the three small mesh multispecies with an open access multispecies permit. The Council chose to recommend the Preferred Alternative as the proposed open access multispecies permit (see Section 4.6).

Discussion and Rationale

Whiting, offshore hake, and red hake are species often caught incidentally in several small mesh and mixed trawl fisheries throughout New England and the Mid-Atlantic. In order to improve the landings and information database for small mesh multispecies, the Council wants to provide vessels with the incentive to both record and land small amounts of whiting and red hake incidental catch that may occur in these fisheries. Most vessels that have participated in any whiting fishery should qualify for a moratorium permit, but the Council wants to assure that non-qualifying vessels will record whiting and red hake incidental catch by requiring them to obtain a permit in order to possess or land these species.

Public comments suggested that the Preferred Alternative for the incidental catch allowance for non-qualifiers (100 pounds of combined small mesh multispecies) may be too low unless the moratorium grants access at a higher level to both current and historical fishery participants. The Whiting Committee and the Council discussed the comments and determined that the proposed moratorium on commercial permits (Section 4.5) addresses the concerns associated with qualifying the appropriate vessels.

Ocean pout is currently identified as a "nonregulated" multispecies, and vessels can fish for ocean pout with an open access nonregulated multispecies permit. Although it will no longer be identified as such (because this amendment is eliminating the open access nonregulated multispecies permit), the ocean pout fishery remains an open access fishery. Ocean pout is not identified a small mesh multispecies and it will no longer be managed in conjunction with whiting and red hake once this amendment is implemented. No management measures contained in this amendment are intended to address or regulate fishing for ocean pout. Vessels that used to fish for ocean pout with an open access nonregulated multispecies permit may now obtain an open access multispecies permit to do so.

E.5.2.2.1.4 Management Alternatives for the Northern and Southern Areas

During public hearings, the Council proposed different management measures for the "northern management area" and the "southern management area." The following paragraphs summarize the management alternatives that the Council considered for both areas. The discussion provides the Council's rationale for ultimately selecting the same management measures for both the northern and southern areas.

Northern Management Area

During public hearings, the Preferred Alternative for the northern management area consisted of a minimum 3-inch mesh requirement to fish for small mesh multispecies, a whiting/offshore hake possession limit of 30,000 pounds in Year 1 and 15,000 pounds in Years 2+, and a separate possession limit for vessels fishing with mesh smaller than 3-inches in combination with a separator trawl (grate) that decreased to 1,000 pounds by Year 3. The Council favored the Preferred Alternative because it was projected to achieve the target reductions within a three-year time frame while still affording vessels the flexibility to profit from whiting through several different avenues in the northern area.

Non-Preferred Alternative 1 (as referred to in the DEIS) for the northern management area included a three-tier, sliding scale whiting/offshore hake possession limit based on vessels' overall length (LOA). This alternative was considered because it addressed concerns about the inequity of implementing one trip limit for several different fisheries in which whiting is caught. For example, smaller vessels tend to fish for whiting closer to shore on a more seasonal basis. These vessels often target squid and other small mesh species in combination with whiting, and whiting is frequently not the most profitable component of the catch. Generally, these vessels will focus on smaller quantities of different species. Larger vessels fish further offshore in what are considered "directed" whiting fisheries. These vessels require larger quantities of whiting in order to cover the expense of their trips.

Non-Preferred Alternative 2 was the Council's most conservative alternative for the northern management area. It consisted of a minimum 3-inch mesh requirement to fish for small mesh multispecies, a whiting/offshore hake possession limit of 10,000 pounds, and a 1,000-pound possession limit for the grate fishery.

Southern Management Area

Zone Delineation

Some of the alternatives proposed for the southern management area contained different management measures for an eastern zone (seaward of a delineation line) and a western zone (shoreward of a delineation line). During public hearings, the Council proposed three options to delineate an eastern and western zone of the southern management area in the event that a management alternative requiring such a delineation was selected. (The Council's Preferred Alternative for the southern management area did not require such a delineation line.) The Preferred Eastern/Western Zone Delineation Alternative consisted of a line drawn southward from the western boundary of the Nantucket Lightship Closed Area to the intersection of the Lobster Restricted Gear Areas and following the contours of the Lobster Restricted Gear Areas. Although the Preferred Alternative was more complicated than the other zone delineation alternatives, the Council favored it because it was suggested by the industry and because the existing gear conflict areas could serve as buffer zones between the eastern and western whiting zones.

Non-Preferred Alternative 1 (as referred to in the DEIS) drew a straight longitudinal line (70°) to delineate the proposed eastern and western zones of the southern management area. The Council developed this alternative while trying to determine the best way to distinguish different whiting fisheries that may require different management approaches. The industry agreed that generally, larger mesh could be used east of 70° where vessels tend to target whiting and not catch it in combination with several other small mesh species (west of 70°). The delineation line proposed in Non-Preferred Alternative 2 was only 20 minutes (1/3 of a degree) west of the line proposed in Non-Preferred Alternative 1. It incorporated the western boundary of the Nantucket closed area to serve as a reference point for the industry in order to avoid confusion that could result from a completely new boundary line.

Management Alternatives for the Southern Management Area

During public hearings, the Council's Preferred Alternative for the southern management area established a Regulated Small Mesh Area (the entire southern management area south to 38°) with a minimum mesh requirement for all fishing activities in the area. During Years 1 and 2, the minimum mesh for fishing in the Regulated Mesh Area was proposed to be 2.5-inches, increasing to 3-inches in Year 3 and beyond. In addition, all vessels would be subject to a whiting/offshore hake possession limit of 30,000 pounds. The proposed default measure accompanying this alternative was a 10,000-pound whiting/offshore hake possession limit in the Regulated Mesh Area (proposed to remain 3-inches under the default). It was predicted that implementing the Preferred Alternative would severely restrict small mesh/mixed trawl fishing, particularly in southern New England and Mid-Atlantic waters.

Non-Preferred Alternative 1 (as referred to in the DEIS) was suggested to the Council by a group of industry members from the southern New England area. It proposed seasonal restrictions based on estimated times during which whiting are found either in combination or separated from other small mesh species. In the summer (April – October), whiting concentrate in offshore areas and tend to separate themselves from other small mesh species. Industry members who developed this option suggested that it would be more effective to apply more restrictive management measures during the summer when vessels are targeting larger amounts of whiting. That way, in the winter (October – April), when whiting are generally found in combination with squid, butterfish, and other small mesh species, fishermen could have more flexibility to target these species together.

Non-Preferred Alternative 1 included different minimum mesh requirements for an eastern and a western zone in the southern management area, weekly sliding scale possession limits (based on vessels' length overall) during the summer season, blocks of time out of the whiting fishery, and a proposed call-in program for vessels fishing in the eastern zone (the zone requiring larger mesh). It also proposed that vessels could retain 1,000 pounds of whiting in the summer and 3,000 pounds in the winter while fishing in the mixed trawl fishery (with mesh smaller than the proposed minimum mesh for whiting). Because it relied on a call-in system, blocks of time out of the fishery, and weekly possession limits, Non-Preferred Alternative 1 was more complicated than the other alternatives and generated potential administrative and enforcement problems.

Non-Preferred Alternative 2 included different minimum mesh requirements for an eastern zone and a western zone of the southern management area as well as a sliding scale whiting/offshore hake possession limit based on vessels' overall length. In addition, Non-Preferred Alternative 2 proposed that vessels could use mesh smaller than the minimum required mesh to retain whiting up to a threshold amount. Once the threshold was reached, however, those vessels would have been required to switch to at least the minimum mesh in order to retain whiting up to the possession limit. If they chose not to switch, then they would discard any additional whiting caught as bycatch while using smaller than the minimum mesh. The threshold served as an attempt to minimize whiting and red hake discards while providing vessels the flexibility to choose whether they want to target whiting or other small mesh species once they are out at sea. However, thresholds are extremely difficult to enforce, and they may encourage vessels to continue to target small mesh multispecies with a less than optimal mesh size. When a vessel lands whiting, it would be impossible to detect whether it caught all of the whiting with the smaller mesh or switched to larger mesh once it reached the threshold. The success of this alternative depended almost entirely on the ability to enforce the threshold at sea.

The default measure accompanying Non-Preferred Alternative 1 and Non-Preferred Alternative 2 consisted of a complete prohibition on the possession of whiting until the southern stock is considered rebuilt (according to overfishing definition reference points).

Discussion and Rationale

As previously discussed, small mesh multispecies are often caught in several different fisheries throughout New England and the Mid-Atlantic. While there are "directed" whiting fisheries, many vessels catch whiting in combination with other small mesh species (herring and squid, for example). In fact, vessels of all sizes target whiting in various fisheries. Selecting management measures that address all sectors of each fishery in which small mesh multispecies are caught has been extremely difficult. As a result, the Council originally proposed several complex management alternatives consisting of different management measures for different areas in an attempt to address various concerns throughout New England and the Mid-Atlantic, which were considered during public hearings.

While a majority of the public supported the Council's Preferred Alternative for the northern management area, many favored the notion of equal management across all areas. A large number of comments suggested that, for the purposes of simplicity and equity, the Council should not implement different mesh requirements and possession limits for small mesh multispecies in different areas. In addition, there was very little support for the Council's Preferred Alternative for the southern management area. Most public comments indicated that this alternative could produce devastating impacts on the loligo squid fishery and southern New England/Mid-Atlantic mixed trawl fishery. Many people claimed that adequate amounts of loligo squid cannot be caught with 3-inch mesh and that requiring 3-inch mesh to fish for small mesh multispecies would eliminate the squid fishery (and other small mesh fisheries). They also feared that other proposed management alternatives for the southern management area could result in substantial discards of small mesh multispecies in these fisheries. In short, the industry supported a management approach that would minimize discarding by allowing vessels to retain their incidental catch in non-directed, small mesh, mixed trawl fisheries.

After public hearings, the Whiting Advisory Panel met and developed a management alternative consisting of a suite of measures for all areas (except for the Cultivator Shoal area) that combined elements of the alternatives proposed for both the northern and southern management areas. The proposal from the Whiting Advisory Panel formed the basis for the final management measures selected by the Council. The Council's recommendations for final measures to be included in Amendment 12 result from:

- the need to minimize the complexity of additional fishery regulations;
- the desire to include more of the industry's input to the management process;
- the desire to provide the incentive for fishermen to change their practices; and
- the objective to achieve the same target reductions in whiting exploitation for both the northern and southern areas.

The proposed management measures are intended to provide an incentive for vessels to use larger mesh to fish for small mesh multispecies while accounting for the different impacts of mesh size increases on different sized vessels and considering the individual characteristics of different small mesh fisheries. It not only creates the incentive to use larger mesh, but also gives NMFS and the Council an opportunity to review an updated stock assessment for these species and to collect some additional, much needed information before requiring larger mesh (3-inches) and potentially causing significant economic dislocation for small mesh fisheries like the loligo squid fishery.

The Council expects that during the first three years of this management program, fishermen will change their fishing strategies by using larger mesh specifically to target whiting, finding times and areas where whiting is separated from other small mesh species, and working to develop more selective gear that decreases the incidental catch of whiting and red hake in non-directed fisheries. In case this approach does not produce the expected results, the default measure for this plan requires a minimum 3-inch mesh for all fishing activities, including fishing for loligo squid and other species generally caught with small mesh (see additional discussion below). This should alert the industry that unless fishermen can adopt more selective strategies to target small mesh multispecies, they will be required to comply with strict mesh regulations that may significantly impact their catch of not only small mesh multispecies, but also many other commercially important species caught with small mesh.

The Council chose to allow vessels participating in the northern shrimp fishery to retain more whiting and offshore hake than their permit allows in order to reduce the discard of small whiting incidentally caught in the shrimp fishery. This measure is intended to support the principal behind National Standard 9. In general, the amount of whiting incidental catch that occurs in the northern shrimp fishery is relatively insignificant. However, since vessels use a grate in combination with small mesh (about 1-3/4-inch), small whiting will be caught. Thus, the Council wants to discourage fishermen from wasteful discarding. While access to the northern shrimp fishery is not limited, the Council is confident that this measure will not provide vessels with the incentive to enter the northern shrimp fishery in order to catch up to 3,500 pounds of whiting and offshore hake. Participation in the shrimp fishery is naturally limited by a short season as well as unpredictable and often dangerous weather. In addition, the peak season for whiting in the northern Gulf of Maine does not occur during the northern shrimp season, and any whiting that is caught in the shrimp fishery must be less than or equal to the amount of shrimp on board (or landed). The Council predicts that no vessel will go through the trouble of catching shrimp only so that it may retain up to 3,500 pounds of whiting without possessing a limited access small mesh multispecies permit.

The Council elected to implement the Preferred Alternative for the southern management area as the Year 4 default measure for either area if the fishing mortality targets are not achieved for the stock in question by the end of Year 3 (see Section 4.15). Without current fishery and stock status information, the Council was uncomfortable recommending such a severe measure for implementation during the first three years of the management program. However, the Council recognized the potential conservation benefits of the Preferred Alternative for the southern management area and chose to implement it as the default measure to ensure that this management plan will achieve its fishing mortality objectives. The Council's goal is to receive updated fishery and stock status information during Years 1 – 3 to better assess the necessity and potential impacts of the default measure.

E.5.2.2.1.5 Management Measures for the Cultivator Shoal Whiting Fishery

Season Change (Section 4.7.1)

During public hearings, the Council proposed to change the Cultivator Shoal season from June 15 – October 31 to July 15 – September 30, a decrease of two months. This proposal also included new framework adjustment language that would allow the Council to change the Cultivator Shoal season back to the original dates (June 15 – October 31) and require vessels to pick one 60-day block during the season in which to participate. That way, all participating vessels would be limited to fishing in the Cultivator Shoal Whiting Fishery for a maximum of 60 days, but every vessel would not be fishing on Cultivator Shoal during the same 60 days.

<u>Discussion and Rationale</u>

The Council proposed to change the season of the Cultivator Shoal Whiting Fishery for several reasons. First, some fishermen have documented increased concentrations of groundfish (particularly haddock and redfish) in the Cultivator Shoal area during the month of June. When other groundfish species are concentrated in the Cultivator Shoal area, the whiting are not. Vessels do not want to make a trip to the Cultivator Shoal if they cannot catch enough whiting to make the trip profitable. They also cannot keep the groundfish and do not want to catch and discard large amounts of fish. Second, this amendment requires a 63% reduction in whiting exploitation. The Council proposes to reduce exploitation equally across all stock areas within four years. If the entire 63% reduction for the Cultivator Shoal Whiting Fishery was achieved through a possession limit, then vessels would probably find it economically infeasible to make trips to the Cultivator. The Council opted to shorten the Cultivator Shoal season as an alternative to reducing fishing effort through other management measures.

During public hearings, most whiting advisors and many members of the public commented that the proposed season change may excessively limit fishermen's flexibility and may produce unintended (negative) consequences for the whiting market. A majority supported the removal of the month of October from the Cultivator Shoal Whiting Fishery season, but many were concerned with the potential impact of removing the month of June. Fishermen maintained that whiting market conditions, combined with the unavailability of whiting in other areas, during the month of June usually generate the best prices for whiting, and participants in the Cultivator Shoal Whiting Fishery take advantage of this time. Additionally, some fishermen noted that they have very few other opportunities to fish during the month of June and that the Cultivator Shoal Whiting Fishery offers a viable alternative and an opportunity to maintain an income through the early part of the summer.

For the reasons noted above, the Council decided to remove only the month of October from the Cultivator Shoal Whiting Fishery season. Originally, this proposal also included a requirement for vessels to call-in for two 15-day blocks of time out of the Cultivator Shoal Whiting Fishery. However, this portion of the proposal was eliminated due to administrative concerns as well as concerns about the conservation benefits that such a measure would achieve. Based on the results of the analysis (see Section E.7.2.2.4), the Council is confident that when implemented in combination with a whiting/offshore hake possession limit, the proposed Cultivator Shoal Whiting Fishery season change will achieve exploitation reductions in excess of the targets specified in this plan. The Council has included the ability to further modify the season as well as declaration and participation requirements for the Cultivator Shoal Whiting Fishery through a framework adjustment to the Multispecies FMP if it becomes necessary to do so in the future.

Adjustment to Participation Requirements (Section 4.7.2)

During public hearings, the Council proposed that while enrolled in the Cultivator Shoal Whiting Fishery, vessels would be allowed to fish for small mesh multispecies in other whiting management areas provided that they complied with the more restrictive management measures (the Cultivator Shoal restrictions or the restrictions for the area in which they chose to fish).

<u>Discussion and Rationale</u>

Participants in the Cultivator Shoal Whiting Fishery have noted that the combination of restrictions which limit small mesh fishing to Cultivator Shoal only and the fact that there are times when whiting are unexpectedly hard to find on the Cultivator increases the likelihood that a trip to the Cultivator Shoal may not be feasible. When whiting are on the Cultivator in numbers, other species are not, but when the whiting are not there, bycatch of non-targeted species increases. Cultivator Shoal fishery participants cannot afford to steam to the Cultivator without catching the whiting they are targeting, and they do not want to throw away any bycatch of regulated groundfish species simply because they must fish for whiting only on the Cultivator Shoal once they enroll in the exempted fishery.

The Council wants to provide participating vessels with the flexibility to fish in other whiting areas when whiting are not concentrated on the Cultivator Shoal. This phenomenon is something that is often not predictable, and vessels making the trip to the Cultivator should be allowed an opportunity to catch whiting elsewhere, especially if they comply with the strictest management measures.

There was unanimous support for this proposal during public hearings. The Council adopted the adjustment to the Cultivator Shoal Whiting Fishery participation requirements as it was proposed for inclusion in Amendment 12. However, because of the nature of the final measures selected for all other areas, the Cultivator Shoal restrictions are considered the most restrictive. Therefore, vessels enrolled in the Cultivator Shoal Whiting Fishery may fish in other areas as long as they continue to comply with the Cultivator Shoal restrictions. Cultivator Shoal restrictions equate to being enrolled in the largest mesh size/possession limit category (3-inches and 30,000-pounds).

Additional Management Measures for the Cultivator Shoal Whiting Fishery (Section 4.7.3)

During public hearings, the Council's Preferred Alternative for additional management measures in the Cultivator Shoal Whiting Fishery included a whiting/offshore hake possession limit of 30,000 pounds (the 3-inch minimum mesh requirement was proposed to remain the same).

Non-Preferred Alternative 1 (as referred to in the DEIS) proposed a 30,000-pound whiting/offshore hake possession limit for Year 1, decreasing to 15,000 pounds in Year 2 and beyond. However, there was serious concern that a possession limit of 15,000 pounds would not be economically feasible for vessels participating in the Cultivator Shoal Whiting Fishery.

Non-Preferred Alternative 2 included a sliding scale possession limit based on vessels' overall length to address concerns about the inequities associated with implementing one possession limit for all types of vessels. However, most vessels capable of making a trip to the Cultivator are larger vessels, and almost all would have fallen into the 71+ feet category. Therefore, this alternative was considered the least restrictive of the management alternatives proposed for the Cultivator Shoal Whiting Fishery.

<u>Discussion and Rationale</u>

Vessels that fish on the Cultivator target whiting and retain only small amounts of incidental catch. The intent of a possession limit in the Cultivator Shoal fishery is to eliminate extremely large whiting trips (over 100,000 pounds of whiting per trip in some instances) that contribute to increased fishing mortality and often reduce the value of the resource as a whole by causing the price to fall.

The Council adopted the Preferred Alternative for inclusion in Amendment 12. The Preferred Alternative was the least complex of the management alternatives for the Cultivator Shoal Whiting Fishery. It achieves the objectives of this amendment without modifying fishing regulations on an annual basis. A 30,000 pound possession limit should allow vessels to continue to profit from making a trip to the Cultivator. When combined with the proposed season change, this action should provide considerable conservation benefits as well as market stability and ultimately an increase in the average ex-vessel price for larger-sized whiting.

E.5.2.2.1.6 Transfer of Small Mesh Multispecies at Sea

During public hearings, the Council supported the Preferred Alternative to prohibit the transfer of silver hake, offshore hake, and red hake at sea in order to prevent vessels from circumventing the proposed whiting/offshore hake possession limits. The Non-Preferred Alternative allowed unlimited amounts of small mesh multispecies to be transferred at sea. The Council considered these two alternatives as well as any options that would represent a compromise or a combination of the Preferred and Non-Preferred Alternative.

<u>Discussion and Rationale</u>

Public comments urged the Council to allow the transfer of small mesh multispecies at sea because the amounts being transferred are relatively insignificant and because some fishermen receive better prices for their fish when they sell them for bait rather than taking them to market. Others noted the (physical) difficulty associated with transferring large amounts of small mesh multispecies at sea (i.e. transferring codends) and indicated that this should not be a significant issue now or in the future. The Council concluded that the ability to transfer small mesh multispecies at sea could be relatively important, especially for vessels participating in commercial and recreational tuna and lobster fisheries. As a result, the Council agreed to limit the transfer of small mesh multispecies at sea to an amount small enough to ensure that its impact on the effectiveness of the possession limits would be inconsequential, but large enough to allow for an adequate amount of small mesh multispecies to be transferred at sea to support fisheries that prefer live or fresh whiting and red hake for bait.

In addition to the physical difficulties associated with transferring small mesh multispecies at sea, a deduction of 500 pounds from a transferring vessel's whiting/offshore hake possession limit (regardless of whether or not a transfer occurs) is intended to discourage many vessels from applying for an authorization to transfer small mesh multispecies at sea. The Council determined that the number of vessels that will obtain a letter of authorization to transfer small mesh multispecies at sea should remain small and may even decrease from current numbers because of the cost (loss of 500 pounds of marketable product per trip) that results from obtaining such an authorization. Although there may be enforcement issues associated with transferring small mesh multispecies at sea, the Council is confident that the proposed provisions will minimize the number of transfers that may occur and that this issue is not critical to meeting the plan objectives.

E.5.2.2.2 Other Alternatives Considered During Scoping

E.5.2.2.2.1 Minimum Fish Sizes

In 1994, the Council initiated a process to develop an amendment to the Multispecies FMP to address some recent developments in the whiting fishery, namely the evolution of an export market for juvenile whiting. At that time, the preferred management alternative was the "10-20 proposal." The Council proposed to establish a minimum size of 10-inches for silver hake with a provision that up to 20% by weight of the whiting on board or landed per trip may be undersized as determined by a random sample. However, the Council's effort to manage whiting was hampered by the unfolding of a serious situation with other regulated multispecies (cod, haddock, flounder). The proposal for a minimum silver hake fish size with a tolerance never evolved into any management action.

As the development of Amendment 12 began, the Council solicited comments on minimum fish sizes (with and without a tolerance) during several scoping meetings in March 1998. Whiting advisors and members of the public commented almost unanimously that a minimum fish size for whiting would be an inappropriate management measure. Since whiting is a high-volume fishery and a highly perishable product, having a minimum fish size requirement would result in a significant decrease in both product quality and profits from harvesting whiting. Whiting vessels try to maintain product quality by getting the catch below deck as quickly as possible and by directing on aggregations of fish with a higher percentage of market-sized fish. Sometimes one tow can result in tens of thousands of pounds of whiting. If vessels are required to sort these fish, they may compromise the quality of the fish they keep. Additionally, any undersized fish thrown overboard would almost certainly be dead by the time they were culled out. A vast majority of public comments suggested that a minimum fish size could not achieve the conservation benefits for whiting that the Council is seeking, and the Council agrees.

Consequently, the Council has rejected any management alternatives involving minimum fish sizes for silver hake at this time. In the future, however, the Council may consider implementing minimum fish sizes for either whiting or red hake through a framework adjustment to the Northeast Multispecies FMP.

E.5.2.2.2.2 Spawning Season/Area Closures

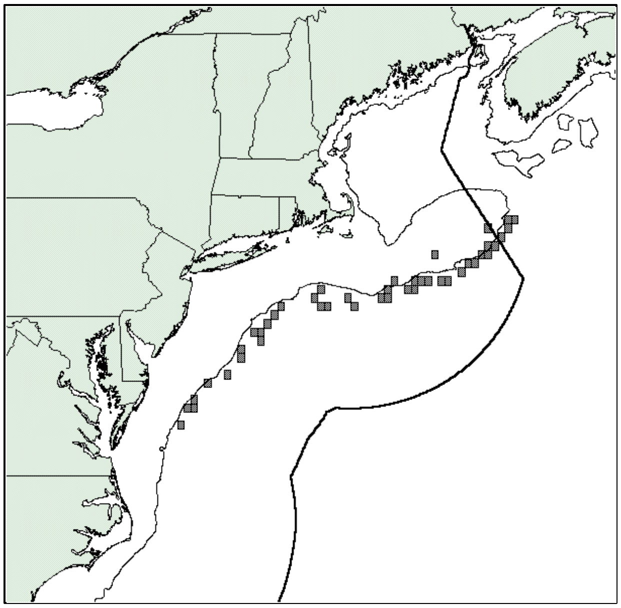
In several meetings during the development of this amendment, the Whiting Committee considered area closures based on spawning and/or larval/juvenile concentrations of whiting. The Council rejected the proposal to manage whiting through spawning and/or juvenile area closures at this time for several reasons. First, available information about whiting spawning times and areas is incomplete. Information about the distribution of spawning fish and juveniles is only available for March/April and August/September, the times when the NEFSC conducts its annual spring and autumn trawl surveys. June, July, and August appear to be peak spawning months for whiting, so NEFSC trawl survey distributions of spawning fish miss critical spawning months.

Second, from the information that is available, it appears that a large portion of whiting spawning, egg, and larval concentrations lies within Georges Bank, but outside of Cultivator Shoal and other exempted small mesh areas. These areas have not been accessible for whiting vessels to fish for several years. Hence, a substantial amount of whiting spawning activity is already protected by both large mesh regulated areas and groundfish closed areas. For these reasons, the Council rejects the notion of managing whiting through spawning season/juvenile area closures at this time. As better information becomes available, the Council may consider implementing spawning season or juvenile area closures through a framework adjustment to the Multispecies FMP.

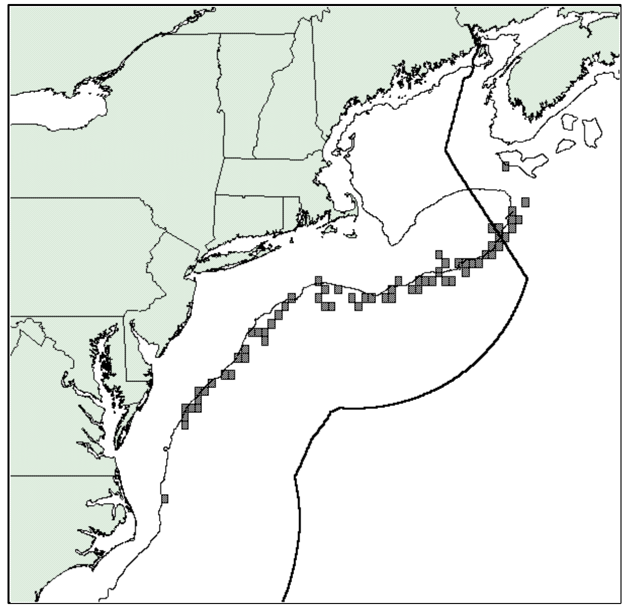
E.5.2.2.3 Essential Fish Habitat Alternatives for Offshore Hake

The following sets of maps **(Figure E.16 – Figure E.19)** represent the alternatives from which the Council chose offshore hake essential fish habitat (EFH) designations for all life stages of offshore hake. The sets of maps for the alternatives include only the "raw" distributions as reflected in the NMFS bottom trawl and MARMAP surveys. The process used by the Council to develop the set of alternatives is explained in detail in the omnibus EFH amendment (Amendment 11).

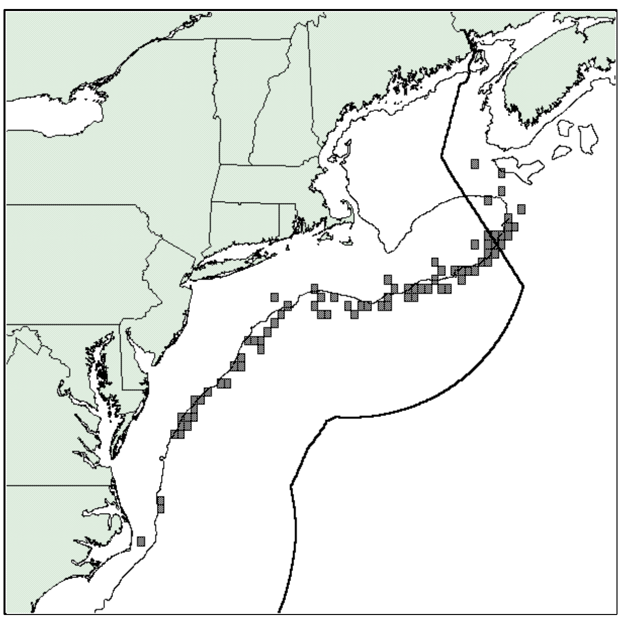
Figure E.16 EFH Designation Alternatives for Offshore Hake (*Merluccius albidus*) Eggs



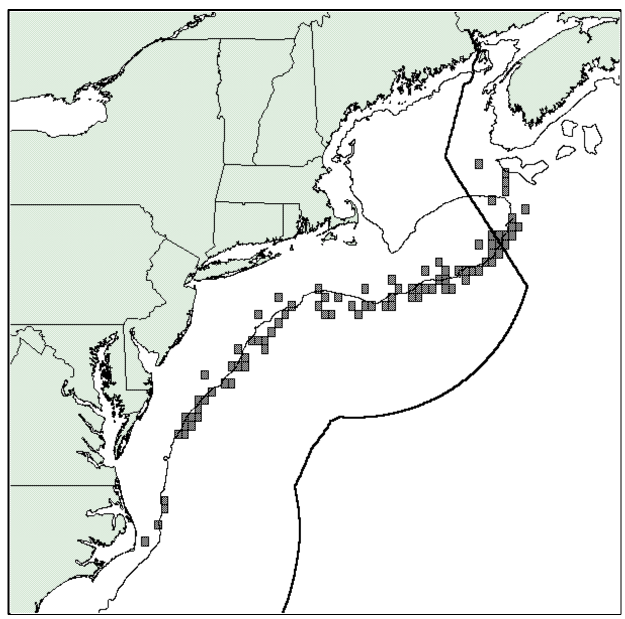
EFH alternative 1 (50%): This EFH alternative represents 50% of the observed range of offshore hake eggs.



EFH alternative 2 (75%): This EFH alternative represents 75% of the observed range of offshore hake eggs.

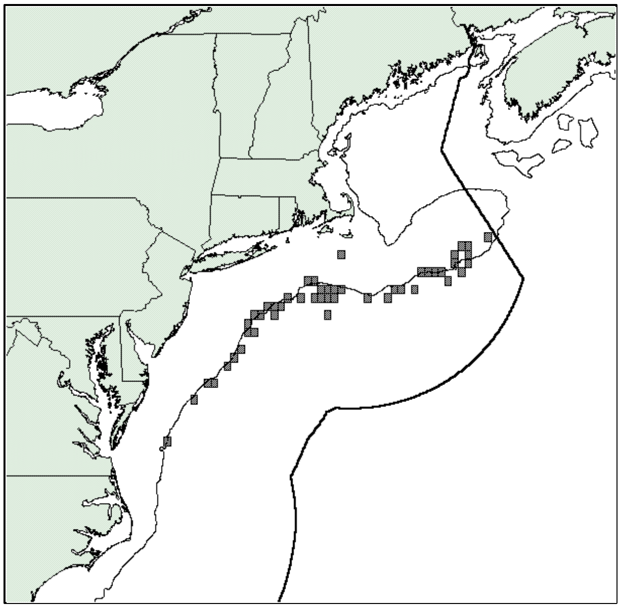


EFH alternative 3 (90%): This EFH alternative represents 90% of the observed range of offshore hake eggs.

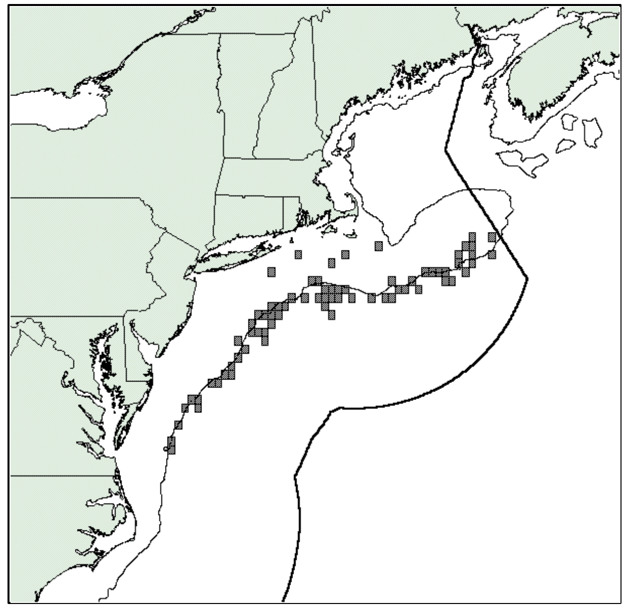


EFH alternative 4 (100%): This EFH alternative represents 100% of the observed range of offshore hake eggs.

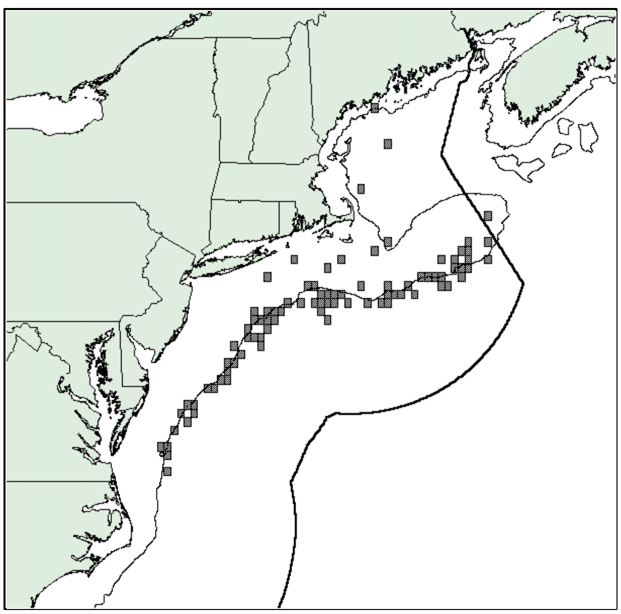
Figure E.17 EFH Designation Alternatives for Offshore Hake (*Merluccius albidus*) Larvae



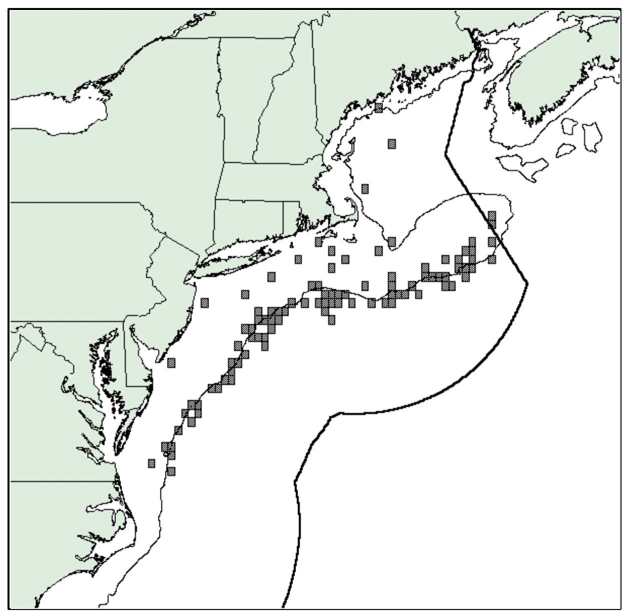
EFH alternative 1 (50%): This EFH alternative represents 50% of the observed range of offshore hake larvae.



EFH alternative 2 (75%): This EFH alternative represents 75% of the observed range of offshore hake larvae.

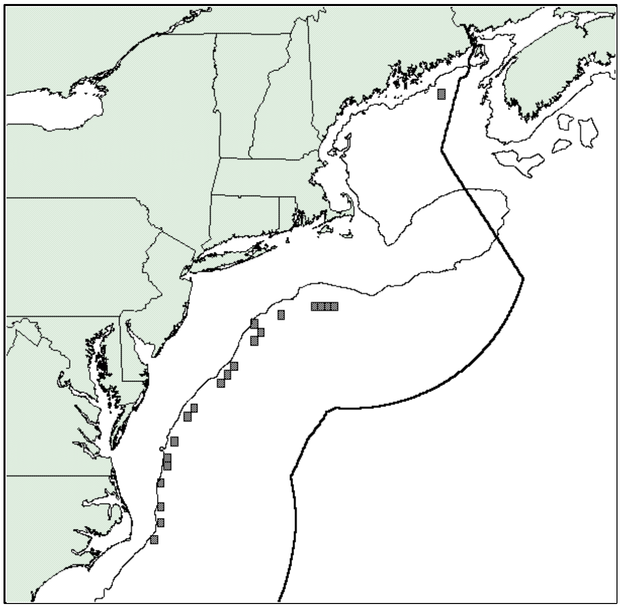


EFH alternative 3 (90%): This EFH alternative represents 90% of the observed range of offshore hake larvae.

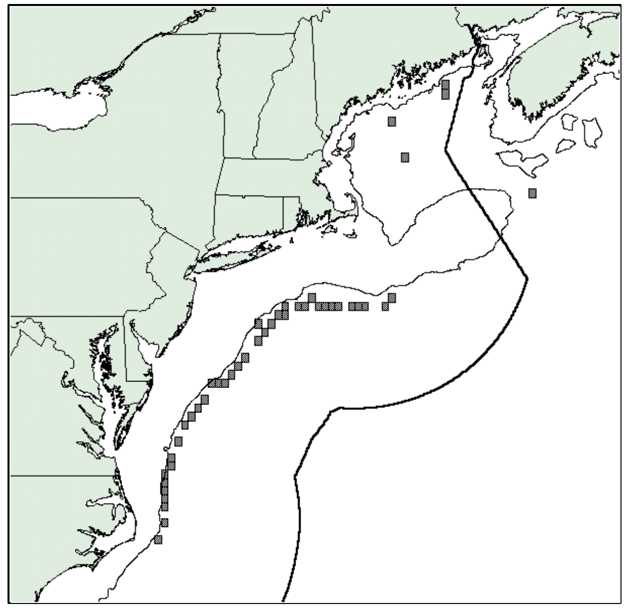


EFH alternative 4 (100%): This EFH alternative represents 100% of the observed range of offshore hake larvae.

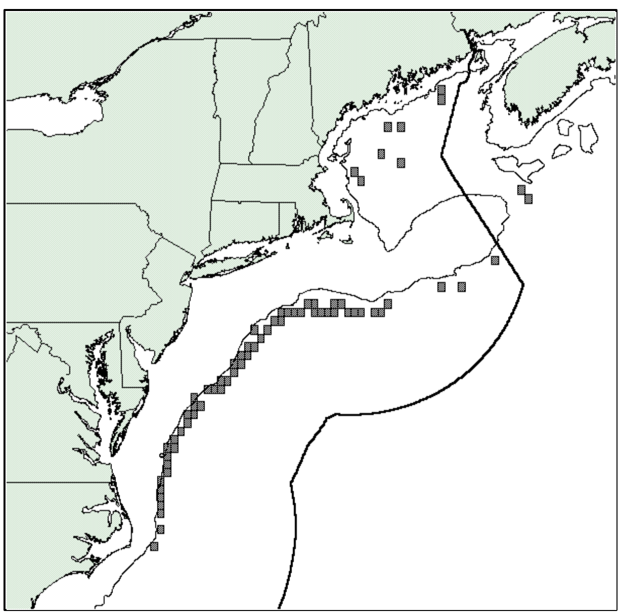
Figure E.18 EFH Designation Alternatives for Offshore Hake (*Merluccius albidus*) Juveniles



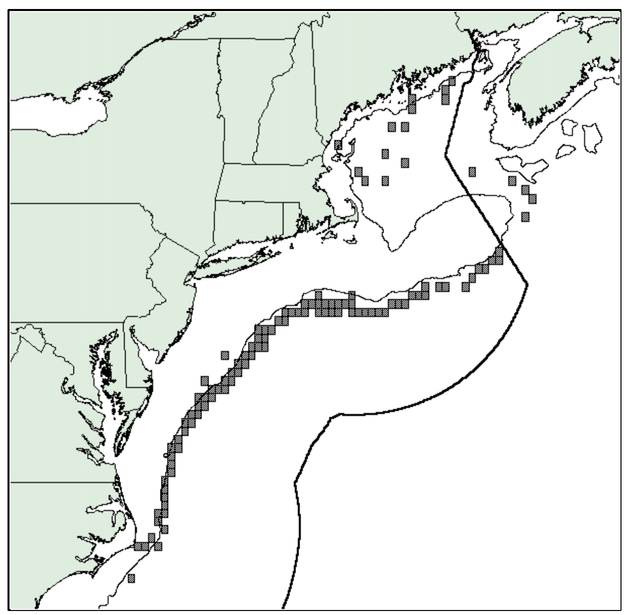
EFH alternative 1 (50%): This EFH alternative represents 19% of the observed range of offshore hake juveniles.



EFH alternative 2 (75%): This EFH alternative represents 40% of the observed range of offshore hake juveniles.

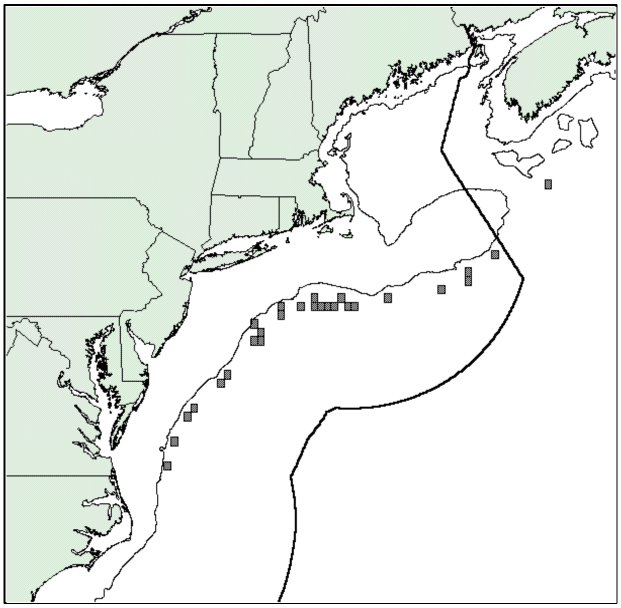


EFH alternative 3 (90%): This EFH alternative represents 62% of the observed range of offshore hake juveniles.

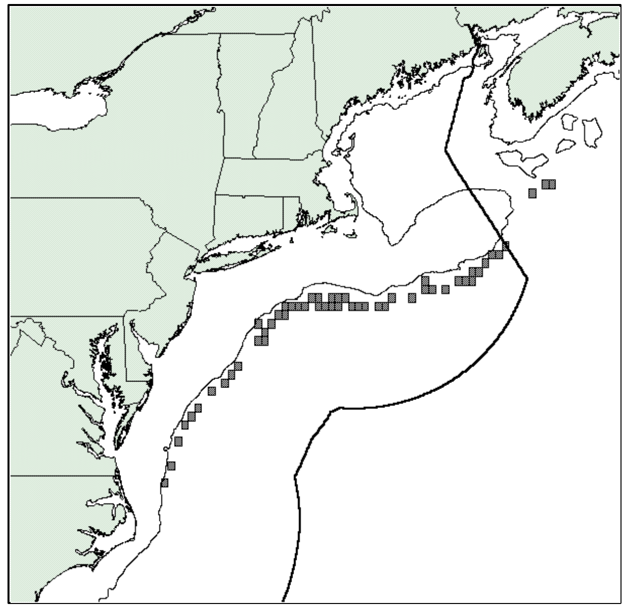


EFH alternative 4 (100%): This EFH alternative represents 100% of the observed range of offshore hake juveniles.

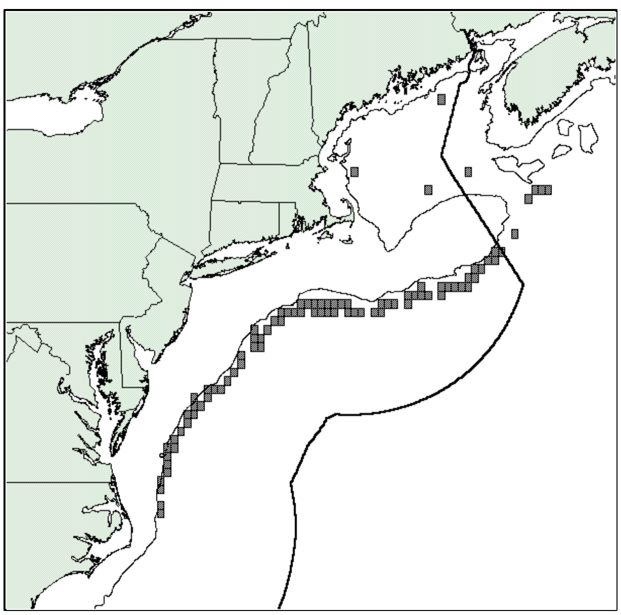
Figure E.19 EFH Designation Alternatives for Offshore Hake (*Merluccius albidus*) Adults



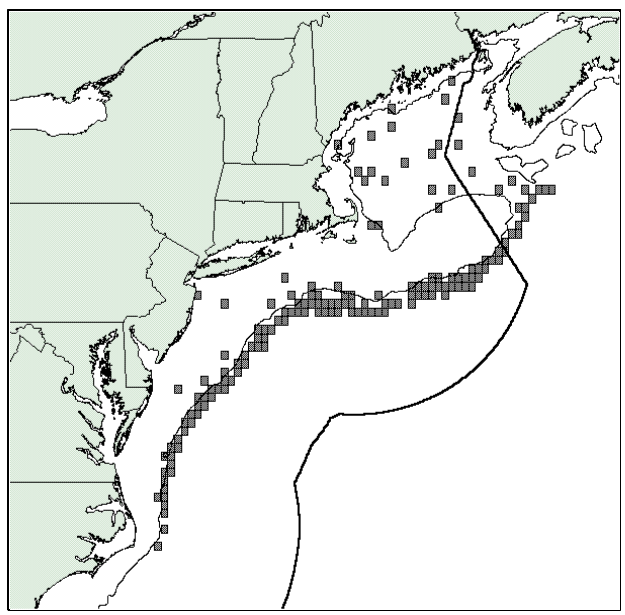
EFH alternative 1 (50%): This EFH alternative represents 17% of the observed range of offshore hake adults.



EFH alternative 2 (75%): This EFH alternative represents 34% of the observed range of offshore hake adults.



EFH alternative 3 (90%): This EFH alternative represents 55% of the observed range of offshore hake adults.



EFH alternative 4 (100%): This EFH alternative represents 100% of the observed range of offshore hake adults.

E.6.0 AFFECTED ENVIRONMENT

E.6.1 INTRODUCTION

This section is intended to provide background information for assessing the impacts of the proposed management action on related physical, biological, and human environments. It includes a description of the stocks and the physical environment of the fishery as well as life history information, habitat requirements, and stock assessments for relevant stocks and a discussion of additional biological elements such as other related commercially exploited and non-exploited species, endangered species, and marine mammals. This descriptive section also describes the human component of the ecosystem, including socioeconomic and cultural aspects of the commercial and recreational fisheries and the impacts of other human activities on the fisheries in question. Much of the information contained in this section is a compilation of information used to make choices from a range of alternatives during the development of the proposed management actions. This section should supplement and/or update information provided in the FSEIS prepared for Amendments 5 and 7.

E.6.2 DATA CONSIDERATIONS

A complete description of the data systems used in fisheries management can be found in Section E.6.1.1 of Amendment 5 and is also provided in each issue of the NEFSC publication, *Status of the Fisheries Resources of the Northeastern United States, "Status of the Stocks."* The fisheries management information system has undergone a number of changes in recent years, most notably a shift from voluntary to mandatory vessel reporting in 1994 pursuant to Amendment 5, and it continues to evolve to address changing needs and improvements. The following sections describe some of the components of the data and information systems used by the Council, in particular during the development of this amendment; the following sections also discuss some changes and improvements currently underway.

E.6.2.1 NEFSC Trawl Surveys

Research vessel surveys are designed to provide fishery-independent indices of fish abundance. Two research vessel bottom trawl surveys conducted by the NMFS Northeast Fisheries Science Center (NEFSC) represent the longest continuous time series of fishery-independent data in the U.S. waters of the Northwest Atlantic and one of the longest continuous time series of fish abundance data in the world. The autumn survey has been conducted annually since 1963, and an independent spring survey has been conducted annually since 1968. Each survey uses a stratified random sampling design that provides comprehensive coverage of continental shelf waters from Cape Hatteras, North Carolina to the Scotian Shelf off Nova Scotia.

The survey is designed to provide unbiased estimates of fish abundance. Only two research vessels, the Albatross IV and the Delaware II, have been used to conduct the survey over the past 36 years. Both sampling gear (net, footgear) and tow specifications (vessel speed, winch payout, and retrieval) have been standardized to produce comparable annual estimates of abundance within the time series. Both differences in catchability between research vessels and changes in catchability resulting from gear changes have been quantitatively evaluated through designed comparison surveys. Survey coverage extends from inshore waters (15 m) to the edge of the continental shelf (200 m) providing comprehensive coverage of the principal distributions of both silver and red hake. The distribution of offshore hake appears to extend beyond the depth range of the surveys, and this species is primarily collected in the two deepest strata sets sampled in the survey. Fixed sets of strata are used to produce indices of abundance and biomass for each stock unit (northern and southern stock units), as defined by the SAW/SARC process.

The stratified random sampling design allows estimates of stratified mean indices of abundance (number / tow) and biomass (weight (kg) / tow). In addition, the length frequencies of silver hake, red hake, and offshore hake are either completely sampled or sub-sampled when catches of an individual species are excessively large. These length frequency data can be used in conjunction with stratified mean abundance estimates to produce estimates of stratified mean number at length for each species. For some species including silver hake, red hake, and offshore hake, a sub-sample of aging material (otoliths for all three species) is collected providing the potential for estimating of the age distribution of the sample. Once otoliths are aged, the samples of ages at length can be used in conjunction with the stratified mean abundance estimates at length to estimate stratified mean number at age. These stratified mean number at age estimates are a principal data input into models (VPA, survey-based total mortality methods) used to estimate total mortality and fishing mortality.

For silver hake, aging material has been continuously collected since 1973, and otoliths have been processed and aged through the Spring 1996 survey. This allows estimation of stratified mean number at age estimates for each silver hake stock through Spring 1996. For red hake, otoliths have been archived for some period of time. Although some historical samples were aged, red hake is considered a low priority species for aging and an aging program has not been maintained for this species. Recently, otolith collections have been initiated for offshore hake collected during the NEFSC surveys. The protocol for aging this species including verification of age determinations has not been established, and no samples has been aged.

E.6.2.2 Stock Assessment Workshops

The Northeast Regional Stock Assessment Workshop (SAW) process is a partnership of the NMFS Northeast Fisheries Science Center, NMFS Northeast Regional Office, the New England Fishery Management Council, the Mid-Atlantic Fishery Management Council, and the Atlantic States Marine Fisheries Commission. The SAW objective is to produce stock assessments, perform pier reviews of those assessments, and prepare scientific advice based on the peer-reviewed assessment results for fisheries management. This is the process that provides the primary biological information used in the management and conservation of the fishery resources in the region.

For a complete discussion of the SAW process, see Section E.6.1.1.1 of Amendment 9 to the Northeast Multispecies FMP.

Twice annually, the NEFSC convenes the SAW to review the status of individual stocks as well as survey and assessment methods. The most recent assessments of the principal stocks which are the focus of this amendment were as follows:

SAW 17- Autumn, 1993	Most Recent Silver Hake Assessment
SAW 11- Autumn, 1990	Most Recent Accepted Silver Hake Virtual Population Analysis (VPA)
SAW 11- Autumn, 1990	Most Recent Red Hake Assessment

Offshore hake has never been assessed through the SAW process.

E.6.2.3 NMFS Strategic Plan for Research

In response to an SFA mandate, NMFS has recently published a national "Strategic Plan for Fisheries Research," which outlines the agency's goals and objectives for research in all areas, including biology and population dynamics, ecology, conservation engineering, information management, and socio-economic aspects of the fishery. The report also contains specific regional research priorities for the NEFSC, which will result in programs to improve collection, management, and analysis of data specific to fisheries in this region.

E.6.2.4 Atlantic Coastal Co-operative Statistics Program

NMFS and the Council are participating in the Atlantic Coastal Co-operative Statistics Program (ACCSP) along with the Atlantic States Marine Fisheries Commission, coastal state fishery agencies and the U.S. Fish and Wildlife Service. The ACCSP is a cooperative state-federal marine and coastal fisheries data collection program. It is intended to coordinate present and future marine and coastal data collection and data management activities through cooperative planning, innovative uses of statistical theory and design, and consolidation of appropriate data into a useful database system.

The mission of the ACCSP is to cooperatively collect, manage, and disseminate fishery statistical data and information for the conservation and management of fishery resources for the Atlantic coast and to support the development and operation of a national program.

The four goals of the ACCSP are:

(1) plan, manage, and evaluate a cooperative, coordinated, cost-effective, dependable, non-duplicative and accurate state-federal marine and coastal fisheries data collection program for the Atlantic coast in which the general public, fishermen, and fisheries managers have confidence;

(2) undertake a unified state-federal marine and coastal fisheries data collection system for the Atlantic coast, including both commercial and recreational sectors, to provide to the general public, fishermen, fisheries managers and stock assessment biologists, the best scientific and technical data needed for effective management on a timely basis;

(3) establish and maintain an integrated cooperative coast-wide fisheries data management system among all Atlantic Coastal states from Maine to Florida, the regional fishery management councils, the National Marine Fisheries Service, the US Fish and Wildlife Service and other state or federal agencies involved in the collection, compilation, and management of marine, estuarine, anadromous and catadromous fisheries statistics; and

(4) support the continued development and operation of a national system to collect, manage, and disseminate marine fisheries information for use by states, councils, interstate commissions, and federal marine fishery management agencies using the existing regional programs as building blocks.

Development of the ACCSP began in 1996 and implementation was scheduled for September, 1998.

E.6.2.5 Data Considerations Specific to this Amendment

As previously discussed, adequate scientific information for the stocks managed under this amendment is lacking. During the development of this amendment, the Whiting PDT and the Council identified several analysis/research needs for whiting, offshore hake, and red hake. Until this information becomes available, uncertainty in the scientific data on which to base management actions for these stocks will constrain the ability of the Council to take appropriate management actions. In addition, effective monitoring and recommendations for appropriate annual adjustments (by the Whiting Monitoring Committee) during Years 1 – 3 hinge on the availability of the information listed below. The most important data needs are as follows (not listed in order of priority, although silver hake and red hake take priority over offshore hake):

A. For silver hake, the catch-at-age data (commercial length and age samples, sea sampled discard rates and biological samples) collected since SAW 17 should be investigated to see if there is sufficient discard and sampling information to complete an assessment for both silver hake stocks. This recommendation directly addresses one of the impediments to completing a silver hake stock assessment at SAW 17. Without this information, recent silver hake stock sizes will remain uncertain.

B. Stock identification remains a considerable source of uncertainty in the stock assessment. Silver hake tissue samples have been collected during NEFSC research vessel surveys to provide genetic information on stock identification as recommended during SAW 17. The Council recommends that genetic identification work on these samples be initiated as soon as possible in order to resolve silver hake stock identification issues.

C. Updated stock assessment information and stock identification work is also needed for red hake stocks in U.S. waters. At this time, age samples are collected from red hake during NEFSC research vessel surveys, but are not currently analyzed. Analysis of these samples would allow estimation of survey based estimates of total and fishing mortality. There are similar stock identification questions for red hake, although no stock identification work has been initiated for this species.

D. Updated ("benchmark") assessments of silver hake and red hake should also provide adequate information to estimate MSY and develop biological reference points consistent with the national standard guidelines.

E. The Council recommends that analysis of existing otolith samples for offshore hake be initiated. These data are necessary to improve the calculation of growth rates which, in turn, will facilitate the calculation of reference points necessary to draft an overfishing definition as required by the FCMA.

F. The Council recommends that offshore hake be assessed through the SAW process.

G. Collection of biological data (survey age samples, commercial length and age samples) should be initiated for offshore hake. Information is necessary to facilitate the calculations of species-specific biological reference points and to assess stock status.

In addition, the Council has identified several other research needs in order to resolve areas of controversy and other issues that arose during the development of this amendment. Most of these needs focus on gear selectivity research and do not pertain to stock assessments or research conducted through the NEFSC. However, these needs may be addressed through sea sampling or the development of experimental fisheries. The industry may lend a hand to obtaining some of the following information. Specifically, the Council is seeking answers to the following questions:

- What is the selectivity (of both whiting and squid) associated with 1-7/8 inch mesh?
- Is 1-7/8 inch mesh the appropriate mesh size for squid?
- What is the appropriate mesh size for whiting?
- Can gear be developed to reduce the incidental catch of small mesh multispecies in the squid fishery (for example, a composite net)? In other small mesh fisheries?

E.6.3 PHYSICAL ENVIRONMENT

E.6.3.1 Habitat Description

A complete description of the physical environment in the Gulf of Maine, Georges Bank, and portions of the Continental Shelf south of New England is contained in Section E.6.2.1 the FSEIS for Amendment 5 to the Northeast Multispecies FMP. The following section contains additional information about the Mid-Atlantic region to Cape Hatteras because whiting and red hake generally tend to be distributed further south than other groundfish species.

E.6.3.1.1 Middle Atlantic Region (Cape Cod to Cape Hatteras)

The coastal zone of the middle Atlantic states varies from a glaciated and rugged coastline from Cape Cod south to the New York Bight; further south the coast is bordered by a 160 km wide plain. Along the coastal plain, the beaches of the outer banks and barrier islands are wide, gently sloped and sandy, with gradually deepening offshore waters. The area is characterized by a series of sounds, broad estuaries, large river basins (e.g. Connecticut, Hudson, Delaware and Susquehanna), and barrier islands. Conspicuous estuarine features are Narragansett Bay, Long Island Sound, the Hudson River, Delaware Bay, Chesapeake Bay, and the nearly continuous band of estuaries behind outer banks and barrier islands along southern Long Island, New Jersey, Delaware, Maryland, Virginia and North Carolina. The complex estuary of Currituck, Albemarle, and Pamlico Sounds behind the Outer Banks o Cape Hatteras (covering an area of 6,500 km^2 or 2,500 square miles, with 150,000 acres of salt marsh) is an important feature of the region. Chesapeake Bay is the largest estuary in the U.S., draining 64,000 square miles of land in five states, and includes almost 300,000 acres of salt marsh and 100,000 acres of tidal flats. Coastal marshes border small estuaries in Narragansett Bay and all along the glaciated coast from Cape Cod around Long Island Sound. Nearly continuous marshes occur along the shores of the estuaries behind the outer banks and around Delaware Bay. As a whole, this region contains more than 3,500 square miles of wetlands, one-third of which are in Chesapeake Bay. Middle

Atlantic coastal plain estuaries are characteristically shallow and subject to strong tidal circulation, thus creating ideal conditions for biological productivity.

At Cape Hatteras, the shelf extends seaward approximately 33 km, then widens gradually to 113 km off New Jersey and Rhode Island. It is intersected by numerous underwater canyons. Surface circulation north of Cape Hatteras is generally southwesterly during all seasons, although this may be interrupted by coastal indrafting and some reversal of flow at the northern and southern extremities of the area. Speeds of the drift are on the order of 9 km per day. There may be a shoreward component to this drift during the warm half of the year and an offshore component during the cold half. The Gulf Stream is located about 160 km offshore of Cape Hatteras, but becomes less discrete and veers to the northeast north of the cape. Surface currents as high as 200 cm per second (4 knots) have been measured in the Gulf Stream off Cape Hatteras.

Hydrographic conditions in the mid-Atlantic region vary seasonally due to river runoff and warming in spring and cooling in winter; the water column becomes increasingly stratified in the summer and homogenous in the winter due to fall-winter cooling of surface waters. In winter, mean minimum and maximum sea surface temperatures are 0° and 7°C off Cape Cod and 1° and 14°C off Cape Charles (at the end of the Delmarva Peninsula); in summer, the mean minimums and maximums are 15° and 21°C off Cape Cod, and 20° and 27°C off Cape Charles. The tidal range averages slightly over one meter on Cape Cod, decreasing to a meter at the tip of Long Island and on the Connecticut shore. Westward within Long Island tide ranges gradually increase, reaching two meters at the head of the Sound and in the New York Bight. South of the bight, tidal ranges decrease gradually to slightly over a meter at Cape Hatteras.

The waters of the coastal middle Atlantic region have a complex and seasonally dependent circulation pattern. Seasonally varying winds and irregularities in the coastline result in the formation of a complex system of local eddies and gyres. Surface currents tend to be strongest during the peak river discharge period in late spring and during periods of highest winds in the winter. In late summer, when winds are light and estuarine discharge is minimal, currents tend to be sluggish, and the water column is generally stratified.

E.6.3.2 Weather

One of the most frequently mentioned physical environmental parameters affecting fishing is the weather. High winds, waves, and extremely low temperatures can create extremely hazardous conditions, ranking commercial fishing among the most dangerous occupations in the world. Section E.6.2.2 of the FSEIS for Amendment 5 contains a complete description of weather patterns affecting the fisheries in question as well as southern New England and the Northeast region.

E.6.4 BIOLOGICAL ENVIRONMENT

E.6.4.1 Geographic Species Assemblages and the Multispecies Fishery

Cluster analysis of NEFSC bottom trawl survey data from 1967-1988 was used to identify persistent spatial boundaries and species membership of groundfish assemblages over the continental shelf between Cape Hatteras and Nova Scotia (see Section E.6.3.1 of Amendment 5).

E.6.4.2 Stocks Under the Multispecies Fishery Management Plan

E.6.4.2.1 Life Histories and Habitat Requirements

A description of all stocks managed under the Multispecies FMP can be found in Section E.6.3.2 of Amendment 5. The most recent biomass distributions of the three species addressed in this amendment according to the NEFSC bottom trawl survey are shown in **Figure E.20 – Figure E.25**.

Figure E.20 Silver Hake Biomass Distribution: NEFSC Autumn Survey, 1995 – 1997

Figure E.21 Silver Hake Biomass Distribution: NEFSC Spring Survey, 1995 – 1997

Figure E.22 Offshore Hake Biomass Distribution: NEFSC Autumn Survey, 1995 – 1997

Figure E.23 Offshore Hake Biomass Distribution: NEFSC Spring Survey, 1995 – 1997

Figure E.24 Red Hake Biomass Distribution: NEFSC Autumn Survey, 1995 – 1997

Figure E.25 Red Hake Biomass Distribution: NEFSC Spring Survey, 1995 – 1997

E.6.4.2.1.1 Silver Hake

For a complete description of the information available about silver hake life history and habitat requirements, see the FMP EFH Source Document for Silver Hake, which was submitted with Amendment 10 to the Multispecies FMP (EFH Amendment).

Silver hake (*Merluccius bilinearis*, whiting) is a widely distributed, slender, swiftly swimming species whose range extends from Newfoundland to South Carolina. The center of silver hake species abundance lies between Nova Scotia and the New York Bight. Two stocks have been identified based on morphological differences; one extends from the Gulf of Maine to northern Georges Bank (the northern stock), and the second occurs from southern Georges Bank to the Mid-Atlantic area (the southern stock). Silver hake generally occur at depths less than 200 meters, but they can be found at a variety of depths from the shoreline to as great as 900 meters. Silver hake prefer water temperatures between 6 and 18^{o} C and undertake extensive seasonal migrations (Collette and Klein-MacPhee MS 1992). Stock aggregation and movement within these broad depth and temperature ranges appear to be related to the distribution and availability of food organisms, hydrographic conditions, and spawning requirements.

Generally, adult silver hake over-winter offshore along the continental shelf and slope, migrate to shallower waters in the spring and summer to spawn, and then return to their wintering areas in the autumn (Helser et al 1996). Peak spawning occurs earlier in the southern stock (May and June) than in the northern stock (July and August). Major spawning areas include the coastal region of the Gulf of Maine from Cape Cod to Grand Manan Island, southern and southeastern Georges Bank, and the Southern New England area south of Martha's Vineyard. More than 50% of age 2 fish (20 to 30 cm, 8 to 12 in.) and nearly all age 3 fish (25 to 35 cm, 10 to 14 in.) are sexually mature (O'Brien et al. 1993). Eggs are buoyant and hatch within 2 to 3 days of fertilization. Larval silver hake appear to be passive plankters until reaching a size of approximately 20 mm when they become able to migrate vertically within the water column in search of preferred water temperatures and prey (Collette and Klein-MacPhee MS 1992).

As juveniles, silver hake feed primarily on small crustaceans such as copepods, amphipods, and euphausiids (Bowman 1981). After reaching about 20 cm in length, their diet shifts to primarily fish, squid, and decapod shrimp (Bowman 1984). Feeding occurs mainly at night. Silver hake growth is initially quite rapid. After reaching 25 cm in length, however, growth rates for males and females begin to diverge, with females growing more rapidly and achieving a larger maximum size (Hunt 1980). Silver hake can grow to a maximum length of about 65 cm (26 in.). Ages up to 15 years have been reported, but few fish beyond age 6 have been observed in recent years. Instantaneous natural mortality is assumed to be 0.4 (33% annual mortality rate due to natural causes). Helser (1996) updated the Von-Bertalanffy growth parameter estimates for both silver hake stocks which are listed in **Table E.7**. The growth parameter estimates were calculated by averaging estimates from different regions (Gulf of Maine, Northern Georges Bank, Southern Georges Bank, and the Mid-Atlantic).

E.6.4.2.1.2 Offshore Hake

A full description of available information regarding offshore hake life history and habitat requirements is given in **Appendix V,** *Comparative Biology of Two Sympatric Hake Species of the Genus, Merluccius, off the Northeastern Continental Shelf of the United States: Offshore Hake and Silver Hake* (Thomas Helser, Report to the New England Fishery Management Council).

Generally, offshore hake (*Merluccius albidus*, blackeye whiting) co-occur with silver hake over the continental shelf and slope of the northwest Atlantic Ocean. However, they are frequently sampled in bottom trawl surveys conducted by the Canadian Department of Fisheries and Oceans as far north as the Laurentian Trench. The southern distribution of offshore hake has been reported as far as Cape Canaveral, Florida between depths of 200-600 meters. Additionally, a possible record from Tortugas, Florida suggests that they may be distributed around Florida and into the Gulf of Mexico. Spring and autumn NEFSC bottom trawl survey data suggest that offshore hake may be distributed more extensively along the continental shelf than silver hake. They occur in several deep basins in the Gulf of Maine; for example, during spring surveys from 1968-1981, more than 100 fish were sampled at several Gulf of Maine stations. Unlike silver hake, offshore hake are found primarily along the 200 meter depth contour (the deepest extent of NEFSC survey coverage) during spring and autumn.

Very little information on life history is available for offshore hake. Similar to silver hake, offshore hake appear to have a protracted spawning season with peak spawning activity occurring around June and July. However, larvae have been detected from October through January, suggesting that offshore hake may spawn year-round or irregularly from year to year. Significant concentrations of larvae usually appear just inside the 200 meter depth contour from the Delaware Bay to southern Georges Bank. During the late summer and early autumn, offshore hake larvae concentrations are almost exclusively restricted to outer continental shelf waters. While silver hake seem to prefer spawning areas around southern Georges Bank, Nantucket Shoals, and the Middle Atlantic Bight, offshore hake appear to prefer spawning along the outer continental shelf. The size of both offshore hake eggs and newly hatched larvae seems to be larger than that of silver hake.

While studies of silver hake sexual maturity in U.S. waters have been conducted, very little is known about the reproductive biology of offshore hake. Bigelow and Schroeder (1955) reported the presence of ripe offshore hake females, up to 71 cm in length, sampled in deep waters off Long Island, New York and Martha’s Vineyard. They also suggest that offshore hake feeding habits are similar to those of European hake (*Merluccius merluccius*); stomach contents of both species consisted of myctophids, snipe eels, and squid. Unfortunately, no detailed maturity data has been collected through NEFSC surveys. Therefore, most analyses of offshore hake in the northeastern U.S. have been based on extrapolations from DFO data and comparisons by analogy. Although both silver hake and offshore hake males appear to mature at smaller sizes than females, both sexes of silver hake mature at smaller sizes than offshore hake. Length at 50% maturation (L_{50}) for female offshore hake was estimated at about 30 cm (versus about 26 cm for female silver hake).

E.6.4.2.1.3 Red Hake

For a complete description of the information available about red hake life history and habitat requirements, see the FMP EFH Source Document for Red Hake, submitted with Amendment 10 to the Multispecies FMP (EFH Amendment).

Red hake (*Urophycis chuss*, ling, mud hake) are distributed from the Gulf of St. Lawrence to North Carolina but are most abundant between Georges Bank and New Jersey. Although the stock structure of this species is not clearly defined, it appears that there are possibly two stocks, divided similar to silver hake. Research vessel trawl surveys indicate the red hake have a broad geographic and depth distribution throughout the year, undergoing extensive seasonal migrations. Red hake over-winter in the deep waters of the Gulf of Maine and along the outer continental shelf and slope south and southwest of Georges Bank. They are most prevalent in relatively deep water and appear to prefer sandy or muddy bottoms (Collette and Klein-MacPhee MS 1992). Adult fish seem to prefer water temperatures between 5 and 12^{o} C.

Spawning occurs primarily between May and November, with major spawning areas located on the southwest part of Georges Bank and in the southern New England area south of Montauk Point, Long Island. Red hake prefer to spawn in waters ranging from 5 to 10^{o} C. Red hake eggs are small, buoyant, and pelagic; hatching occurs within 3 days to approximately 1 week in normal spawning water temperatures (Collette and Klein-MacPhee MS 1992). Juvenile red hake remain pelagic for the first months of life, becoming demersal after reaching approximately 30 mm. After settling to the bottom, juvenile red hake are often found within the mantle cavities of sea scallops (*Placopecten magellanicus*). They maintain this symbiotic association with scallops until they are about 100 mm in length.

As planktonic larvae and juveniles, red hake feed largely on copepods and other small crustaceans. Demersal red hake also feed on crustaceans (decapod shrimp, euphausiids, amphipods, crabs), but as they become adults, they feed more extensively on fish (Collette and Klein-MacPhee MS 1992).

Red hake reach a maximum length of approximately 50 cm (19.7 inches). They are also relatively short-lived fish, reaching a maximum age of about 12 years. However, few fish survive beyond the age of 8. Von-Bertalanffy growth parameters for red hake were calculated by Penttila et al. (1989) and are listed in **Table E.7**. Instantaneous natural mortality is assumed to be 0.4 (33% annual mortality rate due to natural causes). In general, red hake reach maturity at an age of 1.7 to 1.8 years (25 to 27 cm) for females and 1.4 to 1.8 years (22-24 cm) for males (O'Brien et al. 1993).

Table E.7 Von-Bertalanffy Growth Parameters for Silver Hake, Red Hake, and Offshore Hake Stocks

NOTE: L (inf) is the theoretical maximum (asymptotic) size (in cm) as predicted by the growth curve. K is a unitless growth coefficient (the rate at which L (inf) is approached. t_0 is the hypothetical age at which length would be zero.

SPECIES/STOCK	L (inf)	K	t_0
Silver Hake – Gulf of Maine/Northern Georges Bank	43.68	0.377	0.127
Silver Hake – Southern Georges Bank/Mid-Atlantic	40.48	0.449	0.323
Red Hake	60.19	0.191	-0.836
Offshore Hake	N/A	N/A	N/A

E.6.4.2.2 Stock Assessment Information

The following sections are excerpted from the NMFS publication, Status of Fisheries Resources of the Northeastern United States, 1996.

NOTE: The following discussion uses the terms "over-exploited," "fully exploited" and "under-exploited" to describe the stock condition relative to historical patterns and fishing effort. These terms are distinct from and not to be confused with the term "overfished" as defined by the current overfishing definition.

E.6.4.2.2.1 Silver Hake

Gulf of Maine/Northern Georges Bank Silver Hake

The NEFSC autumn bottom trawl survey biomass index declined during the period of heavy exploitation by distant-water fleets, reaching a minimum in 1967 – 68. With the appearance of the strong 1973 and 1974 year classes, biomass indices increased during the mid-1970s, but declined slightly during the late 1970s. Biomass indices have again increased since 1980 and recent recruitment appears to be at or above that of the mid-1970s **(Figure E.26)**.

During 1973-1982, fishing mortality rates on fully recruited fish (age 3+) derived from virtual population analysis (VPA) fluctuated between 0.38 and 1.1, and generally increased from 1982 (0.45) through 1988 (0.70). Although VPA fishing mortality estimates are not available for subsequent years, total mortality estimates based on NEFSC survey abundance indices suggest that since 1992 fishing mortality has doubled, from about 0.7 (42% exploitation rate) to 1.4 (65% exploitation rate).

Substantial mortality of age 1 and 2 (<25 cm) fish has occurred through discarding in the large mesh (>5.5 inch mesh) and small mesh (<3.5 inch mesh) otter trawl fisheries and in the northern shrimp fishery. Annual discard estimates over the 1989-1992 period ranged from 1,700 mt to 7,200 mt. In terms of numbers of fish, the quantities of discarded silver hake have been quite large, ranging from 17 million to 76 million fish per year. This high discard mortality on juvenile fish results in substantial losses in long term yield and spawning biomass.

Bottom trawl survey indices suggest that biomass has remained at or above pre-1975 levels over the past 15 years, but substantial increases in recruitment in recent years have not translated into an increase in mature fish biomass (age 3+). Until this inconsistency is resolved, the precise level of exploitation remains uncertain. However, since it is not likely that fishing mortality will decline substantially in the near future to below the overfishing definition level ($F_{31\%}$ = 0.36, 25% exploitation rate), and given the rapid removal of recruits from the stock in recent years, this stock must be considered overexploited.

Table E.8 Summary of Most Recent Assessment of Gulf of Maine/Northern Georges Bank Stock of Silver Hake

Gulf of Maine - Northern Georges Bank Silver Hake		
Long-term potential catch	=	Unknown
SSB for long-term potential catch	=	Unknown
Importance of recreational fishery	=	Insignificant
Management	=	Multispecies FMP
Status of exploitation	=	Overexploited
Age at 50% maturity	=	1.7 years (both sexes)
Size at 50% maturity	=	22.3 cm (8.8 in.), males 23.1 cm (9.1 in.), females
Assessment level	=	Index
Overfishing definition	=	31% MSP
Fishing mortality rate corresponding to overfishing definition	=	**$F_{31\%}$ = 0.36**
M = 0.40 **$F_{0.1}$ = 0.39**		**F_{1996} > 1.0**

Figure E.26 Survey Indices and Abundance Estimates for the Gulf of Maine/Northern Georges Bank Stock of Silver Hake

Southern Georges Bank/Mid-Atlantic Silver Hake

The NEFSC autumn bottom trawl survey biomass index for the southern stock of silver hake has declined by over 50% since 1985, and survey indices in the past three years have been at or near record lows **(Figure E.27)**.

Between 1955 and 1962, fishing mortality was relatively low, ranging from 0.09 to 0.41 (average = 0.24, 18% exploitation rate). With increased effort by distant-water fleets, F rose rapidly and reached 0.98 in 1965. Fishing mortality decreased to 0.5 (33% exploitation rate) during 1978-1980 and then again increased to over 1.0 (54% exploitation rate) during 1983-1987. Although VPA estimates of fishing mortality and stock size are not available from 1988 onward, total mortality estimates based on NEFSC survey data suggest that F has been close to 1.2 (60% exploitation rate) in recent years.

Significant mortality of age 1 and 2 (<25 cm) fish has occurred through discarding in the large mesh (>5.5 inch mesh) and small mesh (<3.5 inch) otter trawl fisheries. Annual discard estimates over the 1989-1992 period ranged from 1,300 mt to 10,000 mt. The estimated numbers of fish discarded have been quite high, ranging from 10 million to 81 million fish per year. This high discard mortality on juvenile fish results in substantial losses in long term yield and spawning biomass.

NEFSC bottom trawl survey results indicate that stock abundance is low and continues to decline. Age structure of the population is severely truncated, with few fish older than age 4. Although landings are relatively low compared to historical levels, F has steadily increased since 1980, generally exceeding 1.0 during the 1990s. Fishing mortality remains far above the level corresponding to the overfishing definition ($F_{42\%}$ = 0.34, 24% exploitation rate). The stock is overfished and will remain so until the exploitation pattern is improved (i.e., catches of juveniles are minimized), and fishing mortality is markedly reduced.

Figure E.27 Survey Indices and Abundance Estimates for the Southern Georges Bank/Mid-Atlantic Stock of Silver Hake

Table E.9 Summary of Most Recent Assessment of the Southern Georges Bank/Mid-Atlantic Stock of Silver Hake

Southern Georges Bank - Middle Atlantic Silver Hake		
Long-term potential catch	=	Unknown
SSB for long-term potential catch	=	Unknown
Importance of recreational fishery	=	Minor
Management	=	Multispecies FMP
Status of exploitation	=	Overexploited
Age at 50% maturity	=	1.6 years (both sexes)
Size at 50% maturity	=	22.7 cm (8.9 in.), males 23.2 cm (9.1 in.), females
Assessment level	=	Index
Overfishing definition	=	42% MSP
fishing mortality rate corresponding to overfishing definition	=	**$F_{42\%}$ = 0.34**
M = 0.40 **$F_{0.1}$ = 0.45**		**F_{1996} > 1.0**

E.6.4.2.2.2 Offshore Hake

Offshore hake has never been assessed through the SAW process. NEFSC spring and autumn survey indices are displayed in **Figure E.28**.

Figure E.28 NEFSC Survey Indices for Offshore Hake

E.6.4.2.2.3 Red Hake

Gulf of Maine/Northern Georges Bank Red Hake

The NEFSC autumn bottom trawl survey biomass index increased steadily from the early 1970s to a peak in 1989, the highest value in the time series. This index has declined somewhat during the past five years, although values remain high **(Figure E.29)**. This decline does not appear to be fishery-related given the low level of landings. Survey data indicate that most year classes of red hake since 1985 have been moderate, but with low landings these year classes have been sufficient to maintain stock biomass at moderate to high levels. This stock is underexploited and could support substantially higher catches.

Table E.10 Summary of Most Recent Assessment of Gulf of Maine/Northern Georges Bank Red Hake

Gulf of Maine - Northern Georges Bank Red Hake			
Long-term potential catch		=	Unknown
Importance of recreational fishery		=	Insignificant
Management		=	Multispecies FMP
Status of exploitation		=	Underexploited
Age at 50% maturity		=	1.4 years, males 1.8 years, females
Size at 50% maturity		=	22 cm (8.7 in.), males 27 cm (10.6 in.), females
Assessment level		=	Yield per recruit
Overfishing definition		=	3-year moving average of NEFSC autumn bottom trawl survey index falls within lowest quartile of the time series
Fishing mortality rate corresponding to overfishing definition		=	N/A
M = 0.4	**$F_{0.1}$ = 0.5**	**F_{max} = None**	**$F_{1996} < F_{0.1}$**

Figure E.29 Autumn Survey Indices and Abundance Estimates for the Gulf of Maine/Northern Georges Bank Stock of Red Hake

Southern Georges Bank/Mid-Atlantic Red Hake

The NEFSC autumn survey biomass index declined from 1963-1967 and was subsequently relatively constant between 1968 and 1982. The index then declined to a record low in 1987. From 1988 to 1991, the survey index increased, but has since dropped sharply to historically low levels **(Figure E.30)**. The declining trend in survey values from 1983 onward does not appear to be fishery related; landings during the past decade have been very low (less than 2,000 mt per year) compared with the late 1960s and early 1970s (more than 20,000 mt in most years) when the survey index was stable. However, this stock is considered to be overexploited according to the existing overfishing definition.

Table E.11 Summary of Most Recent Assessment of Southern Georges Bank/Mid-Atlantic Red Hake

Southern Georges Bank - Middle Atlantic Red Hake			
Long-term potential catch		=	Unknown
Importance of recreational fishery		=	Minor
Management		=	Multispecies FMP
Status of exploitation		=	Overexploited
Age at 50% maturity		=	1.8 years, males 1.7 years, females
Size at 50% maturity		=	24 cm (9.5 in.), males 25 cm (9.8 in.), females
Assessment level		=	Yield per recruit
Overfishing definition		=	3-year moving average of NEFSC autumn bottom trawl survey index falls within lowest quartile of the time series
Fishing mortality rate corresponding to overfishing definition		=	N/A
M = 0.4	**$F_{0.1}$ = 0.5**	**F_{max} = None**	**F_{1996} = Unknown**

Figure E.30 Autumn Survey Indices and Abundance Estimates for the Southern Georges Bank/Mid-Atlantic Stock of Red Hake

E.6.4.3 Other Stocks

In addition to the stocks covered under the Multispecies FMP, there are a number of other commercially valuable species in the region, some of which are managed by plans developed by the NEFMC, MAFMC, or the ASMFC, or are regulated by individual states, and others which are not regulated at this time even though they are fished commercially. In some cases, the species are caught with the same or similar gear and vessel types as those used to catch small mesh species (squid, mackerel, and scup, for example). The interaction of these species with small mesh species may be direct (through the gear or as a bycatch fishery) or indirect (through ecosystem interactions or habitat similarities). **Table E.12** lists other commercially exploited species that interact with small mesh multispecies.

Table E.12 Commercially Exploited Species in the Northeast and the Mid-Atlantic (other than those included in the Multispecies FMP) which Interact with Small Mesh Multispecies. ***Also noted are the responsible management agency and the most recent assessment of stock status.***

SPECIES	MANAGEMENT AGENCY	ABUNDANCE LEVEL	STATUS
Summer Flounder	MAFMC/ASMFC	Medium	Overexploited
Atlantic Mackerel	MAFMC	High	Underexploited
Scup	MAFMC/ASMFC	Low	Overexploited
Atlantic Herring	NEFMC	High	Underexploited
Butterfish	MAFMC	Medium	Underexploited
Goosefish (Monkfish)	NEFMC/MAFMC	Low	Overexploited
Northern Shrimp	ASMFC	Medium	Overexploited
Spiny Dogfish	NEFMC/MAFMC	High	Overexploited
Black Sea Bass	MAFMC/ASMFC	Low	Overexploited
Squid (Illex)	MAFMC	Medium	Fully Exploited
Squid (Loligo)	MAFMC	Medium	Fully Exploited

Source: Status of the Stocks, 1996

E.6.4.4 Marine Mammals and Other Protected Species

See Volume I of the FSEIS for Amendment 5 to the Northeast Multispecies FMP (Section E.6.3) for a list of threatened, endangered, and other marine mammal species that are likely to occur within the waters governed by the FMP, and the National Marine Fisheries Service Biological Opinion issued on November 30, 1993; also see Volume I of the FSEIS for Amendment 7 to the Multispecies FMP (Section E.6.3.4), the associated Biological Opinion issued by NMFS on February 16, 1996, and the Biological Opinion issued on December 13, 1996 following an unusual right whale mortality event earlier in that year.

Further information may be found in stock assessment reports prepared by NMFS pursuant to Section 117 of the Marine Mammal Protection Act (MMPA) for all marine mammal species in the U.S. Atlantic Ocean and in the Gulf of Mexico. The initial stock assessments were presented in Blaylock, *et. al*. (1995) and are updated in Waring, *et. al.* (1997). The reports present information on stock definition and geographic range, population size and productivity rates, and known impacts. The most recent information on sea turtle status is contained in the 1995 and 1997 status reviews of listed turtles prepared jointly by NMFS and the U.S. Fish and Wildlife Service (NMFS and USFWS, 1995 and 1997).

E.6.4.5 Other Biota

See Section E.6.3.5 of Amendments 5 and 7 for a description of other biota that interact with Northeast multispecies.

E.6.4.6 Stellwagen Bank Marine Sanctuary

See Section E.6.3.6 of Amendment 5 for a description of Stellwagen Bank Marine Sanctuary.

E.6.5 HUMAN ENVIRONMENT

The human environment encompasses a variety of characteristics of the fishing industry and fishing communities along the Atlantic coast, including the cultural composition of communities, employment history, education, regulatory restrictions on fishing, and economic constraints on community development. This chapter discusses these characteristics so as to give the reader enough background information to adequately assess the impacts of the management alternatives presented in this document. This section contains information collected from a variety of sources, including U.S. Census data, NMFS permit and vessel databases, and personal communications with Advisory Panel members, fishermen and other individuals involved in the whiting fisheries.

This section is intended to supplement Section E.7.4, *Social Impacts of the Proposed Management Action,* and should be considered in that context.

E.6.5.1 History of the Fishery

For a description of the commercial and recreational multispecies fisheries, see Section E.6.4 of Amendment 5. The following section will focus on small mesh multispecies fisheries in New England and the Mid-Atlantic.

The United States commercial silver hake fishery apparently began in the mid-1800s (Anderson et al, 1980). Prior to the early 1920s, landings of silver hake totaled less than seven million pounds annually, and most fishermen considered whiting a nuisance fish because it's soft flesh tended to spoil quickly without refrigeration. However, the 1920s saw the birth of a new market using whiting for fried fish shops. Technological advances in handling, freezing, processing, and transportation aided in expanding this market as well as creating new opportunities to capitalize on whiting. Until this time, the fishery operated primarily inshore using pound nets. As the demand for whiting increased, operations began to extend offshore, and vessels started using otter trawls to catch more whiting. By 1950, U.S. commercial silver hake landings had increased to more than 45,000 metric tons. Floating traps, gillnets, purse seines, and longline trawls were also employed (almost all of the U.S. commercial silver hake catch is currently taken with otter trawls).

Prior to 1960, the commercial exploitation of silver hake in the Northwest Atlantic was exclusively by U.S. fleets. Distant water fleets (DWF) had already reached the banks of the Scotian Shelf by the late 1950s, and by 1961, scouting/research vessels from the USSR were fishing on Georges Bank. By 1962, DWF factory freezer fleets (ranging from 500 to 1,000 GRT) intensively exploited the whiting and red hake stocks on the Scotian Shelf and on Georges Bank. Countries that participated in this exploitation at levels that were never approached before included Bulgaria, Cuba, France, the Federal Republic of Germany (FRG), the German Democratic Republic (GDR), Italy, Japan, Poland, Romania, Spain, and the USSR (Helser et al, 1995). Led by the USSR, the DWF landed an increasingly larger share of the silver hake catch from the Gulf of Maine, Georges Bank, and northern Mid-Atlantic waters. In 1962, DWF landed 41,900 tons of silver hake (43% of the total silver hake landings), but that number had increased to 299,200 tons (85% of the total silver hake landings) in 1965 (**Table E.13**). 1965 marked the year of the highest total commercial silver hake landings, 351,000 tons. Recreational landings of silver hake in the southern New England and Mid-Atlantic areas were also at record levels between 1955 and 1965, averaging about 1,360 tons.

Unable to sustain such high rates of fishing, the abundance of silver hake off the U.S. Atlantic coast began to decline. As a result, total commercial catches decreased significantly after 1965 and reached a 20-year low of 55,000 tons in 1970. U.S. recreational landings also dropped after 1965 to about half the levels of previous years. As catches of U.S. silver hake declined, the DWF intensified their efforts on the Scotian Shelf; as a result, their catches of Scotian Shelf hake increased from 2,500 tons in 1967 to 169,000 tons in 1970 and peaked at about 299,000 tons in 1973 (Helser et al, 1995).

After 1970, DWF catches of silver hake in U.S. waters increased again, especially in southern New England and the Mid-Atlantic. Between 1971 and 1977, DWF landings from the southern stock averaged 75,000 tons annually and accounted for 90% of the total harvest from the southern stock. The size and efficiency of DWF factory ships also increased, many ranging between 1,000 and 3,000 GRT.

In 1973, the International Commission for the Northwest Atlantic Fisheries (ICNAF) established temporal and spatial restrictions that reduced DWF to small "windows" of opportunity to fish for U.S. silver hake. These windows restricted the DWF to the continental slope of Georges Bank and the Mid-Atlantic. As effort control regulations increased, foreign fleets gradually left most areas of Georges Bank.

Although foreign fishing had ceased on Georges Bank by about 1980 and in the Mid-Atlantic by about 1986, the U.S. groundfish fleet's technologies and fishing practices began to advance, and between 1976 and 1986, fishing effort (number of days) increased by nearly 100% in the Gulf of Maine, 57% on Georges Bank, and 82% in southern New England (Anthony, 1990). Such increases in effort, although directed primarily towards principal groundfish species (cod, haddock, yellowtail flounder), were accompanied by a 72% decline in silver hake biomass. In turn, U.S. (East Coast) landings of silver hake began to decline, dropping to 16,100 tons in 1981. Since that time, landings have remained relatively stable, but at much lower levels in comparison to earlier years. U.S. East Coast silver hake catches are taken almost exclusively by otter trawls, either as bycatch from other fisheries or through directed fisheries targeting a variety of sizes of silver hake.

Table E.13 Historical Landings Information (Tons) for U.S. and Canadian Stocks of Silver Hake

DWF other than USSR not included.

		Gulf of Maine/Northern Georges Bank			Southern Georges Bank/Mid-Atlantic			
YEAR	**Scotian Shelf Total**	**USSR**	**U.S.**	**TOTAL**	**USSR**	**U.S. Commercial**	**U.S. Recreational**	**TOTAL**
1955	N/A	N/A	53,361	53,361	N/A	12,489	1,353	13,842
1956	N/A	N/A	42,150	42,150	N/A	13,417	1,454	14,871
1957	N/A	N/A	62,750	62,750	N/A	15,476	1,677	17,153
1958	N/A	N/A	49,903	49,903	N/A	12,156	1,317	13,473
1959	N/A	N/A	50,608	50,608	N/A	15,439	1,673	17,112
1960	187	N/A	45,543	45,543	N/A	8,306	900	9,206
1961	2	N/A	39,688	39,688	N/A	11,918	1,291	13,209
1962	8,854	36,575	42,427	79,002	5,325	12,097	1,311	18,733
1963	123,028	37,525	36,399	73,924	74,023	18,252	1,107	93,382
1964	81,147	57,240	37,222	94,462	127,036	25,000	1,518	153,584
1965	50,022	15,793	29,449	45,242	283,366	22,406	1,359	307,131
1966	10,323	14,239	33,477	47,716	200,058	10,571	641	211,270
1967	2,483	6,879	26,489	33,371	81,711	8,957	543	91,249
1968	3,523	10,434	30,873	41,379	48,392	8,447	627	58,496
1969	46,564	7,813	15,917	23,964	66,151	7,601	564	75,561
1970	169,045	12,279	15,223	27,528	19,762	6,404	475	27,512
1971	128,657	23,674	11,158	36,401	64,902	5,163	383	71,890
1972	114,249	16,469	6,440	25,224	85,416	5,561	412	94,396
1973	298,621	17,847	13,997	32,083	95,606	6,146	458	104,593
1974	95,745	13,476	6,905	20,680	99,215	7,213	538	109,863
1975	116,388	25,456	12,566	39,874	63,425	8,342	99	74,253
1976	97,184	65	13,483	13,634	53,707	9,581	853	68,741
1977	37,095	2	12,455	12,457	46,305	9,484	1,974	59,308
1978	48,404	N/A	12,609	12,609	13,390	11,410	1,369	27,132
1979	51,760	N/A	3,415	3,415	3,075	13,087	411	18,375
1980	44,525	N/A	4,730	4,730	N/A	11,731	117	13,546

E.6.5.2 Commercial Fishery Information

E.6.5.2.1 U.S. Atlantic Coast

Table E.14 summarizes landings and revenue information for silver hake and offshore hake landed on the U.S. Atlantic coast from 1980 to 1997. In general, landings have remained consistent at relatively low levels over time, totaling 308,363.4 mt and averaging 17,131.3 metric tons over the time series. 1995 marked the lowest landings of the time series (14,798 mt), while 1984 marked the highest (21,087 mt). In general, average landings have decreased slightly during the 1990s. Landings averaged 17,842.2 mt from 1980 – 1985 and 16,874.8 mt from 1990 – 1995, a decline of approximately 5.7%.

In contrast, revenues generated from landing silver hake and offshore hake have increased over time as new markets for the product emerged, supply remained stable, and consumer demand increased. In 1980, revenues were at a series low ($6,097 thousand). By 1990, revenues increased 147% to a peak for the time series ($15,067 thousand, but landings were also 3,900 mt greater than they were in 1980). While average landings decreased by between 1980 – 1985 and 1990 – 1995, average revenues increased 76.2% from $7,135.75 thousand during 1980 – 1985 to $12,574.7 thousand during 1990 – 1995. The development of the Spanish export market is likely to have contributed significantly to keeping revenues above $10,000 thousand every year since 1990.

Table E.14 U.S. (Atlantic coast) Silver Hake and Offshore Hake Landings and Revenue, 1980 – 1997
1997 estimates are preliminary.

YEAR	SILVER/OFFSHORE HAKE LANDINGS (METRIC TONS)	SILVER/OFFSHORE HAKE REVENUE (THOUSAND DOLLARS)
1980	16,080	6,097.6
1981	16,270	6,916.5
1982	16,581.7	7,809.6
1983	16,821.7	6,804.6
1984	21,087.2	6,907.6
1985	20,212.4	8,278.6
1986	17,985.5	8,225.8
1987	15,711	11,572.4
1988	16,124.1	8,612.6
1989	18,378.5	9,683.3
1990	19,991.1	11,127.8
1991	16,578.9	11,234
1992	16,297.1	10,961.6
1993	17,410.8	14,081.3
1994	16,172.8	13,841.4
1995	14,798.3	14,202.4
1996	16,265.3	13,645
1997*	15,597	15,067.6

Table E.15 summarizes landings and revenue information for U.S. Atlantic coast red hake from 1980 to 1997. Both red hake landings and revenues have remained relatively small in terms of quantity throughout the time series, totaling 32,675 mt and averaging 1,815.3 mt annually. Landings have ranged from a peak of 2,540 mt in 1980 to a low of 1,095 mt in 1996. Even though the amounts are relatively small, landings of red hake have decreased substantially since 1980. Between 1980 and 1985, landings averaged 2,259.1 mt. From 1990 to 1995, average landings were 1,741.1 mt, a decrease of 23% from 1980 – 1985 levels. This was most likely due to a lack of a large, stable market for red hake as well as the perception by commercial fishermen of red hake as a "trash species" at the time.

A domestic market for red hake does exist, however, and as supply has decreased, prices and revenues have increased. From 1980 to 1985, average revenues from red hake were about $665.8 thousand. Between 1990 and 1995, average revenues (from 23% less landings) increased 33.6% from 1980 – 1985 values to $889.8 thousand.

Table E.15 U.S. (Atlantic coast) Red Hake Landings and Revenue, 1980-1997
1997 estimates are preliminary.

YEAR	RED HAKE LANDINGS (METRIC TONS)	RED HAKE REVENUE (THOUSAND DOLLARS)
1980	2,540.5	675.8
1981	2,501.3	885.2
1982	2,241.9	762.7
1983	2,169	580.9
1984	2,278.3	550.5
1985	1,823.6	539.8
1986	2,108.5	673.5
1987	2,007.3	866.6
1988	1,740.3	618.3
1989	1,722.4	697
1990	1,624.2	624.1
1991	1,667.9	817.4
1992	2,162.6	1,060.3
1993	1,692.5	927.8
1994	1,701.1	935.9
1995	1,598.1	973.2
1996	1,095.5	700.7
1997*	1,319	785.7

E.6.5.2.1.1 U.S. Atlantic Coast Landings by Area

Table E.16 provides estimates of the total annual landings of silver hake by area. The “northern area” refers to the area north of the GOM/GB Regulated Mesh Area line, and the “southern area” refers to the area south of the GOM/GB Regulated Mesh Area line. Trips in the southern area are divided into those in which whiting comprised more than 50% of the total landings and those in which whiting comprised 50% or less of the total landings in an attempt to differentiate “directed” trips in the southern area from trips in which small mesh multispecies such as whiting are caught as incidental catch (trips that directed on loligo squid, for example).

The majority of whiting is landed in the southern area. For example, of the total annual whiting landings for all areas between 1995 and 1997, the following came from the southern area:

1995 – 80%
1996 – 70.3%
1997 – 78.6%.

Of the whiting landed in the southern area, the majority appears to come from “directed” trips (landings of whiting are greater than or equal to 50% of the trip’s total landings). For example, of the total annual whiting landings in the southern area between 1995 and 1997, the following came from “directed” trips:

1995 – 83.3%
1996 – 85.6%
1997 – 83%.

Of the total annual whiting landings in the southern area between 1995 and 1997, the following came from “incidental” trips (landings of whiting are less than 50% of the trip’s total landings):

1995 – 13.4%
1996 – 10.12%
1997 – 13.4%.

Of the total annual whiting landings for all areas between 1995 and 1997, the following came from the northern area:

1995 – 14.82%
1996 – 19.3%
1997 – 11.2%.

Of the total annual whiting landings for all areas between 1995 and 1997, the following came from the Cultivator Shoal Whiting Fishery:

1995 – 5%
1996 – 10.3%
1997 – 10.15%.

Table E.16 Total Annual Landings of Silver Hake by Area, 1980 – 1997
**** Prorated estimates based on logbook data.***
***** Preliminary information***

TOTAL ANNUAL LANDINGS OF SILVER HAKE BY AREA (METRIC TONS)						
			SOUTHERN AREA			
YEAR	NORTHERN	CULTIVATOR	Whiting >= 50%	Whiting < 50%	Total Southern Area	ANNUAL TOTAL
1980	4568.4	114.5	6623.3	1850.9	8502.6	13185.5
1981	4132.3	199.7	6504.8	1660.8	8251.4	12583.4
1982	3464.5	1163.0	7423.3	2557.4	10008.7	14636.3
1983	4862.9	281.6	7141.1	1955.2	9115.0	14259.6
1984	7503.1	779.9	8638.2	1760.9	10425.4	18708.4
1985	7911.0	357.1	8136.6	1574.1	9768.9	18037.0
1986	7994.2	364.9	7043.7	1415.8	9407.7	17766.8
1987	5552.4	101.7	6317.9	1870.5	9907.4	15561.4
1988	4323.0	2465.6	5881.3	1623.4	9159.5	15948.1
1989	2194.4	2447.6	6799.7	2062.7	13426.8	18068.8
1990	3401.5	2975.4	7919.7	1970.1	13608.3	19985.2
1991	2550.8	3504.2	5209.0	2063.9	10491.9	16546.8
1992	2310.3	2995.7	5581.9	2100.6	10872.5	16178.5
1993	2248.1	2115.5	6045.9	2499.7	12941.9	17305.4
1994*	3809.6	1436.4	7648.1	3163.3	10811.4	16057.4
1995*	2183.6	743.3	9828.5	1971.7	11800.2	14727.0
1996*	3130.6	1674.3	9754.2	1640.0	11394.2	16199.1
1997**	1712.7	1552.4	9978.3	2048.1	12026.4	15291.5

Table E.17 provides similar landings by area information for red hake between 1980 and 1997.

The majority of red hake is also landed in the southern area. For example, of the total annual red hake landings for all areas between 1995 and 1997, the following came from the southern area:

1995 – 72.6%
1996 – 60.4%
1997 – 69.3%.

Red hake is most often landed as incidental catch in fisheries targeting other species throughout the southern area. Of the total annual red hake landings in the southern area between 1995 and 1997, the following came from "directed" trips (landings of red hake were greater than or equal to 50% of the trip's total landings):

1995 – 18%
1996 – 45.2% (unusually high)
1997 – 3.1%.

Of the total annual red hake landings for all areas between 1995 and 1997, the following came from the northern area:

1995 – 26.3%
1996 – 39.4%
1997 – 29.1%.

In general, Cultivator Shoal Whiting Fishery participants land very little red hake. For example, of the total annual red hake landings for all areas between 1995 and 1997, the following came from the Cultivator Shoal Whiting Fishery:

1995 – 1.1%
1996 – 0.2%
1997 – 1.6%.

Table E.17 Total Annual Landings of Red Hake by Area, 1980 – 1997
**** Prorated estimates based on logbook data.***
***** Preliminary information***

TOTAL ANNUAL LANDINGS OF RED HAKE BY AREA (METRIC TONS)						
			SOUTHERN AREA			
YEAR	NORTHERN	CULTIVATOR	Whiting >= 50%	Whiting < 50%	Total Southern Area	ANNUAL TOTAL
1980	1021.3	1.1	166.1	928.2	1104.3	2126.7
1981	1163.3	59.9	137.6	770.3	916.4	2139.7
1982	1196.5	5.3	103.3	708.1	824.7	2026.4
1983	892.0	2.7	161.4	889.3	1057.3	1952.0
1984	1050.5	2.1	157.5	906.0	1069.9	2122.5
1985	990.3	1.2	39.7	656.5	712.2	1703.6
1986	1456.7	0.6	1.6	578.6	644.1	2101.4
1987	1009.6	3.7	76.9	668.2	943.2	1956.4
1988	804.1	57.7	146.5	522.3	87.0	948.8
1989	666.9	109.1	38.9	593.2	926.8	1702.9
1990	719.8	104.9	42.8	613.6	798.4	1623.1
1991	707.3	36.0	26.9	671.2	924.6	1667.9
1992	831.4	86.2	80.2	686.6	1245.0	2162.6
1993	705.8	62.6	30.5	577.9	924.2	1692.6
1994*	957.5	31.1	38.0	674.5	712.4	1701.1
1995*	420.6	17.1	207.4	953.1	1160.5	1598.1
1996*	432.5	2.1	299.2	362.8	662.0	1096.6
1997**	377.0	20.5	40.1	857.4	897.6	1295.1

E.6.5.2.1.2 Landings by Individual States and Ports

Table E.18 and **Table E.19** summarize silver hake (including offshore hake) and red hake landings and revenues by state and express those figures as a percentage of each state's total landings and revenues for the time period 1990 – 1997. The five states with the highest cumulative landings of whiting and offshore hake between 1990 and 1997 were:

1. Rhode Island,
2. New York,
3. Massachusetts,
4. New Jersey, and
5. Connecticut.

The five states with the highest cumulative landings of red hake between 1990 and 1997 were:

1. Massachusetts,
2. Rhode Island,
3. New York,
4. New Jersey, and
5. Connecticut.

<u>Maine</u>

The significance of small mesh multispecies fisheries in the state of Maine has increased throughout the 1990s (landings have increased), but the contribution of small mesh multispecies to the state's revenues from fisheries remained relatively insignificant throughout the time series. Only in one year of the time series did silver hake landings comprise more than 1% of the Maine's total fishery landings (1996). Revenues from small mesh multispecies fisheries did not comprise more than 0.6% of the state's total revenues between 1990 and 1997.

<u>Massachusetts</u>

Vessels in Massachusetts landed a significant amount of whiting between 1990 and 1997, but small mesh multispecies revenues remain a small portion of total revenues in the state. In 1991, whiting landings comprised 3% of the state's total landings, the highest percentage of the time series. Since 1994, both landings and revenues from small mesh multispecies in Massachusetts have been near or below 1.5% of the state's total.

<u>New Hampshire</u>

Although vessels in New Hampshire did not land large quantities of small mesh multispecies between 1990 and 1997, they contributed a consistent percentage to the state's total landings throughout the times series. The proportion of small mesh multispecies landings to total landings in the state of New Hampshire increased since 1995 to a peak of about 3.3% in 1997 (preliminary estimates). However, revenues from small mesh multispecies in New Hampshire make a small contribution to New Hampshire's total fishery revenues. In 1997, the percentage of revenues generated from combined small mesh multispecies in relation to New Hampshire's total fishery revenues was 0.9%.

Connecticut

The importance of whiting and red hake to the state of Connecticut increased between 1990 and 1997. In 1990, small mesh multispecies landings comprised over 5.5% of the state's total landings; in 1997, that percentage increased to over 25%. The revenues generated from the sale of small mesh multispecies in 1997 were 4% of the state's total fishery revenues.

Rhode Island

Vessels in Rhode Island landed the greatest amount of small mesh multispecies between 1990 and 1997, but the significance of small mesh multispecies in the state decreased throughout the time series. In 1990, landings of whiting and red hake comprised more than 14% of Rhode Island's total landings (the highest percentage of the time series); by 1997, that percentage decreased to just above 9%. Landings of whiting in Rhode Island peaked in 1992 (8,300 mt) and decreased 36% to less than 5,300 mt in 1997. In general, Rhode Island generated an average of about 5% of its total fishery revenues from small mesh multispecies, more than any other state except for New York. This proportion was as high as 7% in some years.

New York

New York's dependence on small mesh multispecies fisheries has always been significant and increased over the 1990 – 1997 time series. In 1990, small mesh multispecies comprised just under 16% of the state's total landings, and between 1995 and 1997, landings averaged over 20% of the state's total. In 1993, small mesh multispecies landings in the state of New York doubled from 1992 levels and remained consistent at elevated levels throughout the remainder of the 1990 – 1997 time series. In 1994, revenues from small mesh multispecies in New York were the highest percentage of the state's total revenues for the time series (about 14% of the state's total fishery revenues). Revenues generated from small mesh multispecies in the state of New York peaked in value in 1997 at $97,000 thousand (6.7% of the state's total revenues).

New Jersey

The significance of small mesh multispecies fisheries in New Jersey decreased throughout the 1990 – 1997 time series. In 1990, over 6% of the state's total landings were small mesh multispecies. That percentage dropped by about 50% in 1991. By 1992, landings of small mesh multispecies in New Jersey decreased to less than 2% of the state's total landings, where they have remained throughout the time series. Revenues generated from small mesh multispecies in New Jersey were never very significant between 1990 and 1997. In 1990, revenues from small mesh multispecies comprised less than 3% of the state's total fishery revenues, and in 1996 and 1997, revenues did not total 1% of the state's total fishery revenues.

Maryland, Delaware, Virginia, and North Carolina

Maryland, Delaware (not included in the tables), Virginia, and North Carolina landed insignificant amounts of small mesh multispecies between 1990 and 1997. In no year in the time series did either small mesh multispecies landings or revenues comprise more than 0.1% of any of the states' totals. However, it should be noted that the state of North Carolina reported relatively significant amounts of small mesh multispecies landings during the 1980s. During public hearings, fishermen in North Carolina testified that the presence of whiting and red hake in the area is variable and that landings during the 1980s were probably offshore hake (blackeye whiting).

Table E.18 Silver Hake (Including Offshore Hake) and Red Hake Landings by State as a Percentage of Total State Landings 1990-1997
1997 data are preliminary.

STATE	YEAR	SILVER HAKE LANDINGS (MT)	RED HAKE LANDINGS (MT)	TOTAL LANDINGS (MT)	SILVER HAKE % OF TOTAL	RED HAKE % OF TOTAL
MAINE	1990	119.7	5.1	76,812.2	0.16%	0.006%
	1991	57.5	4.1	87,059.9	0.067%	0.004%
	1992	46.1	13	91,296.3	0.05%	0.01%
	1993	27.9	0.1	107,262.3	0.03%	N/A
	1994	877.8	37.8	104,825.3	0.84%	0.04%
	1995	898.4	0.3	105,174.2	0.85%	N/A
	1996	1,454.5	0.4	107,335.3	1.36%	N/A
	1997	564.5	0.01	119,478.4	0.47%	N/A
MASSACHUSETTS	1990	3,982.9	722.8	148,789.9	2.7%	0.49%
	1991	3,958	713.8	131,090.7	3%	0.54%
	1992	3,601.5	819.5	124,441.5	2.9%	0.66%
	1993	2,475.1	686.2	99,440.1	2.5%	0.69%
	1994	2,131.8	638.3	83,170.1	2.56%	0.77%
	1995	1,284	151.9	92,674.7	1.38%	0.16%
	1996	1,240.2	390.6	107,327.6	1.16%	0.36%
	1997	1,293.2	312.8	84,195.6	1.54%	0.37%
NEW HAMPSHIRE	1990	103	0.1	4,856.6	2.12%	0.002%
	1991	78.3	0.4	4,843.5	1.62%	0.008%
	1992	84	22.2	4,686	1.8%	0.47%
	1993	64.4	21.1	4,977.8	1.3%	0.42%
	1994	92.1	30.5	5,489.6	1.68%	0.56%
	1995	88.1	14.5	5,790.8	1.52%	0.25%
	1996	110.2	N/A	5,012.3	2.2%	N/A
	1997	148.7	N/A	4,544	3.27%	N/A
CONNECTICUT	1990	237.9	12.5	4,297.2	5.54%	0.29%
	1991	384.7	51.9	6,762.7	5.69%	0.77%
	1992	571.4	134.4	8,908.3	6.41%	1.51%
	1993	1,087.9	148.8	7,893.8	13.8%	1.89%
	1994	856.8	92.1	8,982.3	9.54%	1.03%
	1995	1,620.2	425	9,942.8	16.3%	4.27%
	1996	2,559.9	105.3	9,506	26.93%	1.11%
	1997	1,889.3	174.8	8,190.3	23.07%	2.13%
RHODE ISLAND	1990	8,241	437.6	59,792.2	13.78%	0.73%
	1991	7,304.1	468.4	63,432.4	11.51%	0.74%
	1992	8,318.2	653.1	64,271.8	12.94%	1.02%
	1993	7,004.3	394.4	54,789.5	12.78%	0.72%
	1994	5,842.9	432.2	50,729.6	11.52%	0.85%
	1995	4,485.4	543.6	55,321.7	8.11%	0.98%
	1996	4,274.4	340.7	62,027.2	6.89%	0.55%
	1997	5,281.2	436.3	59,712.4	8.84%	0.73%

Table E.18 continued

STATE	YEAR	SILVER HAKE LANDINGS (MT)	RED HAKE LANDINGS (MT)	TOTAL LANDINGS (MT)	SILVER HAKE % OF TOTAL	RED HAKE % OF TOTAL
NEW YORK	1990	3,353.9	96.1	22,152	15.14%	0.44%
	1991	2,769.1	146.8	23,059.4	12%	0.64%
	1992	2,692.6	318.6	22,736.8	11.8%	1.4%
	1993	5,533.9	198.7	24,655.2	22.45%	0.8%
	1994	5,064.8	235.9	20,290.8	25%	1.16%
	1995	5,155	275	24,142.5	21.35%	1.14%
	1996	5,771.5	196.7	25,740.5	22.4%	0.76%
	1997	5,418.7	282.3	27,229	19.9%	1.04%
NEW JERSEY	1990	3,913	332	67,771.8	5.77%	0.49%
	1991	2,005.6	273.9	79,782.7	2.5%	0.34%
	1992	979.6	194.8	92,726	1.06%	0.21%
	1993	1,196.5	234	88,975	1.34%	0.26%
	1994	1,300.4	226.5	91,469.1	1.42%	0.25%
	1995	1,262.2	186.7	80,388.3	1.57%	0.23%
	1996	850.5	60.9	81,354.8	1.05%	0.075%
	1997	997.5	106.5	77,612.9	1.29%	0.14%
MARYLAND	1990	10	11.7	36,617.5	0.03%	0.032%
	1991	6.7	4.8	40,137	0.017%	0.012%
	1992	1	5.0	25,892.5	0.004%	0.02%
	1993	6.3	5	38,538.1	0.016%	0.013%
	1994	1.5	3.8	30,631.6	0.005%	0.012%
	1995	1.7	0.002	30,866.6	0.005%	N/A
	1996	N/A	N/A	31,387.9	N/A	N/A
	1997	1.1	5.1	34,648.2	0.003%	0.015%
VIRGINIA	1990	25.7	5.8	356,983.2	0.007%	0.002%
	1991	13.8	3.4	309,057.6	0.004%	0.001%
	1992	2.7	1.0	286,080.3	N/A	N/A
	1993	5.5	1.8	330,465.1	0.002%	N/A
	1994	4.7	2.5	263,579.9	0.002%	N/A
	1995	3.5	0.6	352,814	N/A	N/A
	1996	4.5	0.8	299,297.2	0.001%	N/A
	1997	2.3	0.8	264,221.2	N/A	N/A
NORTH CAROLINA	1990	3.9	N/A	79,872	0.005%	N/A
	1991	1	N/A	96,465.1	0.001%	N/A
	1992	N/A	N/A	69,888.8	N/A	N/A
	1993	9	N/A	74,810.8	0.012%	N/A
	1994	N/A	N/A	89,316.2	N/A	N/A
	1995	N/A	N/A	83,785.8	N/A	N/A
	1996	N/A	N/A	87,943.7	N/A	N/A
	1997	0.2	0.1	14,942.5	0.001%	N/A

Table E.19 Silver Hake (Including Offshore Hake) and Red Hake Revenues by State as a Percentage of Total State Revenues 1990-1997
1997 data are preliminary.

STATE	YEAR	SILVER HAKE REVENUES (THOUSAND $)	RED HAKE REVENUES (THOUSAND $)	TOTAL REVENUES (THOUSAND $)	SILVER HAKE % OF TOTAL	RED HAKE % OF TOTAL
MAINE	1990	55.5	2.7	129,876	0.04%	0.002%
	1991	44.4	4.1	155,257	0.03%	0.003%
	1992	52.9	16.2	163,341	0.03%	0.001%
	1993	24.4	0.1	181,136	0.013%	N/A
	1994	526.6	8.3	243,360	0.22%	0.003%
	1995	628.8	0.3	216,546	0.29%	N/A
	1996	1,174.9	0.3	200,930	0.58%	N/A
	1997	319.3	N/A	273,309	0.12%	N/A
MASSACHUSETTS	1990	2,260.5	302.8	302,950	0.75%	0.1%
	1991	2,626.3	323.4	295,838	0.89%	0.11%
	1992	2,680.5	350.6	280,589	0.95%	0.125%
	1993	1,804.2	291.8	232,103	0.78%	0.126%
	1994	1,624.2	346.5	205,939	0.789%	0.17%
	1995	1,025.5	79.5	224,361	0.46%	0.035%
	1996	935.3	187.6	231,380	0.4%	0.081%
	1997	1,141.7	145.1	166,845	0.684%	0.087%
NEW HAMPSHIRE	1990	76.1	0.1	10,028	0.76%	0.001%
	1991	59.9	0.3	13,267	0.45%	0.002%
	1992	80	8.4	11,503	0.7%	0.073%
	1993	70.2	9.2	11,836	0.59%	0.078%
	1994	79.2	13.1	12,746	0.62%	0.1%
	1995	76	2.8	14,923	0.51%	0.019%
	1996	96.8	N/A	13,531	0.72%	N/A
	1997	112.8	N/A	12,577	0.897%	N/A
CONNECTICUT	1990	89.2	6.6	26,873	0.332%	0.025%
	1991	144.2	27.5	44,815	0.32%	0.061%
	1992	214.1	71.1	62,672	0.342%	0.113%
	1993	407.7	78.7	50,885	0.8%	0.15%
	1994	321	49	44,376	0.72%	0.11%
	1995	1,425.6	243.6	56,705	2.51%	0.43%
	1996	1,943.4	76.2	48,409	4.0%	0.16%
	1997	1,740	96.2	49,542	3.5%	0.194%
RHODE ISLAND	1990	3,645.5	124	72,889	5%	0.17%
	1991	3,881	167.7	85,111	4.56%	0.2%
	1992	3,967.6	228.8	85,681	4.63%	0.27%
	1993	4,845.9	164	76,320	6.35%	0.215%
	1994	4,297.5	161.1	76,807	5.6%	0.21%
	1995	4,010.5	263	68,422	5.86%	0.384%
	1996	3,261.9	191.8	69,919	4.67%	0.274%
	1997	4,524.1	235.3	74,856	6.04%	0.31%

Table E.19 continued

STATE	YEAR	SILVER HAKE REVENUES (THOUSAND DOLLARS)	RED HAKE REVENUES (THOUSAND DOLLARS)	TOTAL REVENUES (THOUSAND DOLLARS)	SILVER HAKE % OF TOTAL	RED HAKE % OF TOTAL
NEW YORK	1990	2,601.1	64.4	56,474	4.6%	0.11%
	1991	2,464.5	102.5	53,161	4.64%	0.193%
	1992	2,939.6	234.2	53,985	4.45%	0.434%
	1993	5,900.1	159.8	54,163	10.9%	0.295%
	1994	5,792.7	185	42,817	13.53%	0.432%
	1995	5,724.5	236.2	76,501	7.5%	0.31%
	1996	5,580.7	190.2	83,527	6.7%	0.23%
	1997	6,313.6	230	96,763	6.52%	0.24%
NEW JERSEY	1990	2,377.4	117.8	89,344	2.66%	0.132%
	1991	1,999.9	188.7	96,865	2.06%	0.195%
	1992	1,024.3	148.7	97,500	1.05%	0.15%
	1993	1,016.3	218.6	96,288	1.06%	0.227%
	1994	1,192	169.5	99,866	1.19%	0.17%
	1995	1,306.8	147.1	95,479	1.37%	0.154%
	1996	648.3	54.3	94,026	0.69%	0.06%
	1997	912.7	76.4	99,973	0.91%	0.076%
MARYLAND	1990	6.6	3.6	53,905	0.012%	0.007%
	1991	4.9	1.8	47,131	0.01%	0.004%
	1992	0.6	1.2	36,424	0.002%	0.003%
	1993	4.2	2	53,399	0.008%	0.004%
	1994	1	1.2	60,503	0.002%	0.002%
	1995	1.6	N/A	60,570	0.003%	N/A
	1996	N/A	N/A	52,720	N/A	N/A
	1997	1	2.2	64,323	0.001%	0.003%
VIRGINIA	1990	13.6	1.9	106,529	0.013%	0.002%
	1991	8.6	1.1	94,984	0.009%	0.001%
	1992	1.8	0.4	90,500	0.002%	N/A
	1993	3.3	1.5	108,117	0.003%	0.001%
	1994	7.3	1.6	101,245	0.007%	0.001%
	1995	3.1	0.2	113,659	0.003%	N/A
	1996	3.6	0.3	106,016	0.003%	N/A
	1997	2.1	0.5	97,733	0.002%	N/A
NORTH CAROLINA	1990	2.3	N/A	71,542	0.003%	N/A
	1991	0.5	N/A	66,747	N/A	N/A
	1992	N/A	N/A	57,458	N/A	N/A
	1993	4.9	N/A	57,890	0.008%	N/A
	1994	N/A	N/A	97,892	N/A	N/A
	1995	N/A	N/A	110,884	N/A	N/A
	1996	N/A	N/A	110,057	N/A	N/A
	1997	0.3	N/A	24,517	0.001%	N/A

Table E.20 provides preliminary estimates of each state's share of total U.S. Atlantic coast silver hake and red hake landings and revenues for 1997. The state of New York reported the largest share of silver hake landings during 1997, with almost 35% of the total. Red hake landings from New York in 1997 did not comprise as large a proportion of total red hake landings (21.4%). The state of Rhode Island contributed to over 1/3 of total U.S. east coast landings of both silver hake and red hake during 1997. When combined, Rhode Island, New York, Connecticut, Massachusetts, and New Jersey accounted for over 95% and over 97% of the total U.S. east coast whiting landings and revenues respectively during 1997. The same holds true for red hake landings and revenues in 1997.

Table E.20 State Share of Total U.S. Atlantic Coast Silver Hake and Red Hake Landings and Revenues for 1997 (Preliminary Estimates)

STATE	Percent of 1997 Total Silver Hake Landings	Percent of 1997 Total Red Hake Landings	Percent of 1997 Total Silver Hake Revenues	Percent of 1997 Total Red Hake Revenues
MAINE	3.62	0.001	2.12	0.002
MASSACHUSETTS	8.3	23.72	7.57	18.47
NEW HAMPSHIRE	0.95	0.0002	0.75	0.0009
CONNECTICUT	12.11	13.26	11.55	12.24
RHODE ISLAND	33.86	33.08	30.02	29.94
NEW YORK	34.74	21.4	41.9	29.26
NEW JERSEY	6.39	8.08	6.06	9.73
MARYLAND	0.007	0.39	0.007	0.28
VIRGINIA	0.015	0.062	0.014	0.07
NORTH CAROLINA	0.001	0.009	0.002	0.006

Table E.21 summarizes silver hake landings and revenues, the number of vessels (that landed silver hake), and the number of dealers for all ports where silver hake was landed during 1997. Important whiting ports are highlighted in gray. In 1997, Point Judith, Rhode Island landed more than two times as much whiting compared to any other port on the Atlantic coast (almost 11 million pounds). New London (CT), Greenport (NY), Hampton Bays (NY), and Montauk (NY) followed with almost 4 million pounds of whiting during 1997. Portland (ME), Gloucester (Mid-Atlantic), and Point Pleasant (NJ) reported landings in excess of 1 million pounds during 1997. Point Judith also generated more revenues from whiting than any other port (more than $4 million). Hampton Bays and Montauk followed with over $2 million in whiting revenues during 1997. New London and Greenport generated more than $1.5 million in revenues from silver hake during 1997.

More individual vessels landed whiting in Massachusetts (205) than any other state, followed by New York (142), Rhode Island (112), Maine (100), and New Jersey (84) respectively. This suggests that vessels in New York and Rhode Island are landing larger amounts of whiting per trip than are vessels in Massachusetts. Gloucester (88), Point Judith (87), Portland (82), Hampton Bay (57), and Cape May (41) are the five ports with the largest number of vessels landing whiting during 1997. The state with the most dealers in 1997 is New York (93), followed by Massachusetts (52), Rhode Island (35), Maine (18), and New Jersey (16). Point Judith (28), Hampton Bays (27), Greenport (18), Freeport (17), and Gloucester (17) are the five ports with the most dealers in 1997.

Table E.21 Landings, Revenue, Number of Vessels, and Number of Dealers for Ports Where Silver Hake was Landed, 1997. Important whiting ports are highlighted in gray.

The letter "C" denotes a count of less than four vessels and/or dealers.
*****The total of 744 vessels results from double counting. The unique count of vessels is 607.***
******The total of 233 dealers results from double counting. The unique count of dealers is 105.***

STATE	PORT	LANDINGS (POUNDS)	REVENUE (DOLLARS)	NUMBER VESSELS	NUMBER DEALERS
CT	NEW LONDON	3,960,560	1,650,179	N/A	N/A
CT	STONINGTON	203,373	89,751	N/A	N/A
CT	OTHER CONNECTICUT	124	54	N/A	N/A
TOTAL CT		**4,164,057**	**1,739,984**	**N/A**	**N/A**
MA	CHATHAM	82,981	44,653	28	C
MA	GLOUCESTER	1,775,179	743,362	88	17
MA	NEW BEDFORD	21,680	4,391	16	6
MA	NEWBURYPORT	18,682	5,968	7	C
MA	PLYMOUTH	5,128	1,447	8	4
MA	PROVINCETOWN	933,656	337,020	20	4
MA	SCITUATE	4,879	1,749	17	5
MA	OTHER MASSACHUSETTS	7,947	3,123	21	10
TOTAL MA		**2,850,132**	**1,141,713**	**205**	**52**
MD	OCEAN CITY	2,324	998	14	C
MD	OTHER MARYLAND	36	14	C	C
TOTAL MD		**2,360**	**1,012**	**15**	**3**
ME	CAMP ELLIS	2,369	723	C	C
ME	CAPE PORPOISE	1,158	395	C	C
ME	PORTLAND	1,237,491	317,599	82	5
ME	SEBASCO ESTATES	1,194	97	C	C
ME	OTHER MAINE	2,040	500	12	9
TOTAL ME		**1,244,252**	**319,314**	**100**	**18**
NC	OTHER CARTERET	408	307	C	C
TOTAL NC		**408**	**307**	**C**	**C**
NH	HAMPTON/SEABROOK	149,891	52,219	22	C
NH	PORTSMOUTH	157,756	54,442	39	C
NH	OTHER NEW HAMPSHIRE	19,990	6,121	10	C
TOTAL NH		**327,637**	**112,782**	**71**	**7**
NJ	BELFORD	481,783	228,084	15	C
NJ	CAPE MAY	317,363	135,785	41	5
NJ	PT. PLEASANT	1,359,360	532,258	23	C
NJ	OTHER NEW JERSEY	15,901	10,694	5	6
TOTAL NJ		**2,174,407**	**906,821**	**84**	**16**
NY	BROOKLYN	1,691	1,158	4	C
NY	FREEPORT	597,296	328,839	24	17
NY	GREENPORT	3,950,257	1,771,723	21	18
NY	HAMPTON BAY	3,795,478	2,125,302	57	27
NY	MONTAUK	3,597,478	2,086,266	30	21
NY	OTHER NEW YORK	602	310	6	7
TOTAL NY		**11,942,802**	**6,313,598**	**142**	**93**

Table E.21 continued

STATE	PORT	LANDINGS (POUNDS)	REVENUE (DOLLARS)	NUMBER VESSELS	NUMBER DEALERS
RI	NEWPORT	734,173	249,229	19	C
RI	POINT JUDITH	10,876,380	4,264,023	87	28
RI	OTHER RHODE ISLAND	4,171	1,326	6	5
TOTAL RI		**11,614,724**	**4,514,578**	**112**	**35**
VA	HAMPTON	3,611	1,528	9	C
VA	OTHER VIRGINIA	1,386	530	5	5
TOTAL VA		**4,997**	**2,058**	**14**	**8**
	GRAND TOTAL	**34,325,776**	**15,052,167**	**744***	**233****

Table E.22 summarizes the top 15 whiting ports: the ports with the highest amount of cumulative landings of whiting between 1/1/80 and the 9/9/96 control date. It is no surprise that landings from Point Judith are more than double any other port. However, since the control date was implemented (but not *because*), Point Judith's whiting landings have decreased in quantity. Belford, New Jersey and "Other Monmouth", New Jersey can be combined; this would place Belford and its surrounding ports fifth on the list, closely behind Provincetown. Hampton Bays, Greenport, and Montauk, all located within the same county, could be combined, placing that group of ports just above Portland, but below Belford and its surrounding ports. Adding "Other Washington, RI" (probably Narragansett) to Point Judith just makes Point Judith that much more important in terms of cumulative whiting landings between 1980 and 1997.

Table E.22 Top 15 Ports in Cumulative Landings of Silver Hake Between 1980 and 9/9/96

Top 15 Ports in Cumulative Landings of Silver Hake 1980 to 9/9/96			
MAJOR PORT	**Pounds of Silver Hake**	**Percent of Total**	**Cumulative Percent**
Pt Judith, RI	211,016,463	40.32%	40.32%
Gloucester, MA	109,732,456	20.97%	61.29%
Pt Pleasant, NJ	63,981,665	12.23%	73.51%
Provincetown, MA	28,276,600	5.40%	78.92%
Portland, ME	20,573,930	3.93%	82.85%
Belford, NJ	14,078,684	2.69%	85.54%
Other Monmouth, NJ	13,371,879	2.56%	88.09%
Hampton Bays, NY	11,759,404	2.25%	90.34%
Newport, RI	10,783,038	2.06%	92.40%
Greenport, NY	7,188,196	1.37%	93.78%
Cape May, NJ	5,247,074	1.00%	94.78%
Montauk, NY	4,457,175	0.85%	95.63%
Chatham, MA	3,466,019	0.66%	96.29%
Other Washington, RI	3,129,535	0.60%	96.89%
Other Sagadahoc, ME	2,271,722	0.43%	97.32%

E.6.5.2.2 U.S. Pacific Coast and Canadian Hake Fisheries

Pacific hake (*Merluccius productus*) and Scotian Shelf hake are similar to Atlantic coast whiting and often serve the same domestic and international markets. Landings and revenue data from these fisheries can help to characterize the scale of domestic and international markets for silver hake, offshore hake, and red hake as well as the scale of U.S. east coast whiting fisheries in comparison with others.

U.S. Pacific hake landings and revenue for 1980 – 1996 are summarized in **Table E.23**. In comparison to the U.S. Atlantic coast whiting fishery, the Pacific hake fishery is large in scale. Over the time series, landings total 1,233,651.7 mt and average 72,567.6 mt. The Pacific hake fishery has expanded tremendously since the emergence of processing at sea ships in 1991. Landings between 1980 and 1985 averaged 6,713.3 mt, and between 1990 and 1995, landings increased 2,325% to an average of 162,896.7 mt. In 1996, Pacific hake landings were about 12 times larger than their Atlantic counterparts. However, revenues generated from Pacific hake in 1995 were only slightly greater than that of Atlantic whiting. Processing at sea ships appear to decrease the price of the product and resulting overall fishery revenues.

Table E.23 U.S. (Pacific Coast) Pacific Hake Landings and Revenue, 1980 – 1996

YEAR	PACIFIC HAKE LANDINGS (METRIC TONS)	PACIFIC HAKE REVENUE (THOUSAND DOLLARS)
1980	6,115.8	395.6
1981	5,108.8	342.6
1982	7,073.6	517.3
1983	7,895.1	618.5
1984	6,703.2	682.1
1985	7,401.2	829.3
1986	4,932.3	559.3
1987	5,097.9	695.3
1988	7,131	1,170.2
1989	7,477.3	1,080.9
1990	12,836.6	1,826.4
1991	204,369.9	23,710.2
1992	198,863.3	23,254.3
1993	137,926.3	10,208.5
1994	248,753.7	18,932.1
1995	174,630.6	18,053.1
1996	191,335.1	16,711.6

Canada also has Atlantic and Pacific hake fisheries. After 1977, when Canada assumed management control of the Scotian Shelf fishery, "hake" catches gradually increased, but have since leveled off. In 1991, Canada reduced foreign catch allocations and increased allocations to Canadian companies. These companies subsequently entered into special commercial agreements with foreign countries, primarily Russia and Cuba, to fish the allocations. In effect, there has been little change in the fleets fishing the Scotian Shelf hake stock over the past two decades (Helser et al, 1995). **Table E.24** summarizes landings and revenue for all of Canada's hake fisheries from 1990-1996. Canadian "hake" landings include silver hake, red hake, and white hake (Urophycis tenuis), a regulated multispecies more often caught in New England waters with other regulated groundfish species. In comparison to U.S. Atlantic whiting landings, Canadian hake fisheries are larger in scale. However, it is difficult to truly assess the impact of Scotian Shelf silver hake landings (the closest to U.S. silver hake) without knowing the proportion of Canadian landings and revenue it comprises. It is estimated that Scotian Shelf hake landings have stabilized at around 70,000 tons during the 1990s.

Landings of Canadian (Scotian Shelf) hake on the Atlantic Coast are similar in scale to U.S. Atlantic Coast fisheries, but when combined with Pacific landings, the scale of Canadian's hake fisheries greatly exceeds that of the U.S. Atlantic. From 1990 to 1995, Canadian Atlantic Coast hake landings averaged 31,594.3 mt, and revenues between 1990 and 1995 averaged $15,611.3 thousand.

Table E.24 Canadian Hake Landings and Revenues, 1990 – 1996
Hake refers to silver hake, red hake, and white hake (Urophycis tenuis), all landed on the Atlantic coast of Canada.
*****Pacific refers to Pacific hake (Merluccius productus), landed on the Pacific coast of Canada.***

YEAR	*HAKE* LANDINGS (METRIC TONS)	*HAKE* REVENUE (THOUSAND DOLLARS)	**PACIFIC** LANDINGS (METRIC TONS)	**PACIFIC** REVENUE (THOUSAND DOLLARS)	TOTAL LANDINGS (METRIC TONS)	TOTAL REVENUE (THOUSAND DOLLARS)
1990	15,185	7,590	79,453	12,833	94,638	20,423
1991	63,925	22,127	99,055	15,389	162,980	37,516
1992	38,420	17,810	97,184	15,460	135,604	33,270
1993	35,936	22,192	62,571	8,655	98,057	30,847
1994	14,656	9,048	118,293	16,788	132,949	25,836
1995	21,444	14,901	83,800	11,000	105,244	25,901
1996	29,229	19,148	100,000	14,700	129,229	33,848

E.6.5.3 U.S. Commercial Fishery Information for Individual Small Mesh Multispecies Fisheries

The following sections contain fishery-specific information regarding individual small mesh multispecies fisheries located throughout New England and the Mid-Atlantic. Participation in and the performance of these fisheries are most likely to be directly affected by the proposed management action.

E.6.5.3.1 Small Mesh Areas 1 and 2

E.6.5.3.1.1 Small Mesh Area 1

Small Mesh Area (SMA) 1 is small mesh exemption area in the western Gulf of Maine that operates on a seasonal basis from July 15 through November 15. This area was exempted from groundfish minimum mesh regulations because historical data indicates that regulated species bycatch in the area has been less than 5%. Small mesh multispecies landings peak in Small Mesh Area 1 during August and September. In fact, in all three years, peak whiting and red hake landings occurred during the month of August.

Table E.25 provides landings and revenue information for vessels fishing in Small Mesh Area 1 and landing small mesh multispecies between 1995 and 1997. Vessel Trip Report (VTR) data was used to determine landings, and dealer weighout data was used to estimate revenues. In 1997, silver hake comprised an average of 66.8% of vessels' total landings on trips landing small mesh multispecies, red hake comprised 12.%, and other species comprised 20.9%. "Other species" include allowable incidental catch in the Small Mesh Areas: butterfish, dogfish, herring, mackerel, ocean pout, scup, squid, sculpin, monkfish and monkfish parts, and American lobster. It is important to note that **Table E.25** only reports information from trips where small mesh multispecies were landed between 1995 and 1997. Trips taken in Small Mesh Area 1 that targeted other species (herring, for example) are not included unless at least one pound of whiting and/or red hake was landed as well. Therefore, this information does not characterize total fishing activity within Small Mesh Area 1, just small mesh multispecies fishing activity.

Table E.25 Landings and Revenues from Silver Hake, Red Hake, and Other Species for Vessels Fishing in Small Mesh Area 1, 1995 – 1997

	Silver Hake					
	Landings (Pounds)			Revenues (Dollars)		
MONTH	**1995**	**1996**	**1997**	**1995**	**1996**	**1997**
JULY	169,830	304,268	220,724	57,742	82,152	75,046
AUGUST	514,500	606,548	406,386	190,365	163,768	117,852
SEPTEMBER	468,992	849,122	384,428	168,837	271,719	119,173
OCTOBER	433,312	305,190	40,098	212,323	146,491	15,237
NOVEMBER	37,844	53,180	2,896	19,679	29,781	1,332
	Red Hake					
	Landings (Pounds)			**Revenues (Dollars)**		
MONTH	**1995**	**1996**	**1997**	**1995**	**1996**	**1997**
JULY	105,240	141,415	51,130	19,996	22,626	11,760
AUGUST	137,897	176,849	93,118	31,716	31,833	17,692
SEPTEMBER	68,227	96,173	43,310	12,963	22,120	7,363
OCTOBER	38,724	24,986	6,545	11,617	4,997	1,113
NOVEMBER	811	3,671	170	227	1,322	48
	Other Species					
	Landings (Pounds)			**Revenues (Dollars)**		
MONTH	**1995**	**1996**	**1997**	**1995**	**1996**	**1997**
JULY	122,706	154,833	72,422	9,091	11,416	8,066
AUGUST	256,315	227,670	119,496	16,395	20,770	17,372
SEPTEMBER	180,691	165,206	86,593	13,908	51,812	16,573
OCTOBER	61,504	24,451	45,801	17,322	15,403	12,237
NOVEMBER	6,381	1,488	6,278	4,814	1,619	911

E.6.5.3.1.2 Small Mesh Area 2

Small Mesh Area (SMA) 2 is small mesh exemption area in the western Gulf of Maine that operates on a seasonal basis from January 1 – June 30. This area was exempted from groundfish minimum mesh regulations because historical information indicates that regulated species incidental catch in the area has been less than 5%. April through June appear to be the peak months for small mesh multispecies fishing activity in Small Mesh Area 2. No vessels fished for small mesh multispecies in the area at all during February and March in 1995, 1996, or 1997.

Table E.26 provides vessels' landings and revenue information while fishing for small mesh multispecies in Small Mesh Area 2 between 1995 and 1997. Landings were estimated from VTR data, and revenues were estimated from dealer weighout data. In terms of small mesh multispecies, Small Mesh Area 2 is less productive than Small Mesh Area 1. While vessels are fishing for small mesh multispecies in Small Mesh Area 2, they land very few other species. On trips where either whiting or red hake were landed during 1997, silver hake comprised an average of 95% of the landings. Landings of red hake and other species on these trips were almost inconsequential. It is important to note that **Table E.26** only reports information from trips where small mesh multispecies were landed between 1995 and 1997. Trips taken in Small Mesh Area 2 that targeted other species (herring, for example) are not included unless at least one pound of whiting and/or red hake was landed as well. Therefore, this information does not characterize total fishing activity within Small Mesh Area 2, just small mesh multispecies fishing activity.

Despite the small amounts of landings, it should be noted that small mesh multispecies fishing activity in Small Mesh Area 2 increased significantly during 1997. It appears that the inshore area closures proposed in Framework 27 to the Northeast Multispecies FMP will impact the level of small mesh multispecies fishing effort in Small Mesh Area 2. The closures will eliminate about ½ of Small Mesh Area 2 during the month of April and during the month of May, the entire area will be closed. While the magnitude of small mesh multispecies landings from Small Mesh Area 2 may not be extremely large, April and May have been the peak times for small mesh multispecies fishing in the area. In fact, very little activity occurred in this area outside of the months of April and May between 1995 and 1997 (some activity occurs during June).

Table E.26 Landings and Revenues from Silver Hake, Red Hake, and Other Species in Small Mesh Area 2, 1995 – 1997

	Silver Hake					
	Landings (Pounds)			**Revenues (Dollars)**		
MONTH	**1995**	**1996**	**1997**	**1995**	**1996**	**1997**
JANUARY	0	2,700	0	0	1,358	0
APRIL	0	0	20,323	0	0	9,384
MAY	125	0	2,115	48	0	768
JUNE	0	2,500	3,015	0	666	1,037
	Red Hake					
	Landings (Pounds)			**Revenues (Dollars)**		
MONTH	**1995**	**1996**	**1997**	**1995**	**1996**	**1997**
JANUARY	0	450	0	0	216	0
APRIL	0	0	180	0	0	55
MAY	2,500	0	0	753	0	0
JUNE	0	4,400	0	0	973	0
	Other Species					
	Landings (Pounds)			**Revenues (Dollars)**		
MONTH	**1995**	**1996**	**1997**	**1995**	**1996**	**1997**
JANUARY	0	203	0	0	222	0
APRIL	0	0	1,140	0	0	451
MAY	6,500	0	0	6,271	0	0
JUNE	0	64	80	0	85	93

E.6.5.3.2 The Southern New England and Mid-Atlantic Mixed Trawl Fishery

A large portion of the commercial fishing industry, particularly in the southern New England and Mid-Atlantic areas, has developed around the ability to switch from one species to another during seasons, or even during the same trip. In southern New England, this type of fishing has been categorized as mixed trawl fishing. "Mixed trawl" species include (but are not limited to) whiting, red hake, offshore hake, squid, mackerel, butterfish, scup, and fluke. This style of fishing has evolved over generations and tries to balance a changing resource base with fluctuating market conditions and with the way of life of those who either participate in or depend on it. Over time, mixed trawl fishermen have managed to sustain themselves by providing themselves and their communities with year-round economic activity and by preserving what they view as an irreplaceable part of their cultural heritage (NJ Seafood Harvester's Association).

Landings information from the mixed trawl fishery is difficult to decipher because mixed trawl species are often quite variable. Although the southern New England mixed trawl fishery is not always interconnected with the loligo squid fishery, landings information from the loligo fishery **(Table E.27)** is useful in characterizing both the species targeted in mixed trawl fisheries and the interconnection between silver hake (and other small mesh species) and loligo squid. Silver hake and red hake landings comprised almost 14% of landings on trips where more than 2,500 pounds of loligo squid were landed in 1992.

Table E.27 1992 Landings and Value by Species for Otter Trawl Trips Harvesting 2,500 Pounds or More of Loligo Squid (based on 1992 NMFS weighout data)

SPECIES	LANDINGS (THOUSANDS OF POUNDS)	SPECIES % OF TOTAL POUNDS LANDED	VALUE (THOUSANDS OF DOLLARS)	SPECIES % OF TOTAL VALUE
Loligo Squid	37,605.2	48.9%	21,946.8	52%
Silver Hake	9,431.2	12.25%	4,082.8	9.7%
Atlantic Mackerel	7,063.1	9.2%	1,214.8	2.9%
Scup	4,685.3	6.09%	3,186.2	7.5%
Butterfish	3,983	5.2%	2,510.1	5.94%
Illex Squid	3,964	5.15%	1,137.8	2.7%
Summer Flounder	2,195.3	2.85%	3,595.8	8.5%
Angler	1,379.6	1.79%	922.1	2.2%
Bluefish	1,150.9	1.5%	287.2	0.68%
Red Hake	1,114	1.45%	303.4	0.71%
Winter Flounder	1,008.9	1.31%	969.8	2.29%
Skate	641.5	0.83%	64.3	0.15%
Black Sea Bass	502.6	0.65%	456.3	1.08%
Atlantic Herring	428.2	0.56%	38.2	0.09%
Yellowtail Flounder	393.7	0.51%	405.06	0.96%

Other Species caught included: cod, dogfish, tilefish, weakfish, eel, tautog, witch flounder, lobster, white hake, ocean pout, offshore hake, sea robins, sea scallop, pollock, conchs, Atlantic croaker, sturgeons, sharks, menhaden, haddock, swordfish, John Dory, and other finfish and shellfish.

E.6.5.3.3 The Cultivator Shoal Whiting Fishery

The New England Fishery Management Council established the Cultivator Shoal Whiting Fishery in January, 1991 with the implementation of Amendment 4 to the Northeast Multispecies FMP. For three years prior to Amendment 4, the National Marine Fisheries Service, on the Council's recommendation, conducted an experimental fishery program to collect data about the fishery, particularly in regards to regulated species bycatch. Under the current management program, vessels may obtain authorization to fish for silver hake in the exempted Cultivator Shoal area with a minimum mesh size of 3 inches from June 15-October 31. However, this amendment proposes that the Cultivator Shoal season change to June 15 – September 30.

Participation in the Cultivator Shoal fishery remained at low levels between 1995 and 1997. The largest number of vessels to enroll in the Cultivator Shoal Whiting Fishery during this time was thirteen in 1996. **Table E.28** summarizes port information for vessels that participated in the Cultivator Shoal Whiting Fishery between 1995 and 1997. It should be noted that **Table E.28** reports Cultivator Shoal participants by principal port, a self-reported category. Vessel owners often list the port where they conduct the majority of their business as their principal port, which may be different than their home port (more often their place of residence). For example, **Table E.28** lists no vessels from Gloucester during 1997. This does not mean that none of the vessels based in Gloucester participated in the Cultivator Shoal Whiting Fishery during 1997; it means that they listed a different port for their principal port of business.

Table E.28 Principal Port Profile for Vessels Participating in the Cultivator Shoal Whiting Fishery, 1995 – 1997

** One vessel was counted twice in 1996 due to a permit change.*

PRINCIPAL PORT		NUMBER OF VESSELS		
STATE	**CITY**	**1995**	**1996**	**1997**
CT	**New London**	1	2	1
CT TOTAL		1	2	1
MA	**Boston**	0	0	1
	Gloucester	1	1	0
	New Bedford	0	1	0
	Provincetown	1	0	0
MA TOTAL		2	2	1
ME	**Portland**	0	0	2
ME TOTAL		0	0	2
NC	**Belhaven**	0	1	0
NC TOTAL		0	1	0
NY	**Greenport**	0	3	1
	Hampton Bays	0	1	1
	Montauk	0	0	1
NY TOTAL		0	4	3
RI	**Narragansett**	0	1	0
	Point Judith	2	4	3
RI TOTAL		2	5	3
GRAND TOTAL		5	14*	10

Vessels participating in the Cultivator Shoal Whiting fishery do so on a seasonal basis, and they often participate in a number of other fisheries during other times of the year. **Table E.29** summarizes commercial permit information for vessels that participated in the Cultivator Shoal Whiting Fishery from 1995 – 1997. All vessels are required to have a multispecies permit in order to obtain an exemption to fish in the Cultivator Shoal fishery. Every vessel also possessed a squid/mackerel/butterfish permit from 1995 – 1997. Only one vessel did not possess a scallop permit in 1996. Other common permits for vessels participating in the Cultivator Shoal Whiting Fishery include lobster and summer flounder.

Table E.29 Other Commercial Permits Held by Vessels Participating in the Cultivator Shoal Whiting Fishery, 1995 – 1997

** Multiple permits are owned by one vessel.*

FISHERY PERMIT CATEGORY	YEAR		
	1995	1996	1997
BLACK SEA BASS	0	0	5
SUMMER FLOUNDER	5	11	7
LOBSTER	5	12	9
MULTISPECIES	5	13	10
OCEAN QUAHOG	1	1	3
SCALLOP	5	12	10
SCUP	0	0	6
SURF CLAM	2	4	3
SQUID-MACKEREL-BUTTERFISH	5	13	10
Grand Total	28*	66*	63*

Table E.30 characterizes the performance of vessels participating in the Cultivator Shoal Whiting Fishery from 1995 – 1997. In general, vessels averaged 79 feet in length, 148 GRT, and 17 years in age. Trips to the Cultivator Shoal averaged about three days in duration. The Cultivator Shoal Whiting Fishery is obviously a directed whiting fishery with very little bycatch retained by participating vessels. On average, between 1995 and 1997, over 99% of the fish retained (per day absent) by vessels in the Cultivator Shoal Whiting Fishery was silver hake.

Table E.30 Performance Profile for Vessels Participating in the Cultivator Shoal Whiting Fishery, 1995 – 1997

** One vessel was counted twice in 1996 due to a permit change.*

*** Other Species included bluefish, butterfish, unclassified hake, herring, lobster, mackerel, monkfish, red hake, skate, and squid.*

PARTICIPATING VESSEL DATA	YEAR		
	1995	1996	1997
Number of Vessels	5	14*	10
Average Age	15	16	18
Average Tons	133	139	166
Average Length	74	79	81
Average Days Absent	2.68	2.89	3.08
Landings per Day Absent			
Silver Hake (Pounds)	10,312	11,042	9,283
Other Species ** (Pounds)	108	50	125
Revenue per Day Absent			
Silver Hake (Dollars)	$4,434	$4,196	$4,085
Other Species (Dollars)	$34	$34	$69

E.6.5.3.4 The Raised Footrope Trawl Experimental Fishery

The 1997 southern Gulf of Maine experimental fishery used a raised footrope trawl to fish for whiting, red hake, and dogfish. It was a continuation of the Massachusetts Division of Marine Fisheries (DMF) ongoing initiative to restore trawl fisheries for these species by reducing the incidental catch of regulated groundfish species. DMF sought to re-open northern Cape Cod Bay as well as other area in federal waters, including portions of Massachusetts Bay (west of Stellwagen Bank) and areas east of Cape Cod (referred to as "Nauset" area) to traditional small mesh fisheries for larger sized whiting and red hake. 31 vessels participated in the experiment during 1997.

DMF gave priority to those vessels with recent participation in whiting, red hake, or dogfish experimental fisheries and those that participated in the NMFS Experimental Separator Trawl Fishery between 1995 and 1997. A total of 651 trips were conducted in this experiment by the 31 participating vessels. Landings for this fishery totaled 2,333,135 pounds of all species combined, valued at $781,477. Whiting dominated the landings at 1,793,448 pounds, and red hake was second at 450,964 pounds. These two species comprised 97% of the overall landings and 90% of the fishery's overall value. 51 sea sampling trips were completed, representing 7.8% of all reported trips.

The raised footrope trawl effectively mitigated flatfish incidental catch. However, certain roundfish species (cod, white hake, and redfish) catches caused the 5% bycatch allowance for groundfish to be exceeded in certain areas. With impending groundfish regulations in the Gulf of Maine, the current status as well as the future of the experimental raised footrope trawl fishery is unknown.

For a complete description of the progress of the Raised Footrope Trawl Experimental Whiting Fishery, see **Appendix VI,** *Southern Gulf of Maine Raised Footrope Trawl 1997 Experimental Whiting Fishery*.

E.6.5.3.5 The Experimental Whiting Separator Trawl (Grate) Fishery

An experimental whiting fishery within the Gulf of Maine/Georges Bank Small Mesh Northern Shrimp Fishery Exemption Area was authorized for the period of June 15 – November 30, 1995 in response to an industry request to allow the continuation of whiting fishing in the Gulf of Maine/Georges Bank Regulated Mesh Area. The fishery requires the use of a separator grate (40 mm/1.57" bar spacing) installed in otter trawls with a minimum codend mesh of 1.75-inches. The grate prevents large fish from passing into the codend while allowing smaller whiting to pass through. Generally, participants in the grate fishery target smaller-sized whiting for the Spanish export market. The experiment was re-authorized in 1996, 1997, and 1998 because an evaluation of the fishery showed promising results in the gear's ability to minimize the bycatch of regulated multispecies, but there was insufficient data to support exempting the fishery. The status of this experimental fishery for the 1999 fishing year is unknown.

The experimental grate fishery is a localized fishery, with more than 78% of the participating vessels declaring ports in the state of Maine as their principal port in 1997, namely Portland and its smaller, surrounding ports. **Table E.31** summarizes the principal ports for vessels that participated in the grate fishery since its origination in 1995. In total, the most vessels participated in the experiment during 1996 (79). Only about 30 vessels participated in 1997, primarily due to a low availability of whiting in inshore Gulf of Maine areas. Besides Maine and Massachusetts, a few vessels whose principal ports are located in New Hampshire participated in the experimental fishery. Only one vessel from the southern New England/Mid-Atlantic area has ever participated, and that was during the 1995 season.

Table E.31 Principal Port Profile for Vessels Participating in the Experimental Whiting Separator Trawl Fishery, 1995 – 1997

** Vessels were counted twice due to permit changes and respecifications of principal ports.*

PRINCIPAL PORT		NUMBER OF VESSELS		
STATE	**CITY**	**1995**	**1996**	**1997**
MA	**GLOUCESTER**	0	4	0
	PROVINCETOWN	0	3	0
	OTHER (13)	6	6	4
MA TOTAL		**6**	**13**	**4**
ME	**CUNDYS HARBOR**	0	3	0
	FIVE ISLANDS	5	7	4
	NEW HARBOR	0	3	0
	PHIPPSBURG	4	3	0
	PORTLAND	11	15	8
	SEBASCO ESTATES	5	4	0
	WEST POINT	3	3	3
	OTHER (49)	21	23	10
ME TOTAL		**49**	**61**	**25**
NH TOTAL		**0**	**5**	**3**
NY TOTAL		**1**	**0**	**0**
Grand Total		**56***	**79**	**32***

Table E.32 characterizes the other federally permitted commercial fisheries in which the grate fishery vessels participate. Just as those in the Cultivator Shoal Whiting Fishery, most vessels in the grate fishery participate on a seasonal basis in several different fisheries. Again, all participating vessels must possess a multispecies permit in order to participate in the experimental fishery. A majority of participants possess scallop, lobster, and squid/mackerel/butterfish permits. Some also have possessed summer flounder, scup, and surf clam/ocean quahog permits.

Table E.32 Other Permits Held by Vessels Participating in the Whiting Experimental Separator Trawl (Grate) Fishery, 1995 – 1997

** Multiple permits are owned by one vessel.*

		YEAR	
FISHERY PERMIT CATEGORY	1995	1996	1997
SUMMER FLOUNDER	10	16	5
LOBSTER	32	52	22
MULTISPECIES	54	79	29
OCEAN QUAHOG	16	23	8
SCALLOP	45	70	27
SCUP	0	0	2
SURF CLAM	22	33	14
SQUID-MACKEREL-BUTTERFISH	37	60	18
Grand Total	216*	333*	125*

Table E.33 characterizes the performance of vessels participating in the experimental grate fishery between 1995 and 1997. On average, participating vessels were 17 years old, 34 GRT, and 46 feet in length. No trips in this fishery lasted more than one day. Over the three years, the average amount of whiting landed in this fishery was 3,620 pounds per day absent, and landings of other species averaged 840 pounds per day absent. Overall, about 81% of landings in the experimental grate fishery have been whiting, and about 19% have been other species. Participation and productivity in the grate fishery was low during 1997 and is predicted to have been lower for 1998. This could be due to a decline in the abundance of inshore whiting in the Gulf of Maine, which in itself could be the result of seasonal fluctuations, emigration from the area, or increased fishing pressure. The decline in participation could also be due to an increase in Canadian participation in the Spanish export market.

Table E.33 Performance Profile for Vessels Participating in the Experimental Whiting Separator Trawl (Grate) Fishery, 1995 – 1997

** One vessel was counted twice due to a change in vessel characteristics.*

*** Other Species included bluefish, butterfish, catfish, cod, horseshoe crab, dogfish, winter flounder, American plaice, witch flounder, windowpane flounder, summer flounder, yellowtail flounder, haddock, unclassified hake, herring, lobster, mackerel, monkfish, other finfish, pout, redfish, red hake, sculpin, shad, shrimp, skate, squid, white hake, and blackeye whiting.*

PARTICIPATING VESSEL DATA	YEAR		
	1995	1996	1997
Number of Vessels	55*	79	29
Average Age	16	18	18
Average Tons	29	38	35
Average Length	44	47	46
Average Days Absent	0.6	0.7	0.6
Landings per Days Absent			
Silver Hake (Pounds)	3,378	5,266	2,215
Other Species (Pounds)**	805	867	848
Revenue per Day Absent			
Whiting (Dollars)	$1,453	$2,001	$976
Other Species (Dollars)	$322	$245	$165

E.6.5.3.6 The Northern Shrimp Fishery

A seasonal otter trawl fishery for northern shrimp (*Pandalus borealis*) has existed in the western Gulf of Maine since 1937, generally from December through May. This fishery is managed by the Atlantic States Marine Fisheries Commission (ASMFC). Vessels in the northern shrimp fishery use a 40 mm grate towed with 1-3/4 inch mesh. In the 1988 – 1989 season, approximately 7.1 million pounds of northern shrimp were landed by vessels from ports in Maine, New Hampshire, and Massachusetts. Historically, silver hake discards were relatively high in the northern shrimp fishery, primarily because the finfish caught with shrimp mesh are too small to market (Howell and Langan, 1992). However, with the emergence of the Spanish export market for juvenile whiting during the early and middle 1990s, whiting discards in the shrimp fishery may have decreased, since vessels now have a market to supply with smaller-sized whiting. The potential effects of increased Canadian competition for this market are unknown. Many of the vessels that participate in the northern shrimp fishery also participate in the experimental whiting grate fishery on a seasonal basis.

Table E.34 provides information about vessels that used a shrimp trawl between 1995 and 1997. A majority of the vessels that participated in the northern shrimp fishery from 1995 – 1997 are small to medium-sized, Ton Class 2, and 40 – 50 feet in length. All vessels, including the smaller ones, employ a crew of at lest two people. As **Table E.34** indicates, landings of whiting in the northern shrimp fishery were very low between 1995 and 1997.

Table E.34 Information About Vessels Using a Shrimp Trawl 1995 – 1997
**DA = Days Absent, based on trip time in hours (for example, 0.5 DA = 12 hours absent)*
Source: NMFS Vessel Trip Report (VTR) Database and Weigh-out Database for average price of each species landed.

	YEAR	Number of Vessels	Avg. DA*	Avg. Crew Size	Avg. Revenue per DA	Avg. Lbs. All Species per DA	Avg. Lbs. Shrimp per DA	Avg. Lbs. Whiting per DA	Avg. No. of Trips per Vessel
Tonnage Class 1 (<5 GRT)	1995	11	0.5	2.0	$1,879	2,149	2,146	3	16
	1996	14	0.5	2.0	$1,510	2,089	2,066	18	19
	1997	5	0.6	2.1	$1,546	1,925	1,815	81	24
Tonnage Class 2 (5-50 GRT)	1995	206	0.5	2.1	$2,251	2,559	2,553	2	24
	1996	230	0.6	2.1	$1,993	2,770	2,760	7	27
	1997	194	0.6	2.0	$1,824	2,237	2,205	23	28
Tonnage Class 3 (51-150 GRT)	1995	41	0.6	2.4	$3,053	3,476	3,469	6	26
	1996	46	0.7	2.6	$2,720	3,784	3,775	6	36
	1997	40	0.7	2.6	$2,333	2,860	2,830	30	36
Tonnage Class 4 (>150 GRT)	1995	0							
	1996	3	1.2	3.3	$2,592	3,623	3,623	0	20
	1997	7	1.2	2.8	$1,480	1,810	1,808	0	13

E.6.5.4 U.S. Commercial Fishing Vessels

E.6.5.4.1 General Information

Table E.35 provides general information for otter trawl vessels that landed whiting and/or red hake between 1995 and 1997. Very few Ton Class 1 vessels participated in small mesh multispecies fisheries between 1995 and 1997, and those that did landed proportionately less whiting than larger vessels. An average of about 16% of landings from Ton Class 1 vessels between 1995 and 1997 were small mesh multispecies, and these species comprised between 40-45% of landings on all other participating vessels (Ton Classes 2, 3, and 4) during the same time period. Small mesh multispecies landings comprised the largest proportion of landings on Ton Class 4 vessels. These larger vessels are more likely to participate in offshore, "directed" whiting fisheries instead of inshore, mixed trawl fisheries where small mesh multispecies are often caught as incidental catch.

Table E.35 General Vessel Information for Vessels Using Otter Trawls and Landing Small Mesh Multispecies Between 1995 and 1997

**DA = Days Absent, based on trip time in hours (for example, 0.5 DA = 12 hours absent)*

	Tonnage Class 1 (<5 GRT)			Tonnage Class 2 (5-50 GRT)			Tonnage Class 3 (51-150 GRT)			Tonnage Class 4 (>150 GRT)		
	1995	**1996**	**1997**	**1995**	**1996**	**1997**	**1995**	**1996**	**1997**	**1995**	**1996**	**1997**
Number of Vessels	**6**	**6**	**5**	**221**	**238**	**195**	**195**	**210**	**194**	**53**	**52**	**50**
Avg. Length (Feet)	38.5	40.33	41.2	46.77	45.04	45.64	68.78	68.78	68.25	84.17	82.79	83.14
Avg. Age (Years)	11.67	9	11.6	21.98	22.39	24.23	19.89	20.04	21.18	13.06	14.37	15.14
Avg. GRT	3.67	4	4	26.03	27.27	26.77	99.32	100.2	98.85	176.5	175.6	173.7
Avg. DA*	0.5	0.5	0.5	0.6	0.7	0.6	2.3	2.1	1.9	4.1	3.6	3.4
Avg. Crew Size	1.9	2.2	2.0	2.1	2.1	2.0	3.2	3.2	3.0	4.5	4.3	4.2
Avg. Revenue per DA ($)	2,329	1,500	1,469	1,772	1,727	1,832	2,384	2,990	3,357	3,602	4,203	4,621
Avg. Pounds all species per DA	2,637	2,229	1,897	3,061	3,316	2,948	4,251	5,745	5,246	7,060	7,643	7,688
Avg. Pounds whiting per DA	110	482	182	1,037	1,229	968	1,740	2,410	1,999	2,312	3,087	3,856
Avg. Pounds red hake per DA	53	193	32	243	290	195	187	192	233	266	424	155
Avg. Number trips per vessel	35.83	20.33	26.2	17.55	15.89	18.34	19.83	21.81	22.2	14.75	17.27	18.54

E.6.5.4.2 Revenue Information

Table E.36 reports vessel revenue information (by Ton Class) for vessels that landed whiting and/or red hake between 1995 and 1997. These tables are useful in assessing the relative dependence of specific sectors of the fleet on small mesh multispecies. It should be noted that vessels' current dependence on small mesh multispecies (1995 – 1997) may be different than their historical dependence on small mesh multispecies. During public hearings, many fishermen, particularly those from the southern New England and Mid-Atlantic regions, testified that their vessels no longer fish for small mesh multispecies and that they lost an important source of income with the decline in abundance of whiting. However, in order to assess the potential impacts of the proposed management action on small mesh multispecies and other fisheries, it is important to characterize current fishing activity as well as the present level of dependence on small mesh multispecies by participating vessels.

The majority of vessels earned revenues from small mesh multispecies totaling less than $15,000 between 1995 and 1997. In 1997, almost 82% of vessels in Ton Class 1 (<5GRT) earned less than $500 in revenues from small mesh multispecies. None reported revenues from small mesh multispecies totaling more than $15,000. In Ton Class 2 (5 – 50 GRT), 69% of the vessels earned less than $500 in revenues during 1997, and 4% made between $15,000 and $100,000. The percentage of vessels making $15,000 – $100,000 in revenues from small mesh multispecies during 1997 increases to 31% for Ton Class 3 (50 – 150 GRT) and 22% for Ton Class 4 (>150 GRT).

Table E.36 Annual Revenues from Silver Hake and Red Hake for 1995, 1996, and 1997: Number of Vessels by Ton Class (percentage of entire Ton Class in parentheses)

1995:

Annual Revenue from Silver Hake and Red Hake	Ton Class 1 (<5 GRT)	Ton Class 2 (5-50 GRT)	Ton Class 3 (51-150 GRT)	Ton Class 4 (>150 GRT)	TOTAL
<$500	19 (86.36%)	285 (70.2%)	83 (42.35%)	28 (49.12%)	**415**
$501-$5,000	3 (13.64%)	80 (19.7%)	38 (19.39%)	16 (28.07%)	**137**
$5,001-$15,000	0	18 (4.43%)	21 (10.71%)	3 (5.26%)	**42**
$15,001-$50,000	0	15 (3.69%)	34 (17.35%)	4 (7.02%)	**53**
$50,001-$100,000	0	8 (1.97%)	20 (10.2%)	6 (10.53%)	**34**
>$100,000	0	0	0	0	**0**
TOTAL	**22**	**406**	**196**	**57**	**681**

1996:

Annual Revenue from Silver Hake and Red Hake	Ton Class 1 (<5 GRT)	Ton Class 2 (5-50 GRT)	Ton Class 3 (51-150 GRT)	Ton Class 4 (>150 GRT)	TOTAL
<$500	18 (75%)	279 (71.36%)	89 (41.78%)	19 (39.58%)	**405**
$501-$5,000	3 (12.5%)	65 (16.62%)	39 (18.31%)	15 (31.25%)	**122**
$5,001-$15,000	3 (12.5%)	23 (5.88%)	31 (14.55%)	4 (8.33%)	**61**
$15,001-$50,000	0	19 (4.86%)	35 (16.43%)	4 (8.33%)	**58**
$50,001-$100,000	0	5 (1.28%)	19 (8.92%)	6 (12.5%)	**30**
>$100,000	0	0	0	0	**0**
TOTAL	**24**	**391**	**213**	**48**	**676**

1997:

Annual Revenue from Silver Hake and Red Hake	Ton Class 1 (<5 GRT)	Ton Class 2 (5-50 GRT)	Ton Class 3 (51-150 GRT)	Ton Class 4 (>150 GRT)	TOTAL
<$500	36 (81.82%)	275 (68.92%)	62 (33.16%)	14 (33.33%)	**387**
$501-$5,000	7 (15. 91%)	86 (21.55%)	50 (26.74%)	13 (30.95%)	**156**
$5,001-$15,000	1 (2.27%)	22 (5.51%)	17 (9.09%)	6 (14.29%)	**46**
$15,001-$50,000	0	15 (3.76%)	41 (21.93%)	5 (11.9%)	**61**
$50,001-$100,000	0	1 (0.25%)	17 (9.09%)	4 (9.52%)	**22**
>$100,000	0	0	0	0	**0**
TOTAL	**44**	**399**	**187**	**42**	**672**

E.6.5.5 Important Commercial Small Mesh Multispecies Ports

This section provides general summary information about important whiting fishing ports and communities. These ports are considered important for small mesh multispecies because the majority of small mesh multispecies are landed in them, in recent years as well as historically.

E.6.5.5.1 General Socio-Cultural Characteristics

In general, the social and cultural aspects of most New England and Mid-Atlantic fishing communities can be characterized similarly. This section discusses some of those similarities and provides background information for the Social Impact Assessment (Section E.7.4). In particular, the characteristics described below contribute to the identification and analysis of the social variables (factors) which describe the fishery, its socio-cultural and community context, and its participants. The social variables described below include demographic information, lifestyle information, and information about community dependence on commercial fishing. When combined with the information contained in the individual port profiles, this section provides the framework for a social and community impact assessment of the proposed management action.

Madeleine Hall-Arber's Social Impact Assessment of Amendment 5 to the Northeast Multispecies FMP (May 1993) contributed much of the information contained in this section.

Education

Many fishermen started going out to sea while they were still in high school, during summers with their father or another relative. In the generations now at middle-age or nearing retirement, it was not uncommon to quit school as soon as legally possible to fish full-time. As vessels became more capital intensive and fishing became more technologically complex, fishermen became more sophisticated and began to complete more of their education. Now most ports boast at least a few college educated captains and owners. Nevertheless, the majority of active fishermen are not formally well-educated, but they are educated through their experiences on the water. Consequently, fishermen are at a disadvantage in competition for alternative occupations. However, studies have shown that a lack of formal education in no way interferes with making a living as a fisherman.

Ethnicity

Ethnic affiliation is important because it links fishermen through time with fishermen from foreign communities. The historical perspective permeates the community and affects the way not only fishing, but all aspects of life are organized. Although all individuals do not adhere to the same behavior, in general, choices made regarding education, occupation, marriage, leisure time, etc. reflect the sense of continuity and identification with a particular ethnic heritage. For fishing families, it is about tradition. Important ethnic affiliations within fishing communities include Italian, Portuguese, and Norwegian ties. Some small fishing vessels are run by "Yankees," those from a mixed ethnic heritage, most of whim come form several generations born in the U.S. or Canada. Many important whiting ports contain fleets of "Yankees."

Community Dependence on Fishing

In rural ports, fishing and its related businesses provide a primary source of income for a majority of the population. Property taxes on fishermen's houses support the schools, and vessel mortgages provide income for banks. Fuel companies, ice companies, trucking firms, dealers, and processing firms are often community members as well. Spouses of fishermen tend to work in support industries.

In more urban ports, fishing may play a smaller role in the community as a whole, but it may contribute a vital piece of diversity to the community's economic structure. Primary production can cushion a town when service industries fluctuate. In general, urban centers offer more opportunities for alternative employment than do rural areas, since they often support various manufacturing and construction industries.

Employment in a tourist industry is seen as unlikely in many instances because the characteristics that make suitable personnel in service positions are perceived as antithetical to many values held by fishermen and fishing families. Pride and independence, so valued in the fishing community, are not particularly valued in service industries. On the other hand, the quaintness added to a community by the presence of the fishing industry often attracts tourists. Most tourists enjoy seeing a working waterfront, especially if they are able to walk close enough to talk to fishermen or others working at the dock.

Organizations

There are an array of associations for fishermen throughout New England and the Mid-Atlantic, most often based on gear type. Most organizations have at least one member who actively lobbies for the group and/or gear type in the management forum or even in the downtown portion of the community. The organizations with higher membership are more apt to have a paid staff who can represent them at meetings; consequently, it is these interests that are more actively represented through the management process. There are several very active fishermen's wives associations. The wives organizations generally lobby in the management forum and serve the social functions of supporting each other, organizing fishing related festivals, providing outreach assistance to displaced or troubled fishing families, and promoting seafood consumption.

E.6.5.5.2 Census Information

Table E.37 provides a general profile of commercial fishing related economic activities within communities involved in small mesh multispecies fisheries. Data were collected on a county-wide basis by the U.S. Census Bureau through IRS administrative records for businesses submitting tax returns for 1995. The data in **Table E.37** does not distinguish between fishing for whiting and any other kind of commercial fishing activity in the area, but it is still useful to characterize the general nature of economic and fishing activity in the area and to better understand the dynamics of those communities directly involved in small mesh multispecies fisheries.

The numbers in **Table E.37** only reflect persons 16 years and older who served as employees of establishments either directly or indirectly involved with the commercial fishing industry. It is critical to recognize that this table does not include self-employed persons, i.e. the majority of commercial fishermen and their crew. It does, however, provide an estimate of the relative importance of the commercial fishing industry to community businesses and to entities other than those directly involved in the commercial harvesting of fisheries resources.

This type of census data is only available on a county-wide basis and must be interpreted while bearing in mind some qualifiers. First, when trying to capture the significance of the commercial fishing industry to specific communities, it is important to realize the number and size of fishing communities within each county relative to the entire county. Second, most of the fishing related activities can be assumed to occur in or near the fishing communities within each county. For example, Cumberland (Maine) is a medium sized county (almost 250,000 residents in 1995) extending inland from Portland. Of the more than 128,000 employees in Cumberland County, over 1,300 were employed in fishing related businesses. In total, the proportion of fishing related employees to the total number of employees seems insignificant (1.06%). However, most of those fishing related employees probably work in and around Portland (about 63,000 residents in 1995), and fishing related industries in Cumberland County may be significantly more important to the community of Portland than to Cumberland County as a whole.

Third, an understanding of the business categories listed in **Table E.37** is extremely helpful to more accurately interpret the data. Some categories are comprised almost completely of fields specific to commercial fishing, while others are only partially comprised of relevant fields but are included in an attempt to characterize some sectors of the commercial fishing industry. A few business categories could not be classified with the given census data, and thus, they have not been included in the table. For example, fuel suppliers as well as commercial machinery and equipment suppliers have been omitted because these business categories are too general and include too many fields completely unrelated to commercial fishing. Commercial fishing gear suppliers are also very difficult to pinpoint within the given business categories, so these businesses (except for Cordage and Twine and Misc. Wire Products) have also been excluded from **Table E.37**. In fact, the business categories listed in **Table E.37** only begin to characterize the different entities either directly or indirectly involved in the commercial fishing industry. At the same time, however, by including some broader business categories (marinas, for example), **Table E.37** might include employees in fields unrelated to the commercial fishing industry. The tradeoffs may or may not be equivalent. Below is a list of the business categories listed in **Table E.37** and the industries to which they correspond.

Fishing, Hunting, and Trapping includes establishments engaged primarily in commercial fishing, including finfishing, crabbing, lobstering, clamming, oystering, sponges, and seaweed. It also includes businesses engaged in the operation of fish hatcheries and fish and game preserves. Commercial hunting and trapping, as well as game propagation, are two fields included in this category which may not be related to the commercial fishing industry.

Fresh and Frozen Prepared Fish includes establishments engaged in preparing fresh and raw or cooked frozen fish and other seafood and seafood preparations such as soups, stews, chowders, fishcakes, crabcakes, and shrimp cakes. It also includes entities responsible for processing (removal of heads, fins, scales) product for the purpose of preparing fresh and frozen seafoods. Canned and Cured Fish includes establishments engaged in cooking and canning fish, shrimp, oysters, clams, crabs, and other seafoods and seafood soups. It also includes establishments engaged in smoking, salting, drying, pickling, or otherwise curing fish and other seafoods for the trade.

Wholesale Fish and Seafood includes establishments primarily engaged in the wholesale distribution (but not packaging) of fresh, cured, or frozen fish and seafoods, except canned or packaged frozen (see above categories).

Retail Meat and Fish Markets includes establishments engaged in the retail sale of fresh, frozen, or cured meats, fish, shellfish, and other seafoods, as well as establishments involved with bulk sale of products for freezer storage. Employees in any fields relating only to meat markets and meat freezer provisioners may be mis-characterized.

Animal and Marine Fats and Oils includes establishments involved with manufacturing animal oils, including fish and other marine animal oils, and fish and animal meal. This includes fish liver oils, fish oils, whale oils, and establishments involved with rendering inedible stearin, grease, and tallow from animal fat, bones, and meat scraps. Employees working for establishments only engaged in non-marine animal fats and oils may be mis-characterized.

Ice includes establishments primarily engaged in manufacturing ice (not dry ice) for sale.

Ship and Boat Building and Repairing is a broad category and includes establishments engaged in building and repairing ships and boats of all kinds, including all types of fishing vessels, cargo vessels, crew boats, dredges, patrol boats, lighthouse tenders, naval ships, skiffs, kayaks, dories, canoes, motorboats, offshore supply boats, radar towers, towboats, tugboats, and others. It is very important to understand the shoreside infrastructure of the county when assessing the extent of fishing related ship and boat activity in the area. A county that has a large amount of ship and boat building and repairing activity within it (New London, CT or Newport News, VA) may contain a large military population, and most of the ship and boat activity may result from a large naval shipyard.

Search and Navigation Equipment includes establishments primarily engaged in manufacturing search, detection, navigation, guidance, aeronautical, and nautical systems and instruments. Important products of this category are compasses, fathometers, sonar fish finders, sonabuoys, radar systems and equipment, navigational instruments, and other similar equipment. Again, because aeronautical search and navigation equipment is included in this category, some employees may be mis-represented.

Marinas includes any establishments engaged in operating marinas. Marinas rent boat slips, store boats, and perform a range of services to clean and repair boats. They also frequently sell food, fuel, and fishing supplies. It is important to remember that depending on the county in question, the employees working in marinas may be serving more recreational than commercial fishing interests.

Cordage and Twine includes establishments primarily engaged in manufacturing rope, cable, cordage, twine, and related products from sisal, hemp, cotton, paper, flax, etc. This also includes manufacturers of binder and baler twine, cargo nets, rope nets, trawl twine, fishing lines, nets, and seines.

Miscellaneous Wire Products is another broad category that was included in an attempt to characterize at least part of the fishing gear supply businesses. It includes establishments that manufacture conveyor belts, wire baskets and belts, clips and fasteners, wire delivery cases, wire grates, wire fish traps, sieves, woven wire netting and screening, and trays. This category also includes manufacturers of paper clips, staples, tire chains, lamp frames, etc. Again, employees in this broad category may be mis-characterized, but they may also substitute for underrepresented employees in other gear supply fields.

Subsequent sections of this document will reference **REF** when profiling various fishing communities or discussing the impacts of proposed management measures on these communities.

Table E.37 1995 Profile of Economic Activity in Counties Involved in the Small Mesh Multispecies Fisheries

Numbers reflect hired employees over 16 years of age, but not self-employed persons

	Fishing, Hunting, and Trapping	Fresh and Frozen Prepared Fish	Canned and Cured Fish	Wholesale Fish and Seafood	Retail Meat & Fish Markets	Animal and Marine Fats & Oils	Ice	Ship and Boat Building and Repairing	Search and Navigation Equipment	Marinas	Cordage & Twine	Internal Combustion Engines	Misc. Wire Products	Total Fishing Employment	Total Business Employment in Counties with Principal Fishing Ports	Fishing as Percent of Total
Barnstable, MA	53	60	-	119	113	-	10	127	175	201	-	-	-	858	59,987	1.4%
Essex, MA	245	965	10	454	192	-	10	82	3,750	130	10	-	-	5,848	251,278	2.3%
Cumberland, ME	59	60	-	799	58	-	-	175	-	149	60	-	10	1,370	128,876	1.1%
Cape May, NJ	83	-	375	452	39	-	-	60	-	137	-	-	-	1,146	17,500	6.5%
Middlesex, NJ	10	324	-	43	97	-	-	60	3,407	60	60	-	10	4,071	333,722	1.2%
Monmouth, NJ	60	-	-	111	93	-	10	23	270	118	-	10	175	870	187,447	0.5%
Ocean, NJ	18	10	-	73	87	-	-	76	10	291	-	-	-	565	96,695	0.6%
Nassau, NY	60	-	-	137	510	-	10	60	3,642	175	-	10	126	4,730	522,215	0.9%
Suffolk, NY	71	10	-	416	300	10	10	175	2,466	490	-	10	87	4,045	460,288	0.9%
Newport, RI	27	-	10	60	27	-	10	375	750	143	-	-	-	1,402	23,468	6.0%
Washington, RI	60	10	-	240	20	-	10	60	-	68	60	-	10	538	31,008	1.7%

The following sections present profiles of ports and communities containing vessels that actively participate in small mesh multispecies fisheries. The information contained in the following sections references McCay et al, *Report, Part 2, Fishery Impact Management Project, to the Mid-Atlantic Fishery Management Council* (December 1993) and Aguirre International, *An Appraisal of the Social and Cultural Aspects of the Multispecies Groundfish Fishery in New England and Mid-Atlantic Regions* (October 1996). U.S. Census information and additional citations are noted where applicable.

E.6.5.5.3 Southern New England and Mid-Atlantic Ports

E.6.5.5.3.1 Point Pleasant, New Jersey

Located midway on the New Jersey coast, Point Pleasant falls at the mouth of the Manasquan Inlet in Ocean County. In general, the city's economy is geared towards summer tourism and recreation. However, the commercial, party/charter boat, and recreational fishing industries are very important to the local economy, employing many of the local residents and supporting many related industries like restaurants, seafood markets, marine supply houses, welders and salvage, and many tourist related industries.

Point Pleasant is one of New Jersey's largest and most diverse fishing ports. In 1993, there were 51 core boats centered around two commercial docks in Point Pleasant. The Point Pleasant fleet consists primarily of medium sized otter trawl and gillnet vessels targeting fluke, squid, silver hake, red hake, surf clams, and scallops. In fact, Point Pleasant pioneered the surf clam fishery and was home to one of the first processing plants to use steam shucking. **Table E.38** summarizes the major species landed in Point Pleasant during 1992.

Table E.38 Percent of Total Landed Value, 1992: Point Pleasant, New Jersey

SPECIES	PERCENT OF TOTAL VALUE
Ocean Quahog	37.76
Sea Scallop	12.4
Surf Clam	12.2
Loligo Squid	7.79
Quahog	6.36
Swordfish	3.5
Blue Crab	3.4
SILVER HAKE	**3.35**
Bigeye Tuna	1.96
Yellowfin Tuna	1.56
Summer Flounder	1.41
Angler	1.09
Lobster	0.95
Bluefish	0.71
Dogfish	0.63

It is estimated that between point Pleasant and Belford, there are currently about 20 vessels, 50-80 feet in length, that fish for whiting at least 2/3 of the year. In general, the majority of vessels that fish for whiting out of Point Pleasant are trawlers; they usually carry three nets with them: the targeted species' net, a backup net, and a mixed trawl net. All of the trawlers are owner-operated, and captains are generally middle-aged. Including the captain, the vessels usually have a two or three-man crew. The crew is paid a share of the profit from the catch. Most of the crew is hired locally, and very few are women.

Depending on what is being targeted, these vessels will fish in the Mud Hole or the gully. The average trip to the Mud Hole is one to three days, while the average trip to the gully can be up to a week in duration. Gully trips are less desirable because fishermen are kept away from their families, and the trips are more expensive and more dangerous. However, vessels have begun making more trips to the gully as the whiting abundance in the Mud Hole has continued to decline. However, in 1992, landings form the gully were just as disappointing as landings form the Mud Hole.

Trawler captains in Point Pleasant cite various reasons for the decline in whiting stocks. Some blame inescapable natural cycles, some blame a shift of effort from traditional groundfish species to whiting, and some blame the sudden influx of juvenile whiting to the market (since 1991). As whiting has declined, many of these captains have become generalists, targeting a mixed bag of species with small mesh, generally loligo squid mesh (1-7/8 inch).

Table E.39 summarizes Point Pleasant otter trawl landings during 1992 as a percent of the total landed value for otter trawl vessels. The figures in **Table E.39** illustrate the significance of both the loligo squid fishery and the whiting fishery to otter trawl vessels in Point Pleasant. They also characterize the interrelationship between the whiting fishery and the loligo squid fishery, both of which are components of the mixed trawl fishery (butterfish, scup, mackerel, red hake, etc.).

Table E.39 Otter Trawl Landings as a Percent of Total Otter Trawl Landed Value, 1992: Point Pleasant, New Jersey

SPECIES	PERCENT OF TOTAL OTTER TRAWL LANDED VALUE
Loligo Squid	49.5
SILVER HAKE	**21.27**
Summer Flounder	8.43
Scup	3.57
Dogfish	2.41
Yellowtail Flounder	2.17
Angler	2.01
Butterfish	1.76
Sea Scallop	1.6
Atlantic Mackerel	1.4
BLACKEYE WHITING	**1.39**
RED HAKE	**1.33**
Black Sea Bass	0.75
Bluefish	0.48
Witch Flounder	0.46

The loss of the whiting resource as a mainstay has had significant negative impacts on the port of Point Pleasant. Many vessels have exited the fishery, partially because of low landings and partially because of an increase in regulations for various fisheries. Unfortunately, vessels based in Point Pleasant tend to be older vessels that could not compete as well at docks like Cape May or other large, more modernized ports. Despite this, Point Pleasant was third in cumulative whiting landings between 1980 and 1996 (behind Point Judith and Gloucester). In 1997, whiting landings in Point Pleasant were higher than any other port in New Jersey (over 1,350,000 pounds).

The two commercial docks represent a mere fraction of commercial fishing operations that once thrived in the Point Pleasant community. The decline in the number of commercial fishing docks has many causes, including relatively low levels of landings (compared to history), competition for dock space with private marinas and party/charter boats, and a general decline in interest in commercial fishing with younger generations. The remaining commercial fishing vessels are struggling to maintain their niche in the developing tourist-oriented community and economy.

Point Pleasant Cooperative

The Point Pleasant Co-op holds two docks adjacent to a party/charter boat dock and across from a Coast Guard station. These docks can accommodate more than 20 vessels (trawlers and gillnetters). The Co-op also has an ice machine, a cold storage facility, a retail store, and a station for loading trucks. There are three offloading stations, each of which can be operated simultaneously. During busy days, people from party/charter boats are often hired to accommodate the rush. The retail store deals with both locally caught fish and fish from other states. It sells fresh and frozen fish and prepares fish as a restaurant. It employs approximately eight workers in the winter and fifteen in the summer. There are about six full-time dock employees. All workers are hired locally and are both male and female.

While it is possible to land at the Co-op for free, the lack of dock space makes this very unlikely. Docking is usually reserved for Co-op members only. Members also receive ice, packing and fuel at discount prices. The member buy-in fee can be several thousand dollars. The allure of the Co-op lies in its marketing strategies and in its services to its members. Because of the limited dock space in the area, trawling was limited. Competition from other ports was limited in the past because Point Pleasant has access to a dredged channel that leads out into the Mud Hole, allowing vessels from the area access to fishing grounds even in foul weather. As a result, the Co-op developed into one of the only consistent suppliers of fresh whiting to domestic fish markets (New York, Baltimore, for example).

Demographics and Community Business Trends

Located in Ocean County, New Jersey, Point Pleasant and Point Pleasant Beach had a population of about 24,350 in 1996. The total resident population for Ocean County during 1995 was estimated at almost 465,000. In 1990, about 75% of Ocean County's population (over 25 years of age) were high school graduates, and a little more than 15% were college graduates. The unemployment rate for Ocean County in 1994 was approximately 6.7%. Ocean County's per capita income in 1993 was $22,849 (U.S. Census Bureau).

According to **Table E.37**, Ocean County's most significant fishing-related businesses are marinas, but businesses also employ persons in the fresh and frozen prepared fish industry as well as wholesale fish and seafood, retail meat and fish markets, and ship and boat building and repairing. **Table E.37** suggests that 0.6% of Ocean County's economy is related to the fishing industry, but it is likely that this percentage would be much higher if self-employed fishermen were included. It should be noted that tourism and service industries in Ocean County continue to increase.

E.6.5.5.3.2 Cape May/Wildwood, New Jersey

Situated at the southeastern tip of New Jersey, at the mouth of Delaware Bay, Cape May has long been a departure and arrival point for the well-traveled Cape May, NJ to Lewes, DE ferry, a transportation link between the cities of the north and the Delmarva Peninsula. Among nearby cities to the south is Ocean City, Maryland's premier tourist destination and a common destination for tourists from Washington, DC, and other nearby metropolitan areas. In both areas, tourism dominates the economic activity and the commercial fishing fleets are, on the one hand, appendages to the tourist sectors and, on the other, economic activities that have been marginalized by the tourist sector. Fishermen in both locations have experienced the encroaching effects of coastal gentrification and real estate development, although portions of the fleet in Cape May have situated themselves within the tourist trade, becoming tourist attractions themselves and providing fresh fish to local markets and restaurants.

Vessels from Cape May often target squid, mackerel, fluke, sea bass, porgies, lobsters, menhaden, surf clams, and ocean quahogs. The center of fish processing and freezing in new Jersey, Cape May/Wildwood is home port to some of the largest vessels on the Atlantic coast and has led the way in the development of new fisheries and the expansion of both domestic and international markets to serve them.

In 1993, there were about 33 local draggers operating from Cape May docks, mostly wet boats. Some vessels are equipped with refrigerated sea water (RSW) capacity, and some with flash freezers. Many transient boats (57 in 1992) land in the Cape May/Wildwood area from places like Pt. Pleasant and Point Judith, especially to take advantage of winter loligo stocks and to find safe harbor during storms.

In 1992, total landings in the Cape May area were worth about $37 million. Cape May landed about $30.4 million, Wildwood landed $4.5 million, and other ports in the Cape May area (Cold Spring Harbor and Sea Isle City) landed $2.3 million. Major species landed include sea scallops, ocean quahog, illex squid, loligo squid, and surf clams **(Table E.40)**. Cape May used to be the hub of whiting activity, but most of the activity has moved to ports toward the north. A relatively consistent influx of small amounts of whiting has made Cape May 11th in cumulative whiting landings between 1980 and the 9/9/96 control date.

Table E.40 Percent of Total Landed Value, 1992: Cape May Area (New Jersey)

SPECIES	PERCENT OF LANDED VALUE
Sea Scallop	28.03
Ocean Quahog	10.72
Illex Squid	9.87
Loligo Squid	9.42
Surf Clam	8.14
Summer Flounder	7.63
Angler	3.29
Scup	3.12
Lobster	2.17
Menhaden	2.15
Black Sea Bass	2.02
Tilefish	1.63
Atlantic Mackerel	1.56
Yellowfin Tuna	1.14
Swordfish	1.06
Atlantic Herring	0.91
Weakfish	0.84
Blue Crab	0.84
Bigeye Tuna	0.67
Butterfish	0.62
SILVER HAKE	**0.07**
KING WHITING	**0.01**
Ocean Pout	0.01

Demographics and Community Business Trends

Cape May is located in Cape May County, near Ocean County (Point Pleasant). It's population in 1996 was estimated at just under 4,500. The total resident population for Cape May County was approximately 98,340 in 1995. In 1990, 74% of Cape May County residents over 25 years of age had graduated high school, and 17.2% had graduated college. In 1994, Cape May County's unemployment rate was relatively high, about 12.7%.

Table E.37 suggests that Cape May County's businesses are more dependent on commercial fishing than any other county. This is somewhat misleading because the estimate of total employment in the county is an average of an estimated range and is probably very low. Cape May County's primary fishing related businesses are involved with canned and cured fish and wholesale fish and seafood.

E.6.5.5.3.3 Belford, New Jersey

The fishing port at Compton's Creek, in the towns of Belford and Port Monmouth, is on the Jersey shore of Raritan Bay, inside Sandy Hook. Historically, fisheries in Belford have been centered around the bay and inshore waters, but offshore dragging has increased throughout the past decade. The fishing port itself is within a region that is primarily residential, with small businesses and a major military installation. Tourism is an insignificant industry to the Belford community.

For about a century, this fishing port was dependent on a large menhaden firm in Port Monmouth, which owned much of the property used by the fishing vessels, purchased menhaden from small-scale purse seiners and pound-netters, and hired local people to man its large "bunker boats" (purse-seiners). In the early 1980s, the firm was bought, and the local facilities were shut down. The property was for sale, and the local fishing industry, including the Cooperative, were in peril of losing their access to the waterfront. With help from the Port Authority of New York and New Jersey, the community mustered support to buy the property themselves, part of which was later sold to a waterfront developer for industrial uses (to minimize conflicts that would arise from upper-scale residential and yacht-club waterfront uses).

In 1993, Belford had about 32 core vessels, mostly draggers, lobster boats, and pound-netters. This represents a significant decline in industry activity around Belford; in 1984, it was estimated that there were 67 vessels operating in Belford, 36 of which were operated by members of the Co-op (generally the larger vessels), and 31 of which were operated by independent fishermen engaged primarily in shellfishing or a combination of fish and shellfish harvesting.

The total landed value of fisheries in Belford during 1992 was about $9.2 million. Although the number of vessels may have decreased, the value of Belford fisheries has increased dramatically since 1984, when landings were valued at $2.9 million. This was probably due to the influx of ocean quahog vessels. The landed value for the port in 1992 was dominated by ocean quahogs (32%). When excluding ocean quahogs from the landings and value data, lobster was the most valuable species in 1992, followed by blue crab, summer flounder, menhaden, silver hake, and loligo squid **(Table E.41)**.

Table E.41 Percent of Total Landed Value, 1992: Belford, New Jersey (Excluding Ocean Quahog)

SPECIES	PERCENT OF LANDED VALUE
Lobster	45.57
Blue Crab	8.80
Summer Flounder	7.58
Menhaden	6.95
SILVER HAKE	**6.35**
Loligo Squid	4.01
Winter Flounder	3.44
Bluefin Tuna	2.66
Scup	2.63
Bluefish	1.93
RED HAKE	**1.70**
Sea Scallop	1.12
Weakfish	1.03
Tautog	1.00
Rock Crab	0.94
Black Sea Bass	0.91
Butterfish	0.90

In 1992, Belford otter trawl landings were dominated by summer flounder, but silver hake and loligo squid followed closely behind **(Table E.42)**.

Table E.42 Otter Trawl Landings as a Percent of Total Otter Trawl Landed Value, 1992: Belford, New Jersey

SPECIES	PERCENT OF LANDED VALUE
Summer Flounder	25.95
SILVER HAKE	**22.48**
Loligo Squid	14.21
Winter Flounder	10.9
Scup	9.28
RED HAKE	**2.93**
Butterfish	2.62
Tautog	2.3
Angler	1.57
Atlantic Mackerel	1.53
Black Sea Bass	1.26
Weakfish	0.95
Bluefish	0.85
Lobster	0.76
Sturgeon	0.45
Witch flounder	0.42
Cod	0.35

Whiting fisheries have since increased in importance for Belford vessels. Most vessels participate in mixed trawl fisheries, targeting primarily squid, but catching a combination of whiting, red hake, butterfish, and other small mesh species. When combined, Belford and Monmouth placed 5th in total silver hake landings between 1980 and 1996. In 1997, Belford landed the second most whiting in the state of New Jersey (behind Point Pleasant) with almost 482,000 pounds.

The local Cooperative in Belford handles virtually all of the finfish landed in the port, while other firms handle lobster and shellfish. The Co-op has a recently expanded market, financed through the Port Authority of New York and New Jersey, that deals directly to consumers, as well as to wholesalers, and an ice maker, a storage room, and loading areas. It serves a highly diverse clientele, including small vendors in New Jersey's urban areas as well as ethnic minorities, including Asian-Americans who seek specialties such as whiting and black sea bass. Fish that cannot be sold locally are sent to Fulton Fish Market, South Philadelphia, or other regional fish markets.

Demographics and Community Business Trends

Belford is located in Monmouth County, New Jersey, a county with an estimated resident population in 1995 of 585,230. In 1990, of the residents over the age of 25, 82.8% had graduated from high school, and 28.4% had graduated from college (a relatively high percentage). The unemployment rate for Monmouth County in 1994 was estimated at 5.8%, and the 1993 per capita income was about $28,132.

Table E.37 characterizes Monmouth's business employment in fishing-related industries as very low, the lowest of any other county listed in the table. The two sectors with the most employment are search and navigation equipment and miscellaneous wire products, perhaps the two sectors on **Table E.37** with the least direct relationship to commercial fishing because of the many other industries that fall into those very broad categories. Again, however, the data listed in **Table E.37** should be interpreted cautiously.

Social Factors

The Belford fishing fleet is a community defined by locale, mutual interests, activity, relation, competition, and cooperation. Fourth and fifth generation fishermen, as well as newcomers, can be found in Belford. Many of the fishermen are closely related to each other. Most people involved in the fishing industry live very close to the port, contributing to a strong sense of community. The "Bayshore" communities of Belford, Port Monmouth, East and West Keansburg, etc., are still places where people with modest and uncertain incomes can afford home ownership. Homes are also important for some functions of the fishery: net drying, dipping, and handing; net and gear storage, lobster and eel pot work and storage, baiting pots, and bait storage are often done at home, which is feasible given the close proximity of many homes to the port. Marshlands are also used for aspects of the fishery such as laying out pound-nets and tarring poles and pots.

Belford is a place where most fishermen have little other skilled work experience and thus are particularly dependent on fishing. Traditionally, during bad times, fishermen may be forced to "to up the road," as they say: to find other employment that usually is unspecialized work or similar to fishing in being seasonal and "independent" (construction work, driving an oil truck, dock work, boat building, etc.). A survey conducted by the Fishermen's Wives Organization of Belford showed a very high level of concern for the fate of families if fishing opportunities declined.

E.6.5.5.3.4 Montauk, New York

Montauk is an isolated community at the tip of Long Island, New York. It has no major light industry or other capital generation sources besides commercial and recreational fishing and related tourist activity. Montauk has never had a large commercial infrastructure dedicated to fishing.

The docks in Montauk are a couple of miles away from the town's main street. Around the docks are a number of associated industries such as restaurants, fish markets and marinas, with most of these businesses closed for the winter season. There are four marinas, three party boats and eight charter boats with posted telephone numbers at the Chamber of Commerce. Marinas which cater to the recreational sector include the Montauk Marine Basin, the Montauk Yacht Club, Uihlien's Marina and Boat Rental, and West Lake Fishing Lodge. Commercial vessels are located at two city docks opposite each other on the harbor. One is located near two fish markets and one next to the Coast Guard station. Dock space is a problem in Montauk and is said to be a constraint on use of the port by larger commercial fishing vessels. Regardless of the shortage of dock spaces, one rarely sees a number of boats in port, because they are usually out fishing, mostly for squid and whiting.

Most of Montauk's fish are packed out at four commercial facilities: Inlet Seafood, a fishing cooperative; Gosman's Dock; Montauk Fish Dock; and Deep Water Seafood. Except for Inlet Seafood, which opens after Saint Patrick's Day for the spring-summer season, there is little local processing and sale of fish. Some fish does go to local restaurants during the summer. The commercial catch is shipped to Fulton's Fish Market in New York City. Fish are generally shipped whole frozen. To give an example of the scale of the whiting industry in Montauk, it was reported in 1993 that one of the fish houses packs about 8 – 10 million pounds a year, 90% of which is squid and whiting. These landings were from an average of 11 vessels that consistently offloaded at this particular fish house in Montauk. The people who work at this house are all local, and the house contracts a local trucking company to transport their fish. Seven people worked full-time for this offloading company in 1993.

Otter trawling is the leading method of fishing in Montauk. In 1993, the dragger fleet in Montauk consisted of 12 to 15 offshore boats and 12 to 20 inshore boats. That same year, offshore draggers harvested about 20% of all whiting landed by New England and Mid-Atlantic fishers. A large portion of the catch, which also includes 10% of the illex and loligo squid landings in the Northeast, was sold for export. The value of landings during 1992 indicates the same trend **(Table E.43)**.

Table E.43 Otter Trawl Landings as a Percent of Total Otter Trawl Landed Value, 1992: Montauk, New York

SPECIES	PERCENT OF LANDED VALUE
Loligo Squid	33.0
SILVER HAKE	**19.5**
Summer Flounder	10.4
Scup	7.0

Commercial fishermen in Montauk include both first generation fishermen and fishermen whose families have been involved in commercial fishing for many generations. The winter community is small and insular, consisting of commercial fishers and their families, small businesses, and local charter boat owners/operators. Some of the recreational fishers will overwinter in Montauk or nearby East Hampton. Many others will drydock their vessels and spend the winter months elsewhere. The height of the fishing season begins around mid-March after Saint Patrick's Day, which is marked by a celebration of the rites of spring and the renewal of fishing.

Fishing is most active June to September and least active December to February. Aside from whiting, winter fisheries target tilefish, pollock, and cod along the shelf. In the summer, a large charter boat fleet goes after tuna. Many charter boat owners/operators also hold groundfish permits. Small landings of groundfish are sold to local restaurants or used for subsistence purposes.

As of 1995, there were forty reported commercial vessels in Montauk, similar to the number reported during 1993. (Montauk has many smaller, inshore day boats run by part-time fishermen. They fish mostly in the summer and when the weather is good, and mostly for fluke.) The larger vessels (60 – 80 feet) fish offshore, usually year-round. Most of the offshore boats are "day" boats rather than "trip" boats. The majority of the boats that fish full-time are at sea 200 to 275 days a year. The typical dragger in Montauk is owner-operated.

In 1997, Montauk came in a very close third to Greenport and Hampton Bays (all located in the same county) in terms of whiting landings (almost 3,600,000 pounds). Its cumulative landings between 1980 and the 9/9/96 control date place it 12th among ports with the highest whiting landings. In 1997, one vessel that fished in the Cultivator Shoal Whiting Fishery listed Montauk as its principal port city.

The size of the crew depends on the type of fishing. Mixed trawl fishing, for whiting, red hake, butterfish, and porgies usually requires a larger crew because large quantities of fish are caught at one time, and the fish are culled on deck. Most crew members on otter trawls are paid on the share system. Draggers have pretty steady local crew members, but they usually hire extra crew for larger/mixed trawl trips. The crew can come from a broad educational background. Some crew members are college educated and others are not. Most captains and crew are younger fishermen.

Fishing effort off Montauk and on commercial stocks targeted by Montauk fishers (especially whiting and squid) is increasing somewhat from migration of vessels from other ports since the closure of portions of the Georges Bank. This has caused some concern and conflict between local fishers and these “outsiders.” It has been reported that large boats from New England are now fishing out of Ocean City, Maryland and are directly competing with the Montauk fleet for whiting, squid, and other species.

Another concern and source of potential conflict is the competition between the stabilized commercial fleet and an expanding recreational sector. The sportfishing industry on Long Island contributes about $1.1 billion to the economy, while commercial fishing contributes a yearly average $54 million in seafood for public consumption. There are an estimated 174,000 saltwater fishing households on Long Island, and within the three mile limit, recreational catches of fluke, bluefish and scup regularly exceed harvests by commercial fishers.

Commercial fishers are also extremely concerned about the level of pollution in nearshore waters. Algal blooms, including "red tide," have wreaked havoc with bay waters and shellfish. In 1994, concerns centered around dioxin pollution and other pollutants which were forcing vessels further offshore. Fishing farther offshore has increased risk for those who traditionally fished around the Sound, and two local baymen died at sea in 1993 while fishing far from shore.

Traditional fishing cycles of 2 – 4 days were tied into "making market." With trip lengths increasing to 5 days or more, including greater transit distance and costs to reach the grounds, it has made earning an income more unpredictable.

In response to such events and economic concerns over fishing families, the Montauk Emergency Fishermen's Fund was initiated in 1993. The purpose of this fund is "to take care of fishermen and their immediate families who experience loss of life at sea, medical hardship, or severe economic hardship" (Fund president).

Given the isolation of Montauk, with few options other than marine resource utilization, this community is highly dependent on sustaining its commercial fishing enterprise. Fishing for whiting is a mainstay of the commercial industry, but in recent years, the decline of the whiting stocks has forced Montauk fishermen to seek alternative fisheries. The expansion of the Montauk fleet into new fisheries such as tilefish, the switch to tuna fishing, and the employment of other strategies (e.g., whale watching) has given the commercial fishing community around Montauk more flexibility than in some larger ports, but this community’s dependence on whiting is indisputable.

Demographics and Community Business Trends

Commercial and recreational fishing are the primary activities in Montauk, with the community business sector being geared to servicing these two fishing sectors. The summer season is also important for tourists, and summer rates for hotels and other seasonal housing reflect this. The average age for residents of Montauk is 37.9, while the number of people per square mile is 172.1. The average 1990 income was as follows:

Household	$31,849
Family	$39,292
Non-family	$22,417
Per capita Income	$20,502

As of February 1996, the total population of Montauk was 3,001 (Chamber of Commerce). Census Bureau data give a total 1990 population of 2,813. Of these, 798 claim Irish ancestry, with other dominant groups being German (640), Italian (408), English (252), Polish (174), Russian (158), and Yugoslavian (97).

E.6.5.5.3.5 Greenport, New York

Greenport is a small, quiet community located on the north fork of Long Island. It is a community in which everyone is said to know their neighbors. People often gather in local coffee shops to talk about local and national politics. Most of the business is centered in the downtown waterfront area. Tourism and commercial fishing are the primary economic activities.

Greenport has traditionally been a fishing community. It is attractive to commercial fishermen because it is a deep harbor port. Forty years ago, the bunker (menhaden) boat fleet was located here. Greenport was also a bustling whaling port at one time. In 1983, there was a facility that handled sea scallop vessels. However the plant was closed, the property became a restaurant, and the scallop vessels moved to other ports. Nonetheless, fishing activity and tourism continue to increase in Greenport. More tourists are continuing to visit Greenport because of the increased tourism expenses along the south side of Long Island.

The commercial fishing docks were built and financed by matching grants from the state, county, and village in an effort to bring the fishing industry back to Greenport. Commercial vessels do not pay a fee to dock in Greenport, but they are required to carry insurance in case they damage the docks. When all of the boats are in, the docks are full, and some boats will tie up together. The Greenport town dock is used primarily by the larger boats. Smaller boat owners have dock space around the community, either in front of their homes (if they live on the waterfront) or other, smaller places. Commercial and recreational boats generally do not compete for dock space.

Vessels of all sizes dock in the Greenport harbor. Most of the small boats are local bay boats; the medium boats are generally draggers (60 – 70 feet) that steam 60 – 70 miles offshore for trips up to two days in duration; the large boats are generally larger draggers (80 feet and over) that can steam at least 100 miles offshore and can stay out a week or longer. The number of vessels involved in commercial fishing in Greenport increased during the early 1990s. This trend had more to do with the availability of ancillary services (ice and fuel) than with any overall trend in the fishing industry. There was no place to pack in Greenport before 1989, so vessels went to Montauk, Point Judith, and New Bedford.

Similar to vessels in other southern New England ports (New Jersey and other New York ports), Greenport vessels are more adapted to changing circumstances within their fisheries. They tend to be able to change gear and adjust to the seasonal availability of species because most do not concentrate on just one species. Again, a majority of these vessels rely on the flexibility that mixed trawl fisheries and other seasonal whiting fisheries offer them.

In addition to lobster fishing, three principal methods of fishing are employed by Greenport vessels: otter trawling, pound netting, and gillnetting. In 1993, ten to twenty otter trawl vessels were reported in Greenport; these vessels landed about 60% of the fish. During that time, there were ten boats in the pound net fishery and five gillnet vessels that landed about 6% of the total value of Greenport's catch. The rest came from landings on inshore and offshore lobster vessels.

Table E.44 shows Greenport's landings during 1992 (as a percent of total landed value), and **Table E.45** shows Greenport's otter trawl landings in 1992 (as a percent of total landed value), once again illustrating the importance of and interconnection between the loligo squid fishery, the whiting fishery, and other mixed trawl fisheries. Loligo squid, whiting, scup, and flounder continue to be important species for Greenport otter trawlers. Loligo squid is targeted during the spring and fall and is caught incidentally when fishing for whiting (whiting is also an incidental catch when fishing for squid).

Table E.44 Percent of Total Landed Value, 1992: Greenport, New York

SPECIES	PERCENT OF TOTAL VALUE
Lobster	28.05
Loligo Squid	13.32
SILVER HAKE	**11.68**
Scup	9.08
Summer Flounder	6.89
Winter Flounder	6.71
Bigeye Tuna	4.42
Bluefish	3.13
Angler	2.23
Butterfish	1.88
Weakfish	1.82
Cod	1.82
RED HAKE	**1.07**
Yellowtail Flounder	1.07
Tautog	1.01

Table E.45 Otter Trawl Landings as a Percent of Total Otter Trawl Landed Value, 1992: Greenport, New York

SPECIES	PERCENT OF TOTAL VALUE
Loligo Squid	21.11
SILVER HAKE	**19.52**
Scup	13.68
Winter Flounder	10.49
Summer Flounder	10.23
Lobster	5.87
Angler	3.55
Butterfish	2.46
Yellowtail Flounder	1.79
RED HAKE	**1.78**
Bluefish	1.71
Cod	1.63
Witch Flounder	1.00

In 1997, Greenport landed the most whiting of any port in New York (3,950,257 pounds) and did so with the least amount of vessels in the major whiting ports (21). Its cumulative whiting landings since 1980 place it 10th among top whiting ports. In 1996, three vessels whose principal port was Greenport participated in the Cultivator Shoal Whiting Fishery; in 1997, that number decreased to one vessel.

All of the vessels in Greenport are owner-operated. Some of the larger boat owners may have a first mate who the owner will let run the boat when time off is needed, or the captain may own one half interest in the boat. Vertical integration does not exist in commercial fishing in Greenport. The packing houses do not own boats. The crew is comprised of full-time local men. Most of the draggers have a basic crew of four people. In some fisheries, vessels may pick up a transient crew member. Some of the smaller vessels only have one person who serves as both the captain and crew. The crews are usually paid through the share system. Generally, fuel, ice and food are subtracted from a trip's revenues, and the vessel (owner) receives 50% of the remainder, and the crew receives the other 50%. Sometimes, the captain will receive an extra 2% of the crew share.

There are at least three packing facilities located in Greenport. Winter Harbor packs clams, Long Island Seafood Export handles whiting for export, and Greg's Seafood handles all other species. Overall, most of the fish go either to Fulton Fish Market or are exported to international markets (juvenile whiting). Since the development of these packing facilities and the re-emergence of an ice facility (Greg's Seafood), more vessels have been locating themselves in Greenport. Boats may bring their fish in already packed or loose; Greg's Seafood sends 95% of the fish they pack to Fulton Fish Market in New York City.

In addition to the fuel and ice business mentioned above, Greenport has a local welding business and Greenport Yacht and Shipbuilding. Both of these business are diversified and serve both recreational and commercial fishing interests. Usually, commercial boat repairs take priority over other jobs they may have.

Demographics and Community Business Trends

Greenport, as well as Montauk and Hampton Bays, is located in Suffolk County, a large county with a population of 1,353,704 in 1995. In 1990, 82.2% of Suffolk County residents over 25 years of age had graduated high school, and 23% had graduated college. The unemployment rate in Suffolk County was estimated at 6.2% in 1994, and the per capita income in 1993 was about $24,432 (U.S. Census Bureau).

Table E.37 characterizes Suffolk County's dependence on fishing-related businesses as not very strong, but given the size of Suffolk County, it should be assumed that the majority of fishing-related industry occurs in small waterfront communities like Greenport and Montauk. This makes the importance of those industries to the smaller communities much more significant. Suffolk County's most important industries include wholesale fish and seafood, retail meat and fish markets, and search and navigation equipment.

Social Factors

To an extent, family is important in commercial fishing in Greenport. About half of the boats have been reported to have a family member (primarily a son) working on the boats. Also, some high school students may work on a relative's boat during the summer months. Most of the Greenport captains used to work for other boats and eventually bought their own boats. In 1993, no women were reported to be part of the crews or the packing staff. However, many wives are the backbone of shoreside fishing operations. Women talk to fish dealers, decipher the meaning/impact of fishing regulations, attend meetings, pick up parts and supplies, and work at the dock.

The average age of the crew members is between 25 and 35 years of age. Captains average between 40 and 60 years of age. Almost all of the fishermen in Greenport have fished most of their lives. Most fishermen are high school or college graduates; someone in the family usually has a college degree (either the husband or wife). Most captains and crew members are white males, although several African Americans have been reported to work on the boats in the past. There are some African-Americans and Puerto Rican Americans involved in packing as well. Immigrants from both Russia and Poland have also been reported to work on the crews; they usually live in the Greenport area.

E.6.5.5.3.6 Shinnecock/Hampton Bays, New York

Hampton Bays is a large tourist community with a stable year-round population. Numerous bars, banks, liquor stores, and restaurants cater to the tourists. The port at Hampton Bays is commonly referred to as Shinnecock and the town as Hampton Bays. The fishing port is situated on the north east end of a barrier island next to Shinnecock Inlet. It is surrounded by town and county property. The actual town of Hampton Bays is located across the bridge from the beach area where the docks are. In 1993, it was reported that there were two marinas at the port, two packing houses, and a commercial dock with twenty two slips.

The port area has experienced some problems in the past related to its location on the tip of a barrier island and next to an inlet. In 1992, the ocean breached the dunes, and fishermen were unable to get their trucks in or out of the port area. They had to move their operations up to Montauk for two months during the 1992 – 93 winter. Fortunately, Shinnecock Inlet was being dredged at the time, and the sand was used for beach nourishment. However, fishermen remain unsure of what will happen during a winter when funds are lacking for this type of project.

In 1993, approximately forty commercial boats fished out of Hampton Bays. Most of these were otter trawl vessels. One vessel was reported to longline, and there were no freezer vessels present in 1993. The size of commercial fishing vessels has increased in the last 20 years throughout Shinnecock. Some are 70 to 80 feet in length, and some are over 90 feet. These large boats are considered the big producers. They also tend to fish further offshore and rely on high volume directed fisheries like the whiting fishery. In general, though, there are fewer boats in Shinnecock, especially the smaller ones. Very few new vessels have been built in recent years. In addition to commercial fishing operations, more than five hundred recreational boats have been reported in the Hampton Bays area. These include sport fishing boats, charter/party boats, and yachts.

Dock space is very limited at Shinnecock. The county, with federal money, built a commercial dock fifteen years ago that the town manages. In 1993, it was completely filled, and there was a waiting list for commercial dock space. Fishermen lease dock space on an annual basis. It is difficult for new people to acquire a slip because of the waiting list, and dock space is not inexpensive. The fish houses in Shinnecock have limited dock space in front of their business. For example, there are three berths at the Shinnecock Fisherman's Cooperative, but these are loading zones. Occasionally, the last boat in for the day will stay there until they leave early the next morning.

The landed value of all species in Hampton Bays in 1992 was about $11.5 million. **Table E.46** lists the percent of the total value of species landed in Hampton Bays/Shinnecock during 1992. As with other ports in the New Jersey and New York area, loligo squid was the most important species, and silver hake the second most important. This trend continues today in Shinnecock.

Table E.46 Percent of Total Landed Value, 1992: Shinnecock/Hampton Bays, New York

SPECIES	PERCENT OF LANDED VALUE
Loligo Squid	27.26
SILVER HAKE	**16.51**
Ocean Quahog	12.36
Surf Clam	11.92
Bluefish	6.20
Scup	5.63
Summer Flounder	3.14
Angler	2.18
Skate	1.59
Winter Flounder	1.49
RED HAKE	**1.43**
Atlantic Mackerel	1.36
Albacore Tuna	1.04
Lobster	0.98

Otter trawlers target an array of species on a seasonal basis, including all of the previously mentioned small mesh and mixed trawl species. Squid and whiting are primary species for otter trawl vessels in this area, as with other surrounding areas **(Table E.47)**. Most draggers fish directly south of Long Island. In the winter they fish inside of Hudson Canyon (60 – 90 fathoms of water). In the fall, they fish in shallower water.

Table E.47 Otter Trawl Landings as a Percent of Total Otter Trawl Landed Value, 1992: Shinnecock/Hampton Bays, New York

SPECIES	PERCENT OF LANDED VALUE
Loligo Squid	41.04
SILVER HAKE	**24.90**
Scup	8.46
Summer Flounder	4.65
Bluefish	4.09
Angler	3.29
Winter Flounder	2.14
RED HAKE	**2.14**
Skate	2.13
Atlantic Mackerel	1.42
Butterfish	1.34

In 1997, Shinnecock/Hampton Bays came in a very close second to Greenport for the most amount of whiting landed in the state (almost 3,800,000 pounds). The largest number of vessels than any other port in the state landed that whiting (57). It's cumulative landings from 1980 through 9/9/96 make it 8th in terms of the port with the most whiting landings. In 1996 and 1997, Hampton Bays had one vessel participating in the Cultivator Shoal Whiting Fishery (the vessel's principal port city was listed as Hampton Bays).

Most Shinnecock vessels are owner operated, and there are a few fishermen who own more than one boat. The crew members are not usually family members. They are mostly local men. Crews are paid using the share system. Expenses are taken out first; then, the owner and crew split the rest, 50/50 or 60/40.

Ninety five percent of the fish (except small whiting, squid, swordfish, and tuna) landed at Shinnecock goes to Fulton Fish Market in New York. Fishermen at the Shinnecock Fishermen's Cooperative have cards from the various dealers at the fish market, and they stamp the boxes of fish with the dealers name on it. Fishermen decide to which dealers at Fulton Fish Market they will sell their fish. The Shinnecock Fishermen's Cooperative is a packing facility, formed in 1985 as an alternative to the fish houses. There were approximately twenty-four members of the Cooperative in 1993. At that time, the fee to the Co-op was 10 cents per pound of fish.

Demographics and Community Business Trends

Also located in Suffolk County, Shinnecock/Hampton Bays is more dependent on fishing-related businesses than **Table E.37** suggests. See the profile for Greenport (Section E.6.5.5.3.5) for a description of important fishing related businesses and demographic statistics for Suffolk County.

Social Factors

Many fishermen in Shinnecock have families involved in the commercial fishing industry. Father/son operations are more common in Shinnecock than in other New York fishing communities. Sons usually run the boats for fathers, or fathers will help the sons buy their own boats. They may have uncles, cousins, or nephews as crew. People who enter the fishery as boat owners are usually relatives of those already in the industry or have been working in the business for a long time and have made enough money to buy a boat.

In 1993, there were no women in fishing in Shinnecock. However, the fishermen's wives have an organization and are very active in pushing for the maintenance and upkeep of the Shinnecock Inlet. They traveled to Washington D.C., attended meetings, sold sweatshirts, and worked hard to press the issue and ensure the safety and wellbeing of their fleet. Unlike Montauk, there seems to be a larger number of older fishermen, men who have been fishing for thirty or forty years, located in Shinnecock/Hampton Bays. Most of the captains only know fishing. The crews are mostly recent high school graduates. About 60 – 70% have a high school education. The crews are comprised of mostly white males. In fact, there are few or no ethnic minority communities in the Hampton Bays area. There may be an occasional minority hired to a crew, but not often.

E.6.5.5.3.7 Point Judith, Rhode Island

Point Judith, part of Narragansett, is almost exclusively a fishing community, having a core group of fishermen who fish full-time. Commercial fishing in Point Judith is actually a historically recent activity. Beginning in the 17th century and through most of the 18th, the region of southern Rhode Island surrounding Point Judith was a farming community. Pictures from the turn of the century show plowed fields and farm settlements where there are now secondary growth forest and housing developments. The textile industry started in 1802, became prominent in the late 19th century, and then collapsed. The 20th century has seen the decline of agriculture and mill manufacturing, and their replacement with the tertiary services sector, including retail trade, health care, education, and tourism. Commercial fishing is a secondary industry that came to prominence in the 1930s. Unlike other primary sector industries such as agriculture which have declined, fishing advanced in importance.

In general, Point Judith boats target whiting, fluke, and monkfish. While there are plenty of species more valuable than whiting, it has always been a central species for Point Judith. The total value of fish landed in Point Judith in 1992 was $36.5 million **(Table E.48)**.

Table E.48 Percent of Total Landed Value, 1992: Point Judith, Rhode Island

SPECIES	PERCENT OF LANDED VALUE
Lobster	28.17
Loligo Squid	15.26
SILVER HAKE	**10.35**
Angler	10.15
Summer Flounder	8.30
Scup	5.43
Butterfish	4.16
Winter Flounder	3.97
Yellowtail Flounder	2.19
Cod	1.79
Atlantic Mackerel	1.35
Ocean Quahog	0.73
RED HAKE	**0.61**

Point Judith has a large fleet of trawlers, gillnetters, and lobster vessels. In 1993, approximately 200 commercial boats docked in Point Judith, including 80 trawlers, 30 gillnetters, and 100 or more lobster boats. The trawlers target mixed trawl species: whiting and red hake, squid, mackerel, and butterfish. Between two and four trawlers had freezer capacity in 1993. The older vessels, the eastern rig trawlers, are mostly family run. The bigger vessels, especially the investor owned ones, have crews from all over, and are generally not family run.

Point Judith's fisheries are dominated by otter trawling and lobsterpot fishing, which together made up 95% of the landed value in 1992. Otter trawl catches generally mirror the overall landings (except for lobsters). **Table E.49** illustrates the breakdown of landings by percent value landed for species captured with otter trawls during 1992.

Table E.49 Otter Trawl Landings as a Percent of Total Otter Trawl Landed Value, 1992: Point Judith, Rhode Island

SPECIES	PERCENT OF LANDED VALUE
Loligo Squid	22.71
SILVER HAKE	**15.37**
Angler	14.04
Summer Flounder	12.19
Scup	7.25
Butterfish	6.19
Winter Flounder	5.90
Yellowtail Flounder	3.25
Atlantic Mackerel	1.99
Cod	1.94

Fishermen in Point Judith are maintaining their economic viability by taking advantage of a good mix of mid and north Atlantic fish stocks, and by maintaining diversity in seasonal fishing patterns, gear types, and permits held. The result is a relatively economically healthy fishing fleet, but with few new recruits and no new vessels coming into the system. Ties to international markets have kept the inshore processing sector viable even with the declines in groundfish landings. Offshore midwater draggers have also made up for local declines in groundfish landing by targeting high biomass midwater species such as whiting, herring and squid.

In 1997, Point Judith landed almost 94% of Rhode Island’s total whiting (10,876,380 pounds), more than double the amount of whiting landed at any other port on the Atlantic coast. Over time, whiting landings in Point Judith have remained relatively consistent, and the large volume of landings in Point Judith from 1980 – 9/9/96 made it the top whiting port during that time; it landed almost double the amount of whiting landed at the second highest port (Gloucester) between 1980 and 9/9/96. In 1995, two vessels participating in the Cultivator Shoal Whiting Fishery declared Point Judith their principal port city; in 1996, that number in creased to four, and in 1997, there were three vessels in the Cultivator Shoal fishery whose principal port city was Point Judith. These vessels have contributed to the magnitude of whiting landings in Point Judith.

Point Judith Cooperative

After W.W.II, the fishing fleet expanded and a cooperative was formed (The Point Judith Fishermen's Cooperative Association, locally known as "the Co-op"). Its members included most inshore groundfishermen in the port. The Co-op would purchase fish from member and non-member vessels. As late as the early 1990s, it employed more than 70 people and may have had as many as 175 cutters, staff, and dock workers on any given day. Having the cooperative in town created a different market relationship in Point Judith than elsewhere. Non-cooperative dealers often felt compelled to take fish they usually would not simply because the Co-op would take that species. Such was the case with some market categories of whiting.

The expansion of the industry in the late 1970s pressured the Co-op to put a moratorium on memberships. This was extended until 1986-87 when the Co-op increased its processing capacity by moving into a new larger building. Yet during the moratorium, other companies filled the niche created by the expanding industry, and by the time the Co-op could accommodate the influx, there was little incentive for fishers to join. The expansion of the Coop increased operating costs, and along with pressures from local and external (main market) competitors, contributed to its collapse in 1994.

As late as the late 1970s, Point Judith was predominantly a day boat port. Fishermen in the area were forced to increase the size of their vessels in order to survive, in part due to the decline in the fisheries during the late 1980s and 1990s. Many of the day boat fishermen who did not upgrade are no longer in the business. Unfortunately, these were the local based fishing families who had been active in the industry for a long time in the area. Nonfishing family people, such as lawyers and other professionals, invested in the trip boats during the late 1970s, and their investments led to an influx of boats in Point Judith at that time. People were brought in from other areas, such as Warwick, Rhode Island, to work these new boats.

Today, the port lacks the complex fishing traditions and infrastructure of the larger ports such as Gloucester. Here, a fleet consisting of offshore and inshore vessels follow a cyclic, shifting pattern of resource use that sets Point Judith apart from the northern New England ports. Point Judith boats are diverse in their annual round and approach to the fisheries. While fishermen focus on mixed trawl fisheries, year-round, directed whiting fisheries are also prominent in Point Judith.

The ability of a port to change with the times may relate to the experience of the people involved in the fishery. The average age of Point Judith captains is 30. Point Judith has some of the youngest captains and is considered by many as one of the highest educated ports in New England. The fishermen are not only experienced but also educated.

Port facilities, although small scale compared to New Bedford or Gloucester, are adequate for the size of the local fleet. The area is not much bigger than 3 city blocks, but all the activity in there is associated with some aspect of the fishing industry. Vessels are located at a number of docks which extend perpendicular to the main street. Another set of docks extend off a large industrial area. Across from the harbor are a number of empty docks for seasonal recreational boaters. The main docking facility is the Town Dock. It employs about 50 people and hires between 20-50 part-timers as needed. Temporary employees work at the dock on a seasonal basis depending on the species. Permanent employees all live in the area, while part timers live as far away as Providence. Town Dock handles 12 permanent vessels in the 60-70 foot range. They do handle vessels from other ports but primarily deal with the 12 Point Judith vessels. Dock space does not appear to be a problem in Point Judith, as long as boats are out at sea. During storms the boats have to 'raft-out' which means they tie up to one another along the docks. Boast are charged a docking fee which is handled by the state. There are more docks than processing places in town with a dozen different places to tie up. The Town Dock receives all manner of groundfish, although they do not process much cod and haddock.

Fish product from Point Judith is considered to be of very high quality. It commands high prices in Fulton's and the Boston Fish Market. **Table E.50** shows the Town Dock primary species and their seasons.

Table E.50 Point Judith, Rhode Island: Town Dock Primary Species and Seasons

SPECIES	SEASON
Squid	Year round, with the bulk in May
Herring	December through April
Mackerel	March through May
Whiting	**Year round, with the bulk in the summer**
Scup	Year round, but recently declined

Demographics and Community Business Trends

Point Judith and Narragansett are located in Washington County, Rhode Island. In 1995, Washington County's estimated resident population was 116,862. In 1990, 82.8% of persons over 25 years of age had graduated high school, and 29.1% had graduated college. The unemployment rate for Washington County was estimated to be 5.4% in 1994. The 1993 per capita income for Washington County residents was about $21,887.

As of 1996, the labor force remains skewed towards the service industry, with fishers' numbers remaining fairly constant. Few new fishers are coming into the industry from local communities, but sons of fishers are inheriting operating vessels and permits. Tourism has also become a competing industry, as illustrated below. Although fishers are holding their own, access to prime docking space and 'social space' is being lost to tourism development. Overall, there was a 14% drop in employment in the agriculture/forestry/fishing category between 1984 and 1994. In all other occupational categories, a percent increase is apparent **(Table E.51)**.

Table E.51 Employment Figures for South Kingston, Rhode Island, 1984 – 1994

EMPLOYMENT CATEGORY	1984	1994	Change 1984–1994	% Change 1984–1994
Agriculture/Forestry/ Fisheries	196	168	-28	-14.3%
Construction	97	215	118	121.7%
Manufacturing	781	1,438	657	84.12%
Transportation/ Communication	132	355	223	168.9%
Wholesale Trade	47	102	55	117%
Retail Trade	1,834	2,027	193	10.5%
Finance/Insurance/ Real Estate	132	355	108	81.8%
Service Industries	1,803	2,581	778	43%
TOTAL EMPLOYED	8,530	11,696	3,166	37.12%

Since the post-war days, significant change has come to Point Judith. Tourism is pushing the fishing industry into the economic background as the port becomes more gentrified (Dale 1992). A similar process typifies nearby Newport, where fishing has been overshadowed and incrementally reduced by more than a hundred years of touristic development (Bort 1981). For example, with the increasing costs of boat insurance, insurance companies refused to cover anyone hurt during the Blessing of the Fleet celebration. This change represented a shift in social and economic alliances away from fishing towards tourism.

Areas where fishers used to park before setting out to sea are now lots for tourists. All but one of the social gathering spots for fishers have been converted into tourist attractions such as ice cream shops and restaurants. Weakening of the communal identity of fishers has had a negative social impact. A symptom of this is the changing role of the Point Judith Mission. The Mission initially helped fisher families in crisis with food and small loans. Over the years the emphasis moved towards helping fishers with drug and alcohol addiction problems. Today, some key respondents feel the Mission has lost its community orientation as a support resource for fishing families.

There are numerous support industries along the water. The large industrial area at the North end of the street is where most fish processing is done. It has six processing plants including the former Point Judith Coop (now owned by an independent operator) and the Town Dock. Facilities include dockside fuel pumps, a single restaurant/store, bait shops, commercial marine suppliers, recreational suppliers, and vessel repair shops. Along the adjoining streets are several other restaurants devoted to seafood. As mentioned, the Block Island Ferry leaves from the port and promotes a large seasonal population of people passing through town.

<u>Social Factors</u>

The social cohesiveness of the Point Judith community was based on sharing the common occupation and traditions of the fishing lifestyle. Twenty years ago, there was a different atmosphere to the community. Bait processing and related jobs brought locals with no prior experience into contact with established fishers to share in the development of the industry. An event that represented this shared lifestyle was the blessing of the fleet. The blessing was marked with food, games, parades, and other festivities. Commercial fishing boats would be cleaned and decorated for the celebration to symbolically demonstrate their central value in the social and economic life pattern of the community.

The social reproduction of the fishery follows a father-son progression, and fishers are related to each other patrilineally. Although the history of commercial fishing is in the area is short, the kinship ties in fishing families in this area are long-standing. In 1978, among 116 members of the fishing Cooperative, 18 surnames accounted for 47% of the members, while one family name, represented by three or more fishers each, accounted for 32% of the members. Thus, patrilineal kinship ties have defined the social and occupational networks of local fishermen for generations. There is little ethnic diversity in a population characterized as highly adaptive. The overwhelming majority of fishermen are white males. Older fishermen refer to themselves as "Swamp Yankees." On the other hand, a majority of fish processing workers are ethnic minorities. The former Co-op contracts a company to bus in Asians and Puerto Ricans from Providence to work in the fish houses.

The kinds of impacts that have been noted by families of large draggers in places such as New Bedford and Gloucester are not apparent in Point Judith. Fishermen are still under stress because of the constantly changing regulatory climate, but appear to be coping by maintaining flexible fishing strategies. Point Judith fishers are, overall, being able to sustain their level of social yield in the fishery by maintaining a great degree of adaptability to changing regulatory and economic conditions.

One significant change is that women are involved more as crew and dockside support than they have been in the past, and there is at least one woman boat owner in the port. Another difference with the present fishing populations from the early 1970s is that there has been an influx of first time fishers from the University of Rhode Island and nearby communities that have no family history in the industry, and got into fishing because it was an available option. Present industry recruitment, however, is at a standstill as limits on permits, well established occupational networks, and high start-up costs inhibit new entrants to the fishery.

E.6.5.5.3.8 Other Southern New England and Mid-Atlantic Ports (Freeport/Brooklyn, New York and Newport, Rhode Island)

Freeport/Brooklyn, New York

In 1993, Freeport had 71 permitted vessels, and Brooklyn had 33. The total value of all species landed in the Freeport/Brooklyn area in 1992 was about $4 million. Although some whiting is landed in this area, the most important fisheries in terms of landed value are usually surf clam, loligo squid, summer flounder, scup and lobster **(Table E.52)**.

Table E.52 Percent of Total Landed Value, 1992: Freeport/Brooklyn, New York

SPECIES	PERCENT OF TOTAL VALUE
Surf Clam	44.79
Loligo Squid	13.01
Summer Flounder	11.36
Scup	10.47
Lobster	6.37
SILVER HAKE	**5.97**
Winter Flounder	2.14
Black Sea Bass	0.85
Angler	0.84
Bluefish	0.62
Butterfish	0.52

Bottom trawlers and surf clam dredges account for the majority of the landed value of species in the Freeport/Brooklyn area. Until about ten years ago, there were 25 draggers in Freeport. In 1993, there were 5 active draggers in Freeport, all inshore boats working inside 50 miles. The largest boat was 60 feet, and the others ranged from 40 to 60 feet. The four major species of fish targeted by otter trawlers in Freeport are whiting, winter flounder, summer flounder, and squid **(Table E.53)**.

Table E.53 Otter Trawl Landings as a Percent of Total Otter Trawl Landed Value, 1992: Freeport/Brooklyn, New York

SPECIES	PERCENT OF TOTAL VALUE
Loligo Squid	27.21
Summer Flounder	23.76
Scup	21.89
SILVER HAKE	**12.48**
Winter Flounder	4.47
Black Sea Bass	1.78
Angler	1.75
Butterfish	1.08
Lobster	1.02
Witch Flounder	0.90
Yellowtail Flounder	0.81
Bluefish	0.67
Atlantic Mackerel	0.64
Weakfish	0.35
RED HAKE	**0.32**

Generally, otter trawl boats use a captain and a crew member and the boats pay on the share system. Most draggers are day boats, but they will take a forty-eight hour trip now and again for species like loligo squid. In 1993, only one of the five draggers in Freeport was run by a father and a son. All five draggers were owner operated.

<u>Newport, Rhode Island</u>

Newport is a historical port dedicated to tourism and recreational boating, but with a long and persistent commercial fishing presence. Before the development of the docking facilities at Point Judith, Newport was the center for fishing and shipping in the state. In 1971, 57% of all Rhode Island commercial fisheries landings were in Newport, but Point Judith surpassed Newport in importance by 1973, and now is the dominant commercial port in the state.

Tourism in Newport started as far back as the 1700s. Visitors included southern plantation owners who stayed in Newport to escape the heat of the summer. By the 1830s, tourist hotels began to dominate the shore side landscape. The famous "cottages" of Newport where built by industrialists seeking to outdo each other in displays of ostentatiousness. The present tourist economy is centered on year round activities with the highlights being summer and sailing events. The Americas Cup races are regularly held in the area, attesting to the importance of the pleasure boating industry.

Besides tourism, the East Bay Navy base has a major economic impact in the area. The base employees thousands of local civilians in service roles. The service industry also caters to a large retirement community. Many naval personnel familiar with the area from periods at the local War College or at the command schools select Newport for retirement. They bring money into the community as retirement pensions and contribute to the support of many service-oriented businesses as significant consumers.

During the 1700s to early 1800s, fishing was an important part of the local economy. Historical records mention fish drying stations and fisheries. The quantities of fish are not mentioned, and fisheries as an activity declined by the 1700s with the rapid development of Newport as a slave trading and shipping center. Fishing has always been an integral part of the local economy, although not of the stature of tourism and other components. It does not make much sense to talk of the degree of community "dependency" on fishing in Newport, for the existing 'community' could do quite well if commercial fishing disappeared altogether.

Newport has one of the best natural harbors on the Northeast. It provides excellent protection from rough weather, and is deep enough to provide berthing for US naval vessels. There is only one wharf area that is presently used by fishers. It is leased by the state to the Newport Shipyard Company. This stone filled wharf is adequate to service the 20 vessels that regularly land groundfish in Newport. In 1981, major fish buyers included Anthony's Seafood, Aquidnick Lobster Company, and Parascandolo and Sons. Anthony's is no longer in business, and Parascandolo markets all groundfish landings that come into Newport. Fish are not sold or processed locally, but ice packed in trucks to Boston, New York, New Bedford, and markets south. Decisions are made on where to ship the fish based on equitable pricing and demand. Ice is supplied to these firms by the Eastern Ice Company located in Newport.

In 1992, the total value of landings in Newport for 1992 was $14.5 million. The majority of the landings were comprised of lobster, sea scallops, angler, summer flounder, scup, and loligo squid. During 1997, Newport landed less than 1 million pounds of whiting, 6.8% of the amount of whiting that was landed in Point Judith. However, total whiting landings between 1980 and 9/9/96 have made Newport the 9th most significant whiting port (Point Judith is 1st).

One interest group representative noted that Newport's commercial fishing industry is psychologically different than Point Judith and Quonset Point. There are wetfish trawlers but the majority of boats target groundfish or fluke. Newport is not a big squid or whiting port, having only 15 or so trawlers working out of the port. "Swill Boats" target squid, whiting, butterfish, and scup. These boats make trips of three to five days. Some of the boats have freezer capacity which allows them to stay out longer. The swill boats work with a crew size between three and five including the captain. The boats have conveyor belt systems which make it easier to cull fish using less people. Some boats will go two handed, with just a captain and a mate.

Except during storms, there are usually no more than a half-dozen commercial vessels tied up in Newport. Groundfishing boats, a few scallopers, gill-netters, and draggers make up the range of boats in Newport. Newport also does a great deal of lobstering and has a significant trap and pot fishery. The fishermen who make up the crews in Newport are not necessarily from Newport, but some local people from the area do work on the boats. Some crew members come from Point Judith, New Jersey, New York, and New Bedford. Typically, owners of the boats do not work on them. As with almost all of the ports, crews are paid on the share system.

E.6.5.5.4 Northern New England Ports

E.6.5.5.4.1 Gloucester, Massachusetts

Founded in 1623, Gloucester has been a fishing port for the last 372 years. Although commercial fishing is still a primary industry (Gloucester was ranked second in 1995 in pounds landed on the eastern seaboard), light industry and the service sector are gaining in importance, and foreign imports have taken the place of domestic landings for some local processors. The community's largest fishery employer, Gorton's of Gloucester, processes and markets imported fish only and has not purchased a pound of locally caught fish in 30 years. This is because foreign labor and harvesting costs are lower, there are fewer restrictions and the supply is, therefore, more predictable. Most processors have looked to foreign suppliers to keep their businesses going. Their interests are not as linked to the fate of the local fishing fleet as in the past.

The Gloucester commercial fishing fleet can be divided into four major gear groups. These are mobile gear (draggers) and three categories of fixed gear (gillnets, longlines, and lobster pots). Other types of commercial fishing include jigging, harpooning, diving for sea urchins, and various types of trapping. Other uses of marine resources include recreational and sportfishing, and seasonal whale watching tours. Groundfishing with mobile gear remains the predominant fishing strategy in Gloucester.

The traditional fishing fleet of Gloucester have been ground trawlers, using stern or (rarely) side trawling techniques. Most of the fleet land their fish in Gloucester, although larger vessels may land squid, whiting, and other species in Portland or Rhode Island. There has been a significant decline in landings due to restrictions on days at sea and area closures. The fleet in Gloucester is highly concentrated inside an extremely sheltered harbor, and affordable docking space is at a premium. With the introduction of ice plants in the late 1800s, iced fish could be marketed throughout the eastern seaboard, establishing Gloucester as one of the primary seafood ports in the nation. The existing processing and cold storage facilities have a combined capacity of nearly 95 million pounds. Replacement of this infrastructure would be prohibitively expensive if the fishery were allowed to collapse. The modern state dock, built in 1982, was recently renovated with funds from the Economic Development Administration. There are deep draft berths for 64 commercial vessels at the state fish pier. However, the high docking fees and insurance requirements have kept most commercial vessels off this dock. Scattered among the working vessels are charter boat facilities and whale watching firms that have been taking over spaces vacated by a dwindling groundfish fleet. Space limitations mean most of the vessels must have some arrangement with a processing facility or dealer in order to tie up their vessels.

In 1997, more than 1,775,000 pounds of whiting, almost double that of any other port in Massachusetts, were landed in Gloucester. 88 vessels landed whiting in Gloucester during 1997, three times as many vessels as in other Massachusetts ports. Its landings over time have made Gloucester the second largest whiting port between 1980 and 9/9/96 (behind Point Judith). Only one vessel in the Cultivator Shoal Whiting Fishery claims Gloucester as its principal port, but it is likely that several vessels based in Gloucester participate in the Cultivator Shoal Whiting Fishery. Four vessels that participated in the Experimental Whiting Separator Trawl Fishery during 1996 claimed Gloucester as their principal port, but none did in 1997. Quite a few vessels out of Gloucester have either participated in the Raised Footrope Trawl Experimental Fishery or have expressed interest in doing so.

The decline in the economic viability of the larger fishing vessels has put incredible pressure on the ability of fishermen in Gloucester to make a living. As vessel size increases, there is a considerable increase in operating expenditures, such that the average total expenditures for a larger vessel operating with a normal complement of five crew is approximately six times that of the smaller day boats. Increased costs come from greater number of days at sea, which translates into higher labor, fuel, ice, and food expenditures. Risk is thus considerably greater for larger than smaller vessels.

The lack of security from fishing has steadily increased as the management regime becomes more restrictive, fish of certain target species are scarcer, and operating costs continue to rise. One outcome of this has been reduction in crew size to reduce labor costs. There has been a drop in the number of crew employed on the vessels from a high of 10 – 11 to now just 2 – 6. Some larger vessels are now operating inshore with skeleton crews of just two to four (e.g., a father-son operation). They cannot afford to work with a larger crew, nor can they afford to fish offshore for any extended periods.

Reduction in crew size is accompanied by longer trips at sea (10 – 12 days) compared with 7 – 8 days several years ago, increasing the work load and stress on remaining crew. It also makes it much more difficult to find good crew for vessels that are short handed. Reduced crew means there is also less manpower to deal with emergencies at sea. This puts the remaining crew at greater risk. The loss of days at sea which accompanies putting into port in bad weather pressures captains to stay out even during threatening weather, putting the vessel at greater risk. Deckhands have arguably borne the brunt of reduced crew sizes. Traditionally, the share that goes to the boat is half of the catch profit. To make up for smaller catch and less profit, the boat share is increased. This cuts into the profit shares of crew. Crew aboard larger vessels in Gloucester and New Bedford are more like factory workers than independent fishers in small vessels who own their own means of production.

Gloucester Display Auction

The history of fish marketing has been characterized by an unbalanced economic relationship that favors the buyers. Taking advantage of fishermen has not been not uncommon, yet recently the balance has shifted from dealers to favor fishermen to a greater degree, largely because of the increased competition for the dwindling fleet of suppliers. As the number of markets declined, the options available to the remaining suppliers became more uncertain as there was a decrease in the flexibility of the market due to reduced competition for product.

One remedy to improve the equity of price and market information has come in the form of the fish auction based on a model of the Portland Fish Exchange. The Gloucester Seafood Display Auction opened for business on November 29, 1997. It is privately operated by Star Fisheries of Gloucester, but Star Fisheries does not bid or purchase any fish through the Auction. Sellers and buyers equally pay a fee of .05 cents per pound to the auction for all fish bought and sold. Fish are unloaded and inspected by prospective buyers before the daily auction at 6:00 a.m. Vessels from Portland, Cape Cod, and beyond land at the Auction. Between 1 and 2 millions pounds of fish has been traded each month sine it opened at the Gloucester Display Auction.

The Gloucester Display Auction has provided an opportunity to add value to local product and expand the market share. Quality fish sold at higher prices helps local fishers get into new markets. It is anticipated that, over time, the Gloucester Display Auction will create many shore based jobs for displaced fishermen (crew and owner-operators). Initially, 25 jobs were anticipated from the market, with predictions of up to 100 in early development to 300 in later development. Job qualification for the market fits the profile of displaced/retired fishers. Individuals are needed who have hands-on familiarity with fish, and who can also sort and grade fish for quality. Fishermen can do this, without any significant retraining activities. Most would not have to speak English or have any other skills that they do not already have from working in the fishery.

Fishing vessel owners consistently give good reviews of the auction operation. Fishermen report that ex-vessel prices have substantially increased, sometimes by 2 to 3 times the prices paid before the auction opened (David Bergeron, pers. comm.).

Even with the development of the Gloucester Display Auction, infrastructures related to fishing have faced a severe decline in recent years. Repair shops and equipment once regularly available now must be sought in New Bedford, Boston, or elsewhere. Overall, the ability to shift to other species and gear is limited by the capital investment in the fishing operation. The larger vessels characterizing the Gloucester fleet are often saddled with debt, tied to home mortgages, and too specialized to rig with other gears without further debt. This ability is also limited by the financial ties of the crew to the vessel. A family (or families) that have their homes mortgaged to a vessel cannot easily abandon that vessel to pursue another option.

In addition to adjusting to change within commercial fishing, the prospect exists for fishermen to move into nonfishing occupations or marine related jobs either for short-term, casual employment during down turns in groundfishing or as a viable career alternative. Retraining centers established throughout the Northeast, administered by state Departments of Labor, have been operating on the assumption that adjustment to the current crisis would include job training.

With 95 enrolled, the retraining program has been as successful as possible in Gloucester due to strong leadership in the center and the pairing of center activities with the Gloucester Fishermen's Wives Association (GFWA), but the program suffers from several problems nevertheless. The GFWA is an organization with 26 years working experience with the fishing community. Despite the best efforts of the GFWA leadership in assisting the retraining process, there are still difficult problems to overcome. The major problem, of course, is that people do not want to give up fishing as a way of life, which does not compare to the job opportunities presented by the retraining centers.

Besides experiencing a reduction in fishing fleet and supporting infrastructure of the past twenty years, the contemporary fishing industry of Gloucester has gone through many changes. These are due to technological innovation, competition, and recent scarcity of certain fishing stocks along with increasing competition among a diversity of stakeholders. Reductions in days at sea, closure of large areas, and decline in important groundfish stocks have reduced the viability of the groundfishing fleet. Nevertheless, local fishing and related businesses still employ an estimated 40% of Gloucester’s population. Businesses that support the local industry are small, locally owned and operated.

Demographics and Community Business Trends

Gloucester is located in Essex County, a rather large county with an estimated resident population of 683,723 in 1995. Gloucester’s population in 1996 was estimated at 29,267. In 1990, 80.2% of residents over 25 years of age in Essex County had completed high school, and almost 26% had graduated from college. The unemployment rate in Essex County was estimated to be 6.3% in 1994. In 1993, the per capita income for Essex County residents was about $23,894 (U.S. Census Bureau).

Table E.37 indicates that there is a significant amount of fishing-related business in and around Gloucester (in Essex County). The primary businesses include fish preparation and sale as well as search and navigation equipment. The economic dependence of Essex County on fishing-related activities, however, is probably greater than **Table E.37** suggests due to the large number of self-employed persons in the fishing industry.

There are many occupational roles that support the local fishing industry. These include processing plant workers, lumpers, ice providers, truck drivers, electricians, boat operators/owners, deck hands, gear suppliers, lawyers, social service providers, welders, accountants, engineers, fuel suppliers, seafood processors, marine railway owner/operators, refrigeration service providers, surveyors, and charter boat owner/operators.

A public official pointed out that there are now four major components to the Gloucester economy, and that they are all important to maintaining the economic health and social character of the community. These are: fishing, tourism, light industry, and folk art. In fact, the largest single employer in the community is Varian Ion Implant Systems, headquartered in Palo Alto, California, which supports 1,400 jobs in Gloucester. However, Varian has just gone through two layoffs, and may eventually be reduced to 450 employees.

Many women now work outside the home, and men who traditionally would spend most days outside the household at sea or on the docks find themselves spending more and more time at home. Limitations on days at sea, increasing operating, repair and insurance costs make this necessary. Recent immigrants from Southeast Asia and Latin America are mostly employed as laborers in the processing of sea urchins. They commute from outside areas to work, and by not participating in social or religious organizations, they are not considered permanent residents.

Of the 28,000 residents in Gloucester in 1993, 15,800 residents were 16 years and over and working in the labor force. The rounded figures by category of employment are given in **Table E.54**.

Table E.54 Business Profile of Gloucester, 1993

INDUSTRIAL SECTOR	NUMBER EMPLOYED	PERCENT OF TOTAL
Managers/Professionals	3,900	25%
Technicians/Administrative	4,100	26%
Service Occupations	2,100	13%
Fishing/Forestry	400	2.5%
Precision Products/Crafts	1,900	12%
Operators/Fabrication Laborers	2,200	14%
Self-Employed	1,200	7.5%
TOTAL	15,800	100%

Tourism, conversion to a bedroom community, and local high-tech industry have transformed historic Gloucester as it continues to diversify economically and culturally. Light industry accounts for thousands of new jobs in the area. Light industry is not as intimately linked to fishing as are tourism and the art colony. The fact that Gloucester remains a working fishing port is part of what attracts both artist and tourists to the community.

Social Factors

Gloucester's historical dependence on fishing is revealed in the art and architecture of the community, both religious and secular. Committing resources for the creation of occupationally specific art and architecture shows a deep community dependence on that occupation. Examples include Our Lady of Good Voyage Church, the Gloucester fisherman statue, and the entrance mural of St. Ann's Church. A recent event of significance is the dedication of the plans for the statue of the fisherman's wife. The commission for this community symbol went to a local artist, and a recent ceremony commemorated the commissioning of the statue, which should be completed in three to five years.

Fishing life symbols do not occur in isolation. They are integral parts of social rituals. Rituals are repetitive seasonal actions that reveal the most deeply felt values of families and households (Turner 1967). Rituals of saint worship, of the blessing of the fleet, and seafood festivals are integrated with the secular and religious symbols that are a part of the cultural landscape of the community. Symbols and associated rituals are also representative of persisting social arrangements. Such arrangements include working crews, family networks, social clubs, fisher-processor credit relationships, and fishing associations.

Many of the residents of Gloucester are descendants from Nova Scotia who came to Cape Ann in the last century. The traditional fishing peoples have included Canadian, Scottish, Yankee, Portuguese, with most of the present fishing population of Italian descent. A large number of these fishers have come from fishing ports in Sicily. They came over here "seeking a better life." Migration was based on social networks and kinship. Once a family was established with one or two individuals, others would be urged to join them.

Just under 40% of the 27,000 residents of Gloucester are Italian Americans, having arrived in two primary waves of immigration. The traditional fishing family structure consisted of extended kinship networks of fathers, brothers and cousins who worked together on draggers. While men were responsible for fishing and earning money, women took care of the household, onshore finances and child care. This arrangement provided a very satisfying lifestyle that has been severely strained by the fishing crisis.

Cultural and social distinctions in Gloucester divide fishing families from the rest of the community, making the fishing community to some extent insular. Ethnically, most ground fishers are Sicilian/Italian, and there remain strong connections with Italian communities of origin. The fishing families are aligned to a local church and have been a largely closed population since the founding of the community in 1623. The Catholic parish was founded in 1849 and Catholic fisher arrived shortly after. Protestant fishers declined in numbers over the 16th century while Roman Catholics now comprise the great majority. These indicators of social and cultural distinctiveness--of insularity--have made the fishing community less open to outside intervention in the form of government regulation than fishers who are less distinct from non-fishers such as fishery biologists and managers. Thus, religious as well as traditional values make the community more resistant to change than what would be designated the Yankee ports of the Cape (Chatham) and Maine. While fishers are not encouraging their sons to enter the fishery, they resist leaving it themselves. Unfortunately, several developments external to and within the industry, noted above and below, have made staying in the industry difficult.

As fishing becomes more difficult, there is an associated decline in job satisfaction, which may lead to mental health problems. The Department of Health, Education and Welfare (now Health and Human Services) noted in a 1973 summary of research by the Survey Research Center at the University of Michigan that the absence of job satisfaction is related to psychosomatic illnesses, anxiety, low self esteem, worry, tension, and impaired interpersonal relationships. Increased stress due to the crisis was noted by every key respondent interviewed in Gloucester, and resulted in occasional emotional expressions of stress during the interview. Stress has been attributed by key respondents to strong sentiments of uncertainty and helplessness, particularly since Amendment # 5. An M.D. in Gloucester with decades of history treating local fisher families, processors, and managers noted a dramatic increase in stress related illness and disease over the last three years. This includes gastrointestinal illnesses, stroke, heart attacks, and hypertension. He attributed this directly to the impact of regulations and related changes. Heart disease and other illnesses which impact a person's social relationships have also been related to work dissatisfaction.

E.6.5.5.4.2 Provincetown, Massachusetts

Provincetown (known by locals as "P'Town") is a historic port with the second deepest harbor in the United States. Unlike Point Judith, the fishing fleet of P'Town has concentrated its efforts on dragging, and has not significantly diversified into other fisheries. The majority of the fleet are eastern otter trawlers, complemented by a small fleet of inshore angling vessels. In 1995, a total of 18 vessels were counted at the docks, with their numbers equally divided between steel and wooden hull vessels.

The town pier has two large docks that extend for approximately 300 yards. The construction is wood and cement and is sturdy enough for 18-wheeler truck traffic. At the end of the pier are two fish suppliers: Oceanic Seafood and Whaling City Seafoods. The docks are in good condition, and the Chamber of Commerce has been actively promoting the quality of the harbor for berthing of large offshore (foreign) vessels. The end of the pier is dominated by restaurants and local shops, but there is little evidence of businesses dependent on the fishing industry.

Provincetown has the most dilapidated fleet of any port. Most of the vessels observed (13 out of 18) were old eastern rigged otter trawlers. Half of the fleet were of wood construction, while the other half consisted of rusty steel vessels. The fleet is a combination of scallopers and otter trawls ranging from 45 to 68 feet in length. The otter trawlers have from 2-6 crew, while the scallopers have crews up to seven (NMFS regulations prohibit more than seven crew members on scallopers). The isolation of Provincetown insures that all fishing families live in local residences. Some of these families are having difficulties with their mortgages as they struggle to survive in the fishery. Some of those in economic stress have returned to Portugal.

The age and condition of the vessels is the primary difficulty facing local fishers. Many vessels lack insurance and are unsafe to be on the water. some vessels have sank right at the dock. Sunken dockside derelicts have been refloated and reused if not sold outright. Because fishing has been so poor, and regulations so restrictive, fishermen can only afford to fix the most pressing repairs, ignoring others which could be life-threatening on an extended fishing expedition. The condition of the fleet has thus cut into the trawl time of the more problematic vessels. Captains are afraid to venture far from shore for extended periods because of the threat of sinking.

Besides 28 larger vessels, there were 19 smaller jig boats n P'Town in 1995. Of these, 15 were longliners, two gillnetters, and two lobsterpot fishing. Only 17 of the 28 vessels were in working condition. The smaller vessels are in better financial shape, since they are less costly, but also since they are not expected to provide direct support for more than 1-2 fishermen and their families. However, all vessels and fishing families are marginalized in a fishing community that is experiencing the worst possible combination of marketing, fish stock, and production capital losses.

The importance of fishing to historic P'Town is reflected in murals in the town hall showing fishers bringing in the catch. Provincetown once had a booming fleet that took advantage of its proximity to local fishing grounds to catch large quantities of groundfish. Fish were processed and shipped to Boston and other markets, and a thriving processing sector dominated the local docks. About 15 years ago, local respondents report that the industry began to experience a downturn as nearby fish stocks were depleted and area closures such as Stellwagen Bank limited the opportunities to fish near shore.

Recently, and probably due to the decline in groundfish abundance, the Provincetown fleet has invested a significant amount of time, effort, and money into developing alternative fishing strategies, one of which includes fishing for whiting. Fishermen in Provincetown, with the help of the Massachusetts Division of Marine Fisheries, pioneered the Experimental Raised Footrope Trawl Experimental Fishery. A majority of active draggers out of P'Town have participated in this experiment. Because of the experimental fishery, P'Town's whiting landings in 1997 were the second highest of any port in the state (almost 1 million pounds), a close second to Gloucester. Between 1980 and 9/9/96, whiting landings in Provincetown have made it the fourth most significant whiting port. P'Town was the principal port city for one vessel participating in the Cultivator Shoal Whiting Fishery during 1995, and three vessels in the Experimental Separator Trawl Fishery during 1996.

One disadvantage P'Town has over other ports is its geographic location. Although it has the second deepest natural harbor in the world, being at the northernmost tip of Cape Cod, its distance from major fish markets has made it difficult to compete with ports having better access to ground transportation such as New Bedford and Gloucester. In the summer time, the one road going into an out of P'Town on Cape Cod is regularly clogged with tourist vehicles on their way to visiting the beaches or traveling to the art and tourists shops that have come to dominant the P'Town economic landscape. In the winter time, bad storms can close down the one road making regular access difficult. Processing plants closed down, and the traditional fishing fleet aged while gentrification drove the economy towards tourism:

Original fishers of P'Town were English and Scottish immigrants, eventually replaced by Portuguese immigrants who came to dominate the fishing industry. Extended Portuguese families worked in occupational enclaves based on 6-7 person crews. They did not significantly diversify their economic activities and thus remained somewhat culturally and linguistically isolated from other residents. Migration between P'Town and Portugal was common. Many of the more successful fishermen have left P'Town over the last 25 years to join the fleet in New Bedford. They were replaced by newer immigrants who would take over aging vessels and 'have a go at it." However, others stayed and have fished out of P'Town for up to 40 years. Because of the outward migration of highlanders and the ethnic insularity of the fleet, there was really no impetus (or significant capital) to diversify fishing strategies. Those coming into the fishery took up with what was available, and had little motivation to change.

<u>Demographics and Community Business Trends</u>

Provincetown is located in Barnstable County, a county that spans the entire Cape and includes other fishing communities like Chatham, Harwich, and Hyannis. In 1995, Barnstable County's resident population was estimated to be 199,804. In 1990, 88.4% of residents over the age of 25 had graduated high school, and 28.1% had graduated college. The unemployment rate for Barnstable County was estimated at 8.3% in 1994. In 1993, per capita income was approximately $23,619. **Table E.37** suggests that Barnstable County's primary fishing-related businesses include wholesale and retail seafood, ship and boat building and repairing, and marinas. A majority of these businesses have probably developed in response to the influx of tourism to the area.

The major problem in the port is unemployment and underemployment of former fishermen. Day-to day survival is a struggle as fishermen and their families cope with declining income (or no income) and increasing uncertainty because of fishery restrictions. However, given the fishing and fleet conditions, restrictions on days at sea are less of a problem now than just getting out to sea at all. One possible avenue for fishermen to improve their economic condition is through the retraining programs being offered by the Fishing Family Assistance Center. The Chapter on Gloucester discusses critical issues that include the training centers on Cape Cod. In P'Town, the primary barriers to the success of the program are as follows:

- P'Town fishermen do not see the centers as an opportunity to seek a better life, but as a program designed to take away their opportunity to earn a living fishing;
- the program was not designed with any understanding of local fishing culture and life values;
- ethnic and linguistic barriers exist that limit the participation of male Portuguese fishermen; and
- the opportunities for retraining are limited by economic opportunities in the region.

E.6.5.5.4.3 Portland, Maine

Natives of Maine draw much of their identity and trace their ancestry to traditions based on coastal and marine resources and other interactions with the natural environment (Duncan 1995). Maine fisheries are best known for lobstering, which has emerged as a highly specialized and lucrative fishery but which, currently, is grappling with territoriality and crowding issues that may become more pronounced as continued restrictions on groundfishing force ground fishermen into alternative summer fisheries (Acheson 1987; Ellsworth News 1996).

Despite competition from other industries for space, the Maine groundfishing fleet remains active, geographically dispersed across several communities (mostly between Saco and Rockland), and internally diverse with regard to gears, vessels sizes, and involvement in other fisheries. Maine ground fishermen, their families, the associations they have formed, and those processing and harvesting businesses who buy, pack, and ship their catch have constructed and maintain a complex, interconnected physical and social infrastructure around the pursuit and capture primarily of groundfish.

Portland's (and surrounding smaller ports) groundfish fleet has three principal components:

1. Vessels ranging from 80' to 100' in length that fish, usually, for 10 days at a time. These vessels rarely fish in Maine state waters, usually traveling as far as Georges Bank and beyond and fishing primarily with dragger nets. Crews on these vessels usually consist of a captain and two to three other individuals.
2. Vessels ranging from 45' to 79' in length that fish for 4 to 5 days at a time, also using dragger nets. Crews usually consist of a captain and one to two other individuals. Some of these boats also participate in seasonal shrimp and whiting fisheries.
3. Boats under 45' who fish for a single day at a time. Crews usually consist of a captain and one other individual. A majority of these vessels rely to some extent on fishing for whiting, especially to supply the juvenile export market by using a separator trawl (grate) with 40 mm bar spacing in combination with shrimp mesh (1-3/4").

Portland fishermen and fishing families adjust to increased regulations in fairly predictable ways, based on their past adaptive responses to various political, economic, and ecological crises: specifically, they respond with a combinations of experimenting with alternative survival strategies, protest, and resistance. Maine fishermen consider themselves innovative and entrepreneurial, and their responses to new fishing regulations have been fashioned along typical business lines, including challenging the state on legal grounds and investing time and income in alternative uses for their vessels. One "alternative" to groundfishing has developed through the Whiting Experimental Separator Trawl (grate) Fishery. Vessels fishing out of Portland and other nearby harbors have participated in this experimental fishery on a seasonal basis for three years now. Almost all of the whiting they catch in this fishery supplies the Spanish juvenile export market. Although landings from Portland vessels do not comprise the majority of whiting supplied to the Spanish market, these fish are usually higher in quality (primarily due to the use of a grate) and command a higher price.

Whiting landings in Portland during 1997 (1,237,491 pounds) comprised 99.5% of the total whiting landed in Maine. It's cumulative whiting landings over time make Portland the 5th largest whiting port between 1980 and 9/9/96. This is due to historical whiting fisheries (during the early 1980s) in the Gulf of Maine and the re-emergence of whiting fishing through the development of the juvenile export market in the mid-1990s. Portland was the principal port city for only two vessels that participated in the Cultivator Shoal Whiting Fishery during 1997, but it and other surrounding ports contains a majority of vessels that participate in the Experimental Separator Trawl Fishery (about 80%).

<u>Demographics and Community Business Trends</u>

Portland is located in Cumberland County (total resident population in 1995 about 248,526). In 1996, it was estimated that Portland's population had reached over 63,000. The U.S. Census Bureau reports that in 1990, 85% of all residents in Cumberland County graduated high school, and 27.6% graduated college. The unemployment rate for Cumberland County was estimated to be 5.1% in 1994. The per capita income for residents of Cumberland County in 1993 was just above $23,000.

Portland itself is a diversified community with a complex economy, the center of a county that boasts the second lowest unemployment rate (between 4 and 7%) in the state (Maine Department of Labor 1994). The civilian labor force in the Portland Metropolitan Area averages 132,290 for the year, reaching lows of 126,050 during the month of September and reaching a high of 138,100 during December, when the unemployment rate drops to 4.3%, largely, of course, because of increases in retail trade around Christmas. Generally, however, the summer months suffer lower unemployment rates than the winter months. Seasonal fluctuations such as these are common throughout the state of Maine, if more exaggerated in smaller, isolated communities that are more heavily dependent on fishing. Stonington's unemployment rate, for example, fluctuates between a low of 3.1 percent in August to a high of 10.5% in February. Portland's economy, by comparison, is much more stable seasonally.

Table E.55 shows the distribution of jobs by industrial sector in Portland. These distributions indicate an economy with a strong (but no longer central) manufacturing base and a growing service sector, reflecting national economic restructuring trends. Average wages in the Portland area are around $10.00/hour, or around half of what crew on fishing vessels can make (or were used to making prior to the current situation), and as little as a fifth of what captains were making. Median family incomes in the city were $25,600 in 1983 and $38,511 in 1990, or an increase of 6.5%, indicating a relatively robust economy.

Table E.55 Non-Agricultural Wage and Salary Employment, Portland, Maine, 1993

INDUSTRIAL SECTOR	NUMBER EMPLOYED	PERCENT OF TOTAL
Manufacturing	13,330	10.5%
Construction	5,110	4%
Transportation/Utilities	5,940	4.7%
Wholesale Trade	8,660	6.8%
Retail Trade	28,470	22.5%
F.I.R.E.	12,260	9.7%
Services	36,560	28.9%
Government	16,930	12.9%
TOTAL	126,720	100%

Table E.37 identifies wholesale fish and seafood and ship and boat building and repairing as two primary fishing-related industries that re important to Cumberland County's economy. Commercial fishing, however, is but one of several industries and cannot be said to be the leading industry in the city, although the port itself occupies a central place in the city's economy and its quality of life. Two waterfront surveys compiled by the Council of Governments in Portland reported that during the recession of the late 1980s and early 1990s, Portland's waterfront businesses expanded and hired more employees, indicating the port's overall importance in the city's economic health (Portland Council of Governments 1992a, 1992b).

The Portland Fish Exchange and Other Port Infrastructure

At the heart of the Portland's fishing industry stands the Portland Fish Exchange (PFE), a display auction founded in 1987 on the Portland waterfront. The auction has acquired a reputation for fairness and accuracy of weighing in a region long known for difficulties between seafood dealers and fishermen. Some fishermen have switched from selling their fish in Boston and New York markets, saying that those markets were far too prone to rounding weights downward, arguing over quality and other characteristics of the catch, and sometimes taking days or weeks to pay for fish. The Portland Exchange, by contrast, provides a setting where fishermen or their representatives (brokers) come together with buyers, every Sunday through Thursday at noon, to bid on various lots of fish. Typically, fish are landed at the auction early in the morning, between four and six, separated and weighed, and auctioned off at noon. During the shrimp season, shrimp auctions also take place in the evening.

The Exchange employs between 35 and 55 individuals, fluctuating through the year based on weather conditions and the availability of groundfish. With the exception of shrimp, most of the species they land are groundfish species. The Exchange also assembles daily price reports and lists of species landed by vessel, pounds, sizes, and other information, serving as an excellent data source for National Marine Fisheries Service's efforts to monitor the conditions of the resource on a daily, weekly, or annual basis.

The Exchange is the center of the northern shore of Casco Bay, sitting among several seafood brokering establishments and the Marine Trade Center, a building that is conspicuously businesslike in appearance, reflecting the self-professed entrepreneurial spirit of the Portland fleet. The square brick structure with bold silver letters that read Marine Trade Center symbolizes this stoic and stubborn resistance to what the fishermen of Portland consider onerous regulations. The Center houses the National Marine Fisheries Service offices, the Maine Department of Labor's Fishing Family Assistance Center, Maine Fishermen's Wives Association, and several other marine related businesses or assistance organizations.

In addition to the complex that includes the Fish Exchange, seafood dealers, and the Marine Trade Center, the active space of commerce between Commercial Boulevard and the waterfront, as well as the waterfront across the bay, includes several seafood dealers, gear manufacturers, and other businesses that service the fleet and its personnel in a variety of capacities. Several small eating and drinking establishments depend heavily on fishermen, both as patrons and suppliers of the raw materials for their seafood chowders and fresh fish steaks.

Social Factors

Like fishermen throughout much of the United States, many in Portland either descend from long time fishing families or have worked in fishing or fishing-related work since they were in their teens. Commonly, fishermen took up fishing practices primarily because, compared to other occupations, fishing paid relatively well and required no extensive education beyond day-to-day apprenticeship. Those born into fishing households typically grew up around boats and fishing and learned the industry at a young age, although some fishermen claim that their children either loved or hated fishing, and simply being born into a fishing household does not seal one's fate into a life of fishing. This is especially true today, with the negative publicity surrounding the future of fishing, particularly groundfishing. Despite the pleas of some fishermen, who now desperately need crew who are willing to stay with fishing for years to come, fishing households are having trouble reproducing themselves.

In the process of moving between shore-based, water-related occupations and fishing, either as crew or as part-time fishermen/captains themselves, fishermen gradually gain the trust of the established fishing community and slowly become accepted into its ranks. Because there is a history of regulatory pressure, persistent perceptions that the fishing way of life is being criminalized, untrustworthy marketing relationships, and the necessities of interdependence between captains and crew at sea, developing trusting relationships is a slow and often painstaking process that permeates the fishing community. By the same token, the difficulties of forming long-term and trusting relationships make those that have been formed all the more important as components of the overall social infrastructure of groundfishing.

Considered as part of the economic health of commercial fishing, working in and around the water, moving between fishing and shore-based employment, and occupying different positions on different kinds of fishing vessels have been important to the ways in which the social capital of fishing develops and becomes available for investment in a productive fishing enterprise. Social capital refers to network relationships – those between captains and crew, captains and suppliers, among crew or among captains, and between captains, owners, and creditors, and so forth – that enable partnerships designed to generate incomes. In fishing, the development of skills and knowledge about fishing grounds, the willingness to adhere to captains' safety standards, the ability to remain at sea for extended periods, etc. are all attributes normally considered human capital. Yet human capital in fishing is useless without the web-like partnerships that link vessels to credit systems for financing, fuel, ice, trip food, etc. If credit relations in the fishing industry are enhanced by trust, so too are they particularly susceptible to pieces of information that chip away at that trust. This occurs, moreover, within an industry whose participants have been prone to considering attacks on their ways of life as stemming from a conspiracy of environmentalists, government personnel, and recreational fishing and tourist interests. While these sentiments are widespread throughout the fishing industry of the United States (see Fritchey, 1993), the ways fishermen act on them, responding to what they perceive as crises and to very real restrictions of their fishing activity, vary from port to port.

Like fishermen in the Gulf States and up and down the eastern seaboard, many Portland fishermen perceive their way of life being criminalized, largely unjustly, due to either environmentalists' interests or to fisheries biologists who regulate fishing based on inaccurate data. Holding such viewpoints, they consider regulations with suspicion and often view them as illegitimate or even morally reprehensible. This justifies, in their own minds, protest and resistance.

At the same time, Maine fishermen adjust to crises--whether politically instigated or not--by experimenting with options within and outside of fishing. Within fishing, this involves moving into new, similar fisheries with the same gears (i.e. whiting), making modifications to gears and vessels for compliance purposes, making modifications to enter qualitatively different fisheries (moving from net-based fisheries to trap-based fisheries, for example), or exploring new fishing territories. When switching from fishing to shore-based employment, many fishermen remain tied to the industry in an altered capacity, engaging in work in seafood establishments, vessel repair operations, and so forth.

Portland fishermen are adapting to new developments in fishing regulations in ways that are in line with their historical participation in the fisheries: by resisting regulations while experimenting with new gears, new species, and new on-shore economic opportunities. The concentration of the fleet around the Exchange has meant that those fishermen based in and around Portland are likely to be more heavily impacted by further groundfishing restrictions than those in other, smaller ports, where lobster fishing prevails. Although the Greater Portland economy has a broad and diverse base, fishermen in this area will be unlikely to find comparable work with comparable incomes outside of fishing; in addition, of course, they face the loss of large investments in fishing vessels and gears with the collapse of the industry.

E.6.5.5.4.4 Other Northern New England Ports (Chatham, Massachusetts)

Situated on the elbow of Cape Cod, Chatham's fishing fleet represents, most likely, the future of fisheries that are able to remain viable in a setting of increasing coastal gentrification and development of the coast for recreational purposes. It is, by most accounts, a fleet comprised of smaller vessels; its fishermen use a wider range of fishing gears than those in the smaller ports, with fewer relying on dragger nets and more relying on gillnets, longlines, hand lines, and traps. This suggests Chatham is a less specialized fleet than the large ports to the north and south. Chatham fishermen, in fact, view the larger fishermen with some disdain, seeing them as primarily responsible for the current crisis in the fisheries.

Chatham is a seasonal resort community. It is a wealthy community, and property values generally run very high. Both sportfishing and commercial fishing are important to the community. However, they do not seem to be the mainstays of the community's economy. Land for boatyards and marinas is scarce for instance, because the land is used for residential homes and areas. The town's population increases four to five times during the summer. Chatham has within it a number of ponds so there is quite a bit of waterfront property. On a typical fall morning, ten or more small boats will be in one of these ponds with someone clam raking. Many sail boats and pleasure boats are anchored or docked in these ponds as well.

Chatham's fishing community is divided between two ports, Chatham Harbor on the east coast of the town, and Stage Harbor on the south side of town. In 1993, the Chatham Harbor fleet was made up of gillnetters, draggers, tub trawlers (longliners), a scottish seiner, and lobster boats. Groundfishing is generally the mainstay of this fleet. Recently, several Chatham vessels have begun targeting dogfish as well. Scup, fluke, sea bass, mackerel, butterfish, weakfish and bluefish are also caught as miscellaneous fish by Chatham Harbor vessels.

Squid, butterfish, mackerel, and scup landings in Chatham come almost exclusively from Stage Harbor. Four or five draggers and gillnetters work out of Stage Harbor, but the majority of landings from these species are from Chatham's trap fishery.

Due to small size, most vessels make day trips or take a short trip that will last between two or three days. The boats in Chatham are owner and family operated. The crew sizes vary depending on the gear. Gillnetting boats and draggers carry a three person crew, and tub trawlers carry a one or two person crew. Most boats work on the share system, but some may pay crew members by the trip. Stage Harbor tends to dock larger vessels (60 – 70 feet), especially during the summer months.

Whiting has never been a backbone species of Chatham's fisheries, mostly due to the diversity of fishing gear Chatham fishermen employ. A majority of the loligo squid that is caught and landed in Chatham is done so using pound nets and traps, gear that is not very successful at catching whiting. Any vessels that target whiting probably land their catch elsewhere. Although third in the state (behind Gloucester and Provincetown), Chatham's whiting landings in 1997 totaled less than 83,000 pounds. It's total landings between 1980 and 9/9/96 make it 13th in terms of top whiting ports. Chatham has not served as the principal port for any vessels that have participated in the Cultivator Shoal Whiting Fishery, although quite a few of Chatham's principal port vessels have participated in the Raised Footrope Trawl Experimental Fishery.

Obviously, dragging – the principal gear in many other ports – is far less common than gillnetting and longlining in Chatham. This is due not only to the physical and social characteristics of the port, but also to market factors. Chatham fishermen claimed that they fish for a quality product, selling primarily fresh fish that is, of course, in high demand among the tourists and seasonal residents. Longlines, they claim, are least damaging to fish and gillnets less damaging than draggers; daily fishing, too, contributes to the emphasis on quality that has developed here, since fish are landed within hours instead of days of being caught.

Chatham has a town dock called "The Fish Pier." Boats using the pier tie up to moorings out in the water. Fishermen must have a permit to unload their fish at the town docks, and they pay for the permit by paying a fee per pound of fish landed. The town has made the fish pier a tourist attraction. The tourists can come to the pier and buy fresh fish on the spot. In this way, the town fosters a working relationship between the fishing industry and the tourist industry. Not all fishermen use the town dock; for instance, some dock their boats in water near their homes.

Fishing in Chatham, in any case, occupies an economic niche within a larger economy based primarily on tourism and seasonal residence. Chatham is a seasonal community, quite wealthy, with many summer houses and seasonal tourist cottages and businesses that open only during the summer. In years past, the seasonal fluctuations in the town's population were more pronounced, but today more shops and stores remain open through the year. These provide the bulk of the employment in Chatham, along with service and construction personnel who staff the motels, bed-and-breakfasts, and cottages during summer and, usually through the late winter and spring, repair or make ready for residence the seasonal homes. Summer remains, of course, the busy season for both fishermen in Chatham and those involved in the tourist industry.

Chatham fishermen, in part because of the smaller size of their vessels, tend to be more constrained by weather and seasonal considerations than the larger fleets of Gloucester, New Bedford, and Portland. Many of them take most of the winter off, concentrating their efforts during the summer and fishing intermittently through the spring and fall. Vessel size in Chatham also influences their range: most do not have the fuel capacity to fish further than fifty miles off shore, and most fish either in state waters or within twenty to thirty miles of shore. Chatham fishermen also deviate from fishermen in the ports dominated by larger vessels in that they tend to move among different fisheries and different gears through the course of their lives and over the course of a single year. Typically, they combine winter shellfishing (scalloping or clamming) with summer groundfishing.

E.6.5.6 The Recreational Whiting and Red Hake Fishery

Participation in the recreational whiting and red hake fisheries has dwindled to almost insignificant amounts over the past decade.

Marine angler surveys in 1960, 1965, 1970, and 1974 estimated the recreational silver hake catch to be 1,801, 2,717, 950, and 1,075 tons, respectively, during those years. Results from NMFS' surveys in the New York Bight area from 1975 – 1977 estimated recreational silver hake catches to be 197, 1,706, and 3,948 tons, respectively, during those years (Anderson et al, 1980).

Table E.56 provides recent recreational catch information for silver hake and red hake according to the Marine Recreational Fisheries Statistics Survey (Mark Terceiro and John McClair, pers. comm.).

Table E.56 Available Information About Recreational Catches of Silver Hake (Whiting) and Red Hake (Ling), 1981 – 1997, According to the MRFSS

YEAR	SILVER HAKE CATCH	RED HAKE CATCH
1981	399,425 pounds	422,379 pounds
1982	367,487 pounds	109,805 pounds
1983	884 pounds	282,043 pounds
1984	N/A	1,610,260 pounds
1985	N/A	36,297 pounds
1986	N/A	905,522 pounds
1987	N/A	2,060,119 pounds
1988	N/A	536,582 pounds
1989	N/A	880,586 pounds
1990	N/A	935,668 pounds
1991	N/A	655,950 pounds
1992	N/A	504,518 pounds
1993	N/A	189,823 pounds
1994	<100 metric tons	117,922 pounds
1995	<100 metric tons	126,030 pounds
1996	<100 metric tons	58,600 pounds
1997	<100 metric tons	462,906 pounds

The following description of historical and current recreational whiting and ling fisheries contains anecdotal information provided by several individuals involved in the recreational fisheries in New York and New Jersey.

During the 1980s, the recreational fishery for whiting and red hake flourished, especially throughout New York and New Jersey. Larger vessels actively participated in this fishery during the winter season, especially December and January. Whiting was a very important component of these recreational fisheries during the winter due to its availability at a time when very few other species were available, particularly in inshore areas. When the fall mackerel run didn't live up to expectations or the codfish run never got going, whiting would fill the bill (John Geiser, pers. comm.). Charter boats and head boats would travel from Barnegat Inlet north and east to Freeport and as far as Montauk, New York. Popular recreational whiting and ling (red hake) cites included areas around Barnegat, Sheepshead Bay, Shark River Inlet, the Atlantic Highlands, Raritan Bay, and Manasquan River Inlet (Bogan, pers. comm.). During December and January, recreational vessels could count on making well over 50% of their income from whiting and ling trips. Vessels targeted 12 – 14 inch whiting and ling and rarely caught many fish smaller. Smaller whiting were more common than smaller ling. The recreational ling fishery was a less seasonal fishery than the recreational whiting fishery, as ling would extend inshore throughout a portion of the spring as well. However, ling was not the crowd-pleaser that whiting was. Customers could always count on a good fight when they hooked a larger whiting.

In addition to a healthy charter boat fishery, New Jersey's coast once supported a unique onshore recreational fishery for both whiting and ling. On bitterly cold nights with a relatively calm surf and light northwest wind, whiting would often get caught and chilled in receding waves and cast up on the sand as "frostfish," where they could sometimes be picked up by the dozens (Geiser, pers. comm.).

Long Brach Pier (Long Branch, New Jersey) was an extremely popular spot to fish for whiting during the winter. Unfortunately, and quite ironically, Long Branch pier was destroyed in a fire about seven years ago, during the time when the recreational whiting fishery began to disappear. Now, the once popular recreational beach fishery for whiting is completely nonexistent.

A typical rig for catching whiting on a party boat is a three-hook set-up with 1/0 to 3/0 hooks spaced about 15 inches apart on a 20-pound leader. The bottom hook is usually tied to a 10- to 12-inch leader fixed with a clinch knot to a one-inch dropper just above the sinker snap or lark's head knot attaching the sinker. The bottom hook is designed to pick up ling off the bottom. A few years ago, the whiting-ling rig was fished with plain hooks baited with two- to three-inch thin fillets of whiting, mackerel, or herring. These hooks are now generally fitted with two-inch lengths of fluorescent tubing. The tubing extends from partway down the shank of the hook over the first part of the two-inch dropper loop attached to the hook. This helps to stiffen the loop so that it stands out from the leader. A good deep water whiting rod is seven feet overall with a power rating of seven. This puts the rod on the heavier end of the scale of boat rods (Geiser, pers. comm.).

Ten years ago, at least 50 larger head boats and a few smaller recreational boats were actively involved in the recreational whiting and ling fisheries out of New York and new Jersey. Now, the few remaining large recreational vessels target other species, as directed whiting and ling recreational fisheries are no longer economically feasible. No large recreational vessels sail from Barnegat anymore. One fisherman who runs a charter boat from Manasquan Inlet said that there are only about three or four recreational vessels left in his area, and he is only carrying about 30-40% of the customers he carried 5 or 10 years ago. He estimated that Shark River Inlet is now home to only one or two recreational vessels and that Atlantic Highlands can only boast about four boats. Many of these vessels no longer target whiting at all, but some will target ling when the weather permits. Unfortunately, ling are not as valuable recreationally as they once were because they no longer make their way inshore during the spring in the numbers that these recreational fishermen are used to seeing.

The potential to rejuvenate the recreational whiting and ling fisheries certainly exists in the southern New England area if the fish populations can recover. Over time, the size of the recreational fleet in this area has shrunk considerably (many attribute this in part to the decline of whiting stocks). There are certainly fewer vessels today that could enter the recreational charter/head boat fishery, but a stock recovery would certainly allow for the remaining vessels to recover some of what they lost during the decline of the whiting stocks over the last decade.

E.6.5.7 Market Information

Information provided in the following sections was collected through interviews with industry representatives involved in the marketing sector throughout New England, southern New England, and the Mid-Atlantic.

Of all whiting that is landed on the East coast, it is estimated that about 50% supplies domestic markets, while the other 50% supplies international markets (this proportion varies quite a bit from port to port). For example, industry representatives estimate that 80% of the whiting landed in Point Judith supplies domestic markets, while only 20% supplies international markets. Generally, southern New England and Mid-Atlantic fisheries provide consumers with about 30 million pounds of whiting annually. Although the market appears to support a consistent supply, market conditions for whiting are rather volatile and respond dramatically to supply and demand. The market price for whiting varies on a daily basis and can fluctuate anywhere from $0.15/pound to $1.50/pound.

In general, offshore hake, which are caught in deeper waters than most whiting, are mixed with whiting and sold as whiting. Currently, of the offshore hake that is landed, about 50% is regular-sized, and 50% is large, although years ago, they were almost all king-sized. Offshore hake meat is softer than that of whiting, and if they are sold separate from whiting, they are usually sold for a lower price. Point Judith is one of the only ports that separates offshore hake from whiting and reports the two as separate species. Although it usually goes to the same markets as whiting, offshore hake is larger, and people tend to prefer smaller-sized whiting. Industry members in Point Judith also testify that offshore hake usually commands a lower price than whiting.

The future of the market demand for whiting, although not secure, is promising. The domestic fish markets that handle whiting (discussed below) could undoubtedly handle larger quantities as long as the demand for the product increased proportionately to the available supply. Domestic markets would certainly benefit from development initiatives, probably through supermarkets, since whiting is not an extremely popular white fish among American consumers. Some industry participants suggest that the domestic market for fillets could expand significantly if the average size of whiting increased to produce a larger fillet. Preparation of the product is inexpensive, and whiting stocks, once rebuilt, could certainly support an increase in consumer demand as long as they were harvested at a sustainable level.

A few industry representatives noted the potential for re-expansion into the frozen whiting H+G (headed and gutted) market. The whiting trade is not expected to diminish or disappear, so people have suggested that the market for value-added whiting products could expand significantly; the product simply needs to be available and made more attractive to supermarkets.

E.6.5.7.1 Domestic Markets

There are essentially two domestic markets for whiting: a fresh fish market and a frozen market.

<u>Fresh Fish</u>

Fresh whiting is supplied to consumers through three major markets: New York (Fulton Fish Market), Philadelphia, and Baltimore (Jessup). When combined, these three markets absorb about 200,000 pounds of whiting each week. These markets supply supermarkets, restaurants, and consumers with relatively inexpensive fish for fried fish sandwiches. In general, New York demands about 2/3 regular-sized whiting (10 – 12 inches), 1/4 large whiting (12 – 15 inches), and the rest king whiting (>15 inches). Jessup and Philly usually take about 50% large and 50% regular-sized whiting.

Although about 80% of the whiting that these markets purchase is sold directly within them to supermarkets and restaurants, a small percentage of the fish that reach these markets is distributed to communities further inland. There are two distribution (trucking) companies in North Carolina, as well as one in Canada, that purchase whiting from New York, Philadelphia, and Jessup and truck the whiting to their respective areas for distribution.

In the past, Fulton Fish Market handled more than double the weight of whiting that the market is currently handling. Although the quantity of whiting supplied was higher than it is today, the revenues generated from the sale of whiting were not much different. This is primarily due to the decrease in the availability of whiting, especially over the past ten years. Additionally, consumer preferences have changed over time, and these changes are ultimately reflected in the structure and composition of the market. The tradition of purchasing fresh fish to clean and fillet at home has been replaced an increased dependence on packaged and prepared foods. The shift in consumer preference is exacerbated by the fact that whiting does not keep very well and must be transported and distributed rather quickly after harvest.

<u>Frozen Fish</u>

The domestic frozen whiting market has about disappeared in recent years. Historically, whiting was processed and sold as frozen 5 pound Headed and Gutted (H+G) blocks. Several processing plants handled whiting, particularly in Gloucester and Point Judith, but these plants have disappeared. There could be a few reasons for this decrease in the market for frozen H+G whiting: (1) fresh fish prices are higher than frozen H+G prices, (2) the decrease in the abundance of whiting has led to a decrease in the availability of whiting for processing, and (3) the west coast production of H+G whiting is less expensive than it was on the east coast. East coast frozen H+G whiting could cost up to $0.10/pound, while the west coast can sell H+G Pacific whiting for $0.04-$0.06/pound.

E.6.5.7.2 International Whiting Markets

Almost all of the whiting that supplies international markets is exported to the country of Spain (some 1 – 2 pound fish are shipped to France and Italy). Generally, the Spanish prefer smaller whiting (20 – 28 cm, 8 – 11 inches), sometimes called small regulars. A majority of these fish have not reached sexual maturity. Hence, the Spanish export market is often referred to as the "juvenile whiting fishery."

The Spanish like to stuff the tail of the small whiting into the fish's mouth and deep fry the entire fish. The whiting that supply the Spanish market are usually caught in 1-2 days, packed whole in ice, and flown to Spain directly from New York. New York boasts the only airline on the East coast that flies directly to Spain and allows the product to arrive while still very fresh. Some industry members said that problems on the other end of export (in Spain) have deterred them from involving themselves in the market. Of the total amount of whiting that is shipped to Spain, about 40% is distributed directly to Spanish supermarkets, and about 60% is shipped to Madrid and distributed among 13 clean, well-kept, indoor seafood markets. Occasionally, restaurants and little shops around the area will buy 1 or 2 boxes.

The Spanish market for small whiting developed on the East coast (especially new Jersey and New York) around 1991. East coast fishermen supply the Spanish market with about 300,000 pounds per week, sometimes more in the winter than in the summer. June, July, and especially August are the slowest months for this market. When the market first developed in 1991, prices for the Spanish whiting were about $0.50/lb. in the winter and $0.30/lb. in the summer. Now, prices have increased to about $0.60/lb. in the winter and $0.30/lb. in the summer.

There are probably about 10 – 15 vessels that consistently supply the Spanish market during the winter season. In the summer and early fall, vessels fishing in the Gulf of Maine Experimental Separator Trawl fishery (grate fishery) supply a relatively small amount of whiting for the Spanish market. However, the fish supplied by the grate fishery are usually smaller and of better quality. Southern New England whiting dealers involved in the Spanish market (only about 2 or 3) send representatives to the Portland Fish Exchange to buy the small whiting and truck them to New York for export about 4-5 times per week during the grate fishery season. The whiting that are landed in the Raised Footrope Trawl Experimental fishery are generally too big for the Spanish market. In general, most fish that supply this market are landed between southern Georges Bank and New Jersey.

The Spanish market is considered by the industry to be an extremely important market for whiting. The primary reason that the Spanish seek U.S. whiting is that their whiting resource can no longer sustain the quantities that their consumers demand. Consumer demand has caused Spain to seek smaller fish from other countries. Therefore, next to their own locally caught whiting, some industry representatives think that East coast whiting is Spain's preference. Right now, the east coast is the primary supplier of smaller whiting to Spain. South America and Chile, however, have an abundant Pacific hake resource, and they could become important players in this market if they could coordinate their export process to become more effective. If this was the case, then New England and Mid-Atlantic whiting fishermen could potentially be out of the juvenile whiting export business.

E.6.5.7.3 Red Hake Markets

In general, red hake (ling) is not a very durable product. The meat literally disintegrates if it is frozen and cannot be stored or transported very successfully. For these reasons, the United States has not developed a significant market, either domestic or international, for ling. Today, there is a small fillet market for ling in New York, and even more so in Philadelphia and Baltimore (the Baltimore market for red hake has been in existence since WW II). The fillets cost about $1-2/lb. once they are boned. There are still some fillet houses in New England, Rhode Island, and Long Island that handle red hake for this purpose.

There is also a small domestic market for whole ling. The price fluctuates, but it averages about $0.70/lb. in the winter. It generally sells for less than good regular-sized whiting. Massachusetts and Maine fillet fairly large ling for sale in supermarkets. Ling that comes from the grate fishery in Maine is usually sold for a decent price to the Philadelphia market. One industry member from Maine noted that she would but and sell red hake if the product was larger in size. Rhode Island and southern New England usually sell their ling through distribution markets because the fish are too small to fillet.

E.6.5.8 The Processing Sector

As discussed earlier, whiting was processed into 5 pound frozen H+G blocks at processing plants located throughout New England. Historically (40-50 years ago), whiting was used to make fertilizers, and the skeletons were ground into cat food. In fact, anecdotal information suggests that vessels from Point Judith used to target whiting for use in both cat and mink feed. Additional quantities of silver hake, generally those that were too small or otherwise undesirable for processing as a food product, were processed into fish meal for use as poultry and cattle food supplements. A specialized trawl fishery actually developed for this purpose around 1949 in New England (Anderson et al, 1980). In 1957, New England landed about 18,000 tons of silver hake for reduction purposes (fish meal). That number fell to about 10,000 tons in 1958 and then peaked at close to 20,000 tons in 1964 (Anderson et al, 1980). However, these industrial uses for whiting ceased as the availability of whiting declined and industrial hake products were imported from South America. Between 1970 and 1980, landings of silver hake for reduction purposes averaged less than 1,000 tons annually, and that number has decreased even further in the 1980s and 1990s.

There is currently a small portion of the domestic market that relies on the processing of whiting mainly for Chinese fishballs. About 40,000 pounds/week from New York and 10,000-20,000 pounds/week from Philly and Jessup (combined) are sent to processing plants for the production of fishballs. Fresh whiting are headed, gutted, boned, grind into paste, formed into balls, and deep fried to produce a spongy fishball used in several popular oriental dishes.

E.6.5.9 Safety Aspects of the Fishery

This section serves as an update to Sections E.6.4.3.4 of the EIS for Amendments 5 and 7. The background information for this section can be found in those sections of Amendments 5 and 7.

In light of both recent regulations implemented through Amendments 5 and 7 as well as some of the recent framework adjustments, it is important to examine trends in fishing vessel safety and the safety of human life at sea. National Standard 10 of the FCMA states that,

> *"Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea."*

The following information was provided by the U.S. Coast Guard and reports recent casualty rates in otter trawl and other fisheries the region. These statistics reflect only those casualties that were reported to the Coast Guards or were a direct result of Coast Guard involvement in search and rescue missions. They cannot be interpreted as a complete list of recent regional fishing vessel casualties (Robert Higgins, pers. comm.).

Figure E.31 – Figure E.36 illustrate the number of fishing related deaths and casualties and their primary causes since 1993. Data for 1998 is through July 1998.

Figure E.31 Annual Fishing Related Deaths in the First District, 1993 – 1998

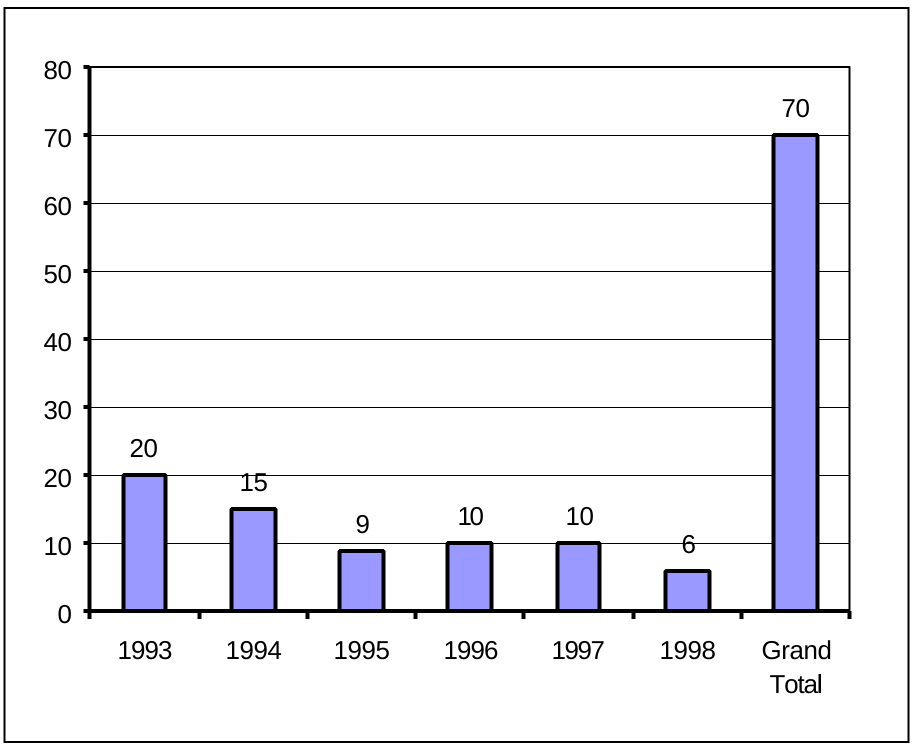


Figure E.32 Number and Primary Causes of Fishing Related Deaths in the First District, 1993 – 1998

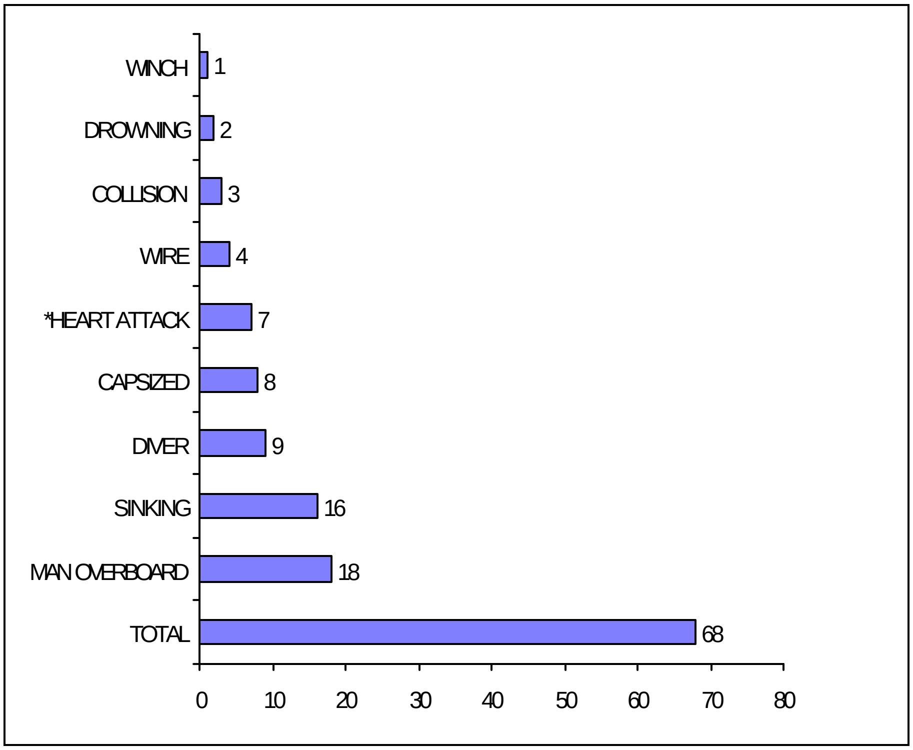


Figure E.33 Number and Primary Causes of Fishing Related Injuries in the First District, 1993 – 1998

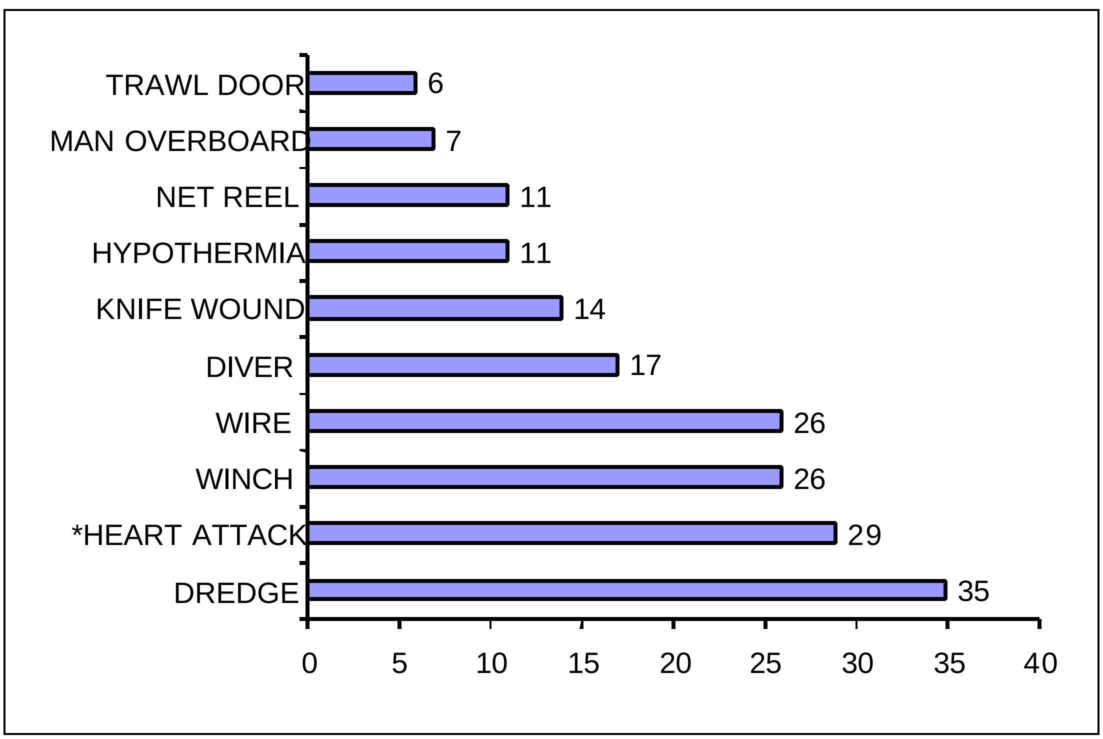


Figure E.34 Number and Primary Causes of Fishing Related Casualties in the First District, 1993 – 1998

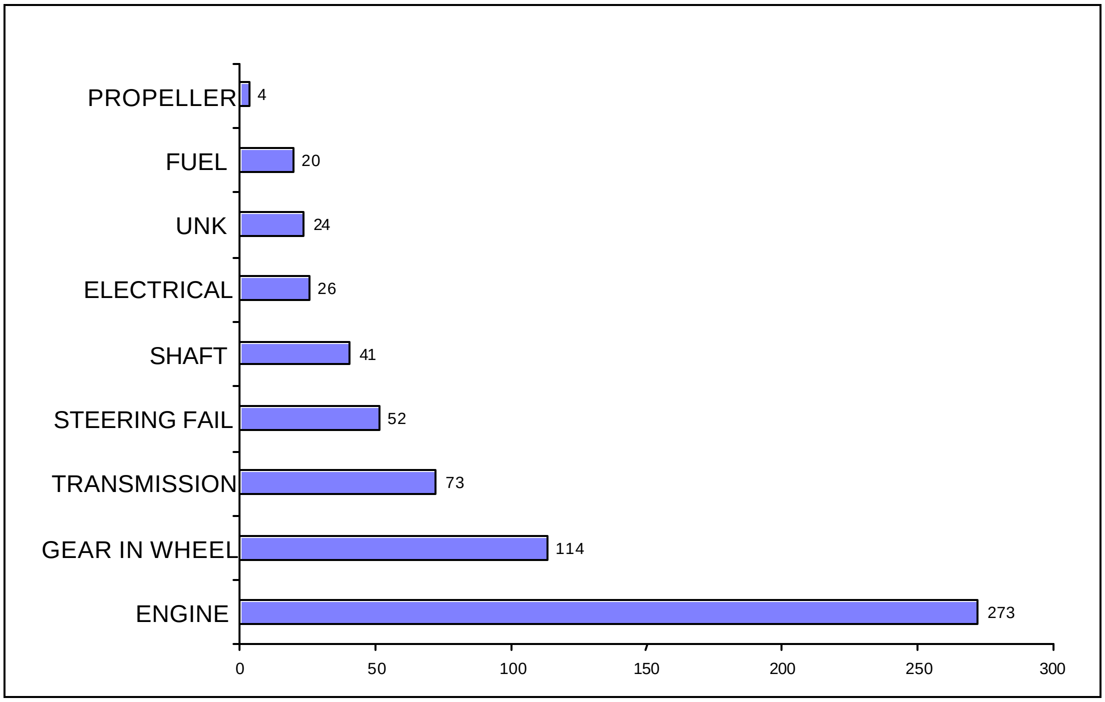


Figure E.35 Number of Fishing Related Casualties in the First District by Gear Type, 1993-1998

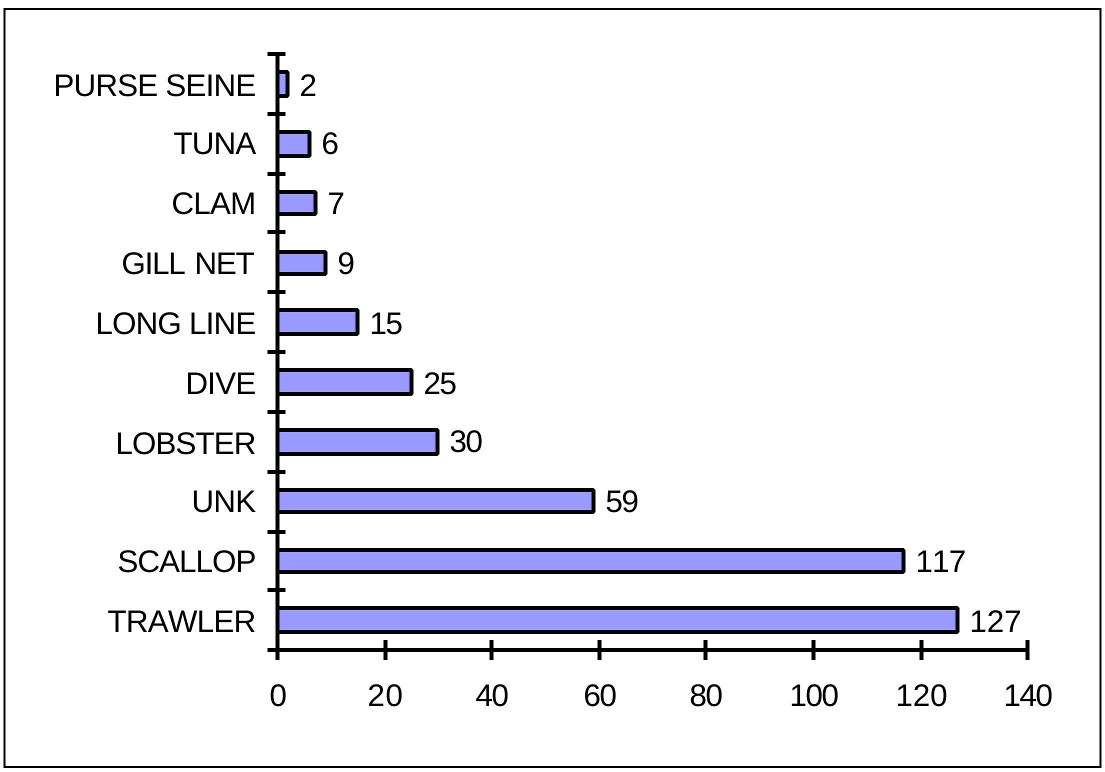
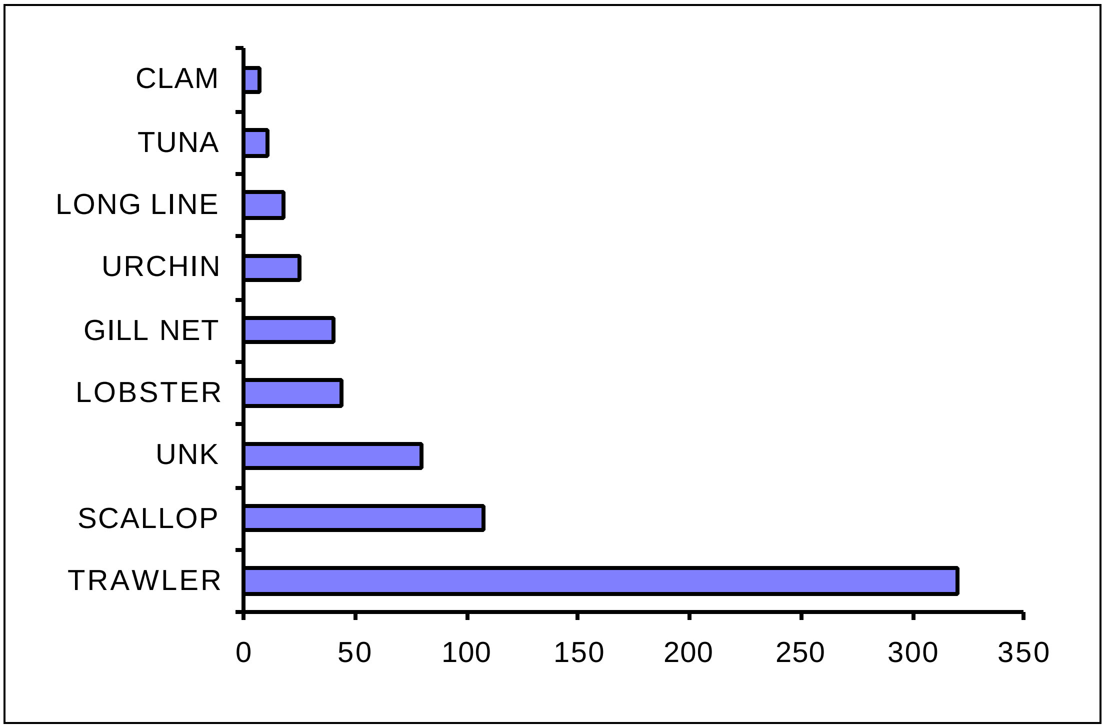


Figure E.36 Number of Equipment Casualties in the First District by Gear Type, 1993-1998



E.6.5.10 Impacts of Human Activity (Fishing) on the Environment

The impact of fishing on small mesh multispecies can be characterized primarily as fishing mortality. The impact of the fishery can also extend beyond the target species through predator-prey relationships, competition among the region's inhabitants for food and habitat, and other forms of ecosystem interactions. For example, many recreational fishermen have noted the importance of whiting as a forage food for bluefin tuna. Low whiting abundance cannot be directly linked to negative impacts on the tuna stocks, however.

In addition to the complex impacts of removing fish form the ecosystem, there are more direct impacts of human activity on the environment. These impacts are discussed in Section E.6.4.4 of the EIS for Amendment 5.

E.6.5.11 Impacts of Human Activity Other than Fishing on the Environment

The Council has identified the impacts of non-fishing activities on the environment through Amendment 10 to the Multispecies FMP, which identifies essential fish habitat (EFH) for silver hake and red hake. Amendment 12 identifies EFH for offshore hake, but the review of the impacts of non-fishing activity on the environment that is contained in Amendment 10 remains unchanged.

E.7.0 ENVIRONMENTAL IMPACTS

E.7.1 SUMMARY OF IMPACTS

Under the proposed management action, spawning stock biomass (SSB) is projected to increase substantially from initial projection year levels for both stocks of silver hake (53% and 600% from base year levels for the northern and southern stocks respectively). Landings are expected to decline through the first 3 – 4 years of the management plan but turn upward in the later years. Landings from the southern stock of silver hake are expected to increase 240% from base year levels by Year 10. Median landings of king whiting are predicted to increase significantly for both whiting stocks. This is due to a projected increase in the age-at-entry to the fishery (from increased mesh size) and the decrease in whiting exploitation, which should restore the appropriate age structure to both stocks.

The proposed management action is projected to result in the following range of reductions in whiting exploitation (as estimated from the 1993 – 1995 baseline):

	Years 1 – 3	Year 4 Default Measure
Aggregate/Coast-Wide Reductions	**33 – 49%**	**58 – 68%**
Northern Area	**17 – 23%**	**62 – 71%**
Cultivator Shoal Whiting Fishery	**40%**	**73%**
Southern Area	**36 – 48%**	**55 – 63%**

When combined with other factors affecting the northern and southern areas, the proposed management action should achieve its conservation objectives.

Of the total 1,156 participating small fishing entities between 1995 and 1997, 860 (74%) are expected to experience no change in gross revenues, operating costs, or net returns under the management measures proposed for Years 1 – 3 **(Table E.77)**. Twenty six (2.2%) are predicted to experience increased returns above operating costs under the Year 1 – 3 measures. Two hundred seventy participating small fishing entities (23%) are predicted to experience losses in both gross revenues and median returns above operating costs (relative to the status quo) as a result of the Year 1 – 3 management measures. Fifty two percent of Rhode Island's participating home port vessels and thirty eight percent of New York's participating home port vessels are expected to experience such losses under the Year 1 – 3 measures.

With the implementation of the Year 4 default measure, 492 of the 1,156 participating vessels (42.6%) are predicted to remain unchanged in terms of their gross revenues, operating costs, and net returns. One hundred twenty six participating vessels (10.9%) are projected to experience increased returns above operating costs under the default measure. The number of negatively affected participating entities under the Year 4 default measure is projected to increase 99% (relative to the Year 1 – 3 measures) to 538 vessels (46.5% of the original 1,156 participating entities). Seventy one percent of Rhode Island's participating home port vessels and fifty four percent of New York's participating home port vessels are expected to experience such losses under the Year 4 default measure.

Of the total 1,156 participating small fishing entities between 1995 and 1997, 860 (74%) are expected to experience no overall change in profitability under the management measures proposed for Years 1 – 3 **(Table E.84)**. Median profits for these 860 vessels are estimated at -$667. This value is cumulative for three years, so the median unaffected vessel is operating at just below break-even profit. Twenty eight (2.4%) are predicted to experience increased profitability under the Year 1 – 3 measures. For these 28 entities, median profits under the status quo were negative and are projected to remain negative, yet *less* negative, under the Year 1 – 3 measures than under the status quo (9.4% less negative). The increase in profitability for these participating entities under the proposed management action can be attributed to the projected decrease in their operating costs.

Two hundred sixty eight participating small fishing entities (23% of all participating small entities) are predicted to experience losses in gross revenues, operating costs, labor costs, and therefore profitability (relative to the status quo) as a result of the Year 1 – 3 management measures. Of the 268 negatively affected participating vessels, profitability is estimated to decrease, but remain positive, for 184 vessels (69%) under both the status quo scenario and the measures proposed for Years 1 – 3. Fifty nine of the negatively affected participating vessels (22%) operated at a net loss under the status quo and are projected to do so under the Year 1 – 3 measures as well. Last, 25 of the 268 vessels (9%) earned positive profits under the status quo but are projected to operate at a net loss under the Year 1 – 3 measures. Fifty two percent of Rhode Island's participating home port vessels and thirty eight percent of New York's participating home port vessels are expected to experience such losses under the Year 1 – 3 measures. These two states are home to the largest proportion of negatively affected participating small fishing entities.

With the implementation of the Year 4 default measure, 492 of the 1,156 participating vessels (42.6%) are predicted to remain unchanged in terms of their profitability relative to the status quo baseline (1995 – 1997). One hundred twenty eight participating vessels (11%) are projected to experience increased profitability under the default measure. Median profits for the vessels are negative under the status quo and are projected to remain negative, yet *less* negative, under the default measure (18% less negative). The increase in profitability for these 128 participating vessels can be attributed primarily to the projected decline in operating costs associated with the Year 4 default measure.

Projected landings and value for vessels participating in small mesh multispecies fisheries during Years 1 – 4 shows that ports in New York and Rhode Island will be impacted most severely by the proposed management action. Of the significant whiting ports identified in **Table E.103**, the New York ports of Greenport, Shinnecock/Hampton Bays, and Montauk are projected to experience the largest reductions in both landings and value of all species combined. Aside from Point Judith (RI), no other ports are projected to lose more than 5% of aggregate species landings or value (from 1995 – 1997 levels). The same four ports (Greenport, Shinnecock, Montauk, and Point Judith) are also projected to experience the most significant reduction in landings and value of all three small mesh multispecies (individually or combined). Results from the Year 4 default projections are similar to those reported for the Years 1 – 3.

Under the Year 1 – 3 management measures, 134 small mesh multispecies dealers (70.2%) are projected to experience reduced product purchases of less than five percent **(Table E.95)**. Of the remaining small mesh multispecies dealers, 40 are projected to experience reductions in purchases of five to 20%, and purchases of small mesh multispecies are expected to decline by 20% or more for 17 small mesh multispecies dealers (8.9%). Reflective of the relative importance of small mesh multispecies, the states of New York and Rhode Island are projected to have the highest proportion of small mesh multispecies dealers affected by more than a five percent reduction in purchases of seafood products under both the Year 1 – 3 measures and the Year 4 default measure. More than half of the small mesh multispecies dealers in New York (26) are projected to experience reduced seafood purchases from federally permitted vessels in excess of 5%, and nine are projected to experience declines in purchases of greater than 20% for the Year 1 – 3 measures. The Year 4 default measure yields similar results, but the number of New York small mesh multispecies dealers affected by more than a 20% reduction gross seafood purchases from federally permitted vessels is projected to increase from nine to seventeen.

The social impacts of the proposed management action will fall the hardest on the communities that depend most heavily on small mesh multispecies fisheries in the Exclusive Economic Zone (EEZ). Most of these communities are located in southern New England and the Mid-Atlantic, in the states of Rhode Island, New York, and New Jersey. Some communities likely to experience the most severe impacts include, but are not limited to, Montauk (NY), Point Judith (RI), Greenport (NY), Hampton Bays (NY), and Point Pleasant (NJ). To the extent that fleets can maintain their flexibility, switch fisheries, and adapt to the regulations, the social impacts of the proposed management action will be lessened in the short term. In the long term, the recovery of small mesh multispecies has the potential to create greater economic opportunities in small mesh multispecies fisheries than any of the affected vessels have experienced. Negative social impacts resulting from the proposed management action are likely to be replaced with positive impacts resulting from rebuilt stocks and healthy, thriving small mesh multispecies fisheries.

E.7.2 BIOLOGICAL IMPACTS OF THE PROPOSED MANAGEMENT ACTION

In this section, the impacts of the proposed action on the whiting and red hake stocks, other commercial stocks, marine mammals and endangered species, and on the general biological environment are discussed. The biological impacts of the proposed action are characterized as the sum of the cumulative impacts of specific management measures designed to reach target fishing mortality rates. In other words, this plan has been designed to incorporate a moratorium on commercial permits, minimum mesh sizes, and possession limits to achieve its fishing mortality objectives. Any or all of these measures may be adjusted to ensure that the fishing mortality objective is achieved and that the stocks can rebuild within a ten-year time period.

In general, the biological impact analysis contains three portions: a bioeconomic analysis (Section E.7.2.1), an analysis of the proposed management action in the context of the necessary exploitation reductions (Section E.7.2.2), and an analysis of the effects of the proposed management action on current fishery levels (Section E.7.2.3). These portions, as well as discussion of other biological impacts, are presented in the sections below.

E.7.2.1 Bioeconomic Analysis of Proposed Management Action

This analysis evaluates the expected long-term outcomes of the proposed management action as compared to the status quo in terms of changes in mesh selectivity and reductions in fishing mortality rates consistent with the required reductions in exploitation rates to meet target levels. The results of this bioeconomic projection model represent the conceptual, strategic framework by which the more detailed management tools (possession limits and minimum mesh size increases, for example) will achieve the exploitation rate reductions necessary to meet the current overfishing definition targets. In other words, the results of this analysis predict long-term fishery impacts that are likely to occur as target fishing mortality rates are realized, independent of which management actions are implemented to achieve that objective. They characterize the possible biological (stock rebuilding) and economic outcomes from the proposed management actions over a ten-year time period. Results from the economic component of this bioeconomic analysis are presented in Section E.7.3.1. The management measures proposed in this amendment are analyzed to assess the likelihood that they will achieve target fishing mortality rates in Section E.7.2.2. In summary, this bioeconomic analysis predicts the likelihood of successful stock rebuilding within a ten-year time period if this management plan achieves its objectives.

The management scenario evaluated in this bioeconomic analysis is slightly different than that which the Council is implementing in this amendment. This analysis assumes that the minimum mesh size to retain small mesh multispecies increases to 3-inches in all areas and that declines in fishing mortality to target levels are phased-in over a three-year time period. While this plan does intend to decrease fishing mortality rates to target levels within a three-year time period, the declines are not actually phased-in. Instead, a suite of management measures will be implemented in Year 1, and the Whiting Monitoring Committee will annually assess the success of these measures in decreasing fishing mortality rates to target levels. The Monitoring Committee may recommend annual adjustments, if necessary, to ensure that targets Fs can be achieved within the intended time frame.

This plan provides an incentive to use 3-inch mesh during the first three years, but does not require minimum 3-inch mesh until the default measure is implemented at the beginning of Year 4. Prior to Year 4, a portion of vessels will increase their mesh size to 3-inches, but the selectivity pattern associated with 3-inch mesh will not be realized unless the default measure is implemented in Year 4. Therefore, the results of this analysis incorporate the biological impacts of the default measure and the selection pattern corresponding to 3-inch mesh. Since this management plan is intended to achieve the same objectives as those in the bioeconomic analysis within a similar time frame, the long-term predicted impacts of such action will be the same. If the objectives of the plan are achieved during Year 3 and the default measure becomes unnecessary, then it can be assumed that the long-term positive biological impacts of this plan will be similar to, if not greater than, those impacts predicted in this analysis.

E.7.2.1.1 Methodology

The bioeconomic analysis evaluates the following management scenarios:

- **Status Quo/No Action:** No additional regulations are imposed on fishing for small mesh multispecies than those already in place (Cultivator Shoal Whiting Fishery and restrictions on fishing in the Small Mesh Areas). Codend mesh sizes used by fishery participants under the status quo option are assumed to be 2-inches throughout all areas (the mesh size assumed to be used in the Cultivator Shoal Whiting Fishery remains 3-inches). Fishing mortality rates are set at 1992 – 1995 values (1.53 in the north and 1.43 in the south) for the entire ten-year simulation horizon.
- **Proposed Management Action:** Average mesh size is assumed to increase to 3-inches in all areas. Fishing mortality rates are decreased to target levels (0.36 and 0.34 for the northern and southern stocks, respectively) in Year 3.

The scenarios described above are examined within the framework of a stochastic bioeconomic projection model. The model combines elements of an age-structured Leslie population matrix model and a harvest yield model with an economic component (Helser et al. 1996; Thunberg et al. 1998). Therefore, the analysis evaluates biological benefits of interest to managers, such as future yields or rebuilding of parental stock, as well as future revenues and costs of interest to fishery harvesters. The methodology behind the bioeconomic model will be briefly described below along with procedures for deriving the partial recruitment pattern from mesh selection studies and growth studies and for calculating yearly instantaneous fishing mortality rates to meet exploitation rate phase-in reductions (see ***Appendix IV,*** *Bioeconomic Analysis of Alternative Selection Patterns in the United States Atlantic Silver Hake Fishery*, for more detail).

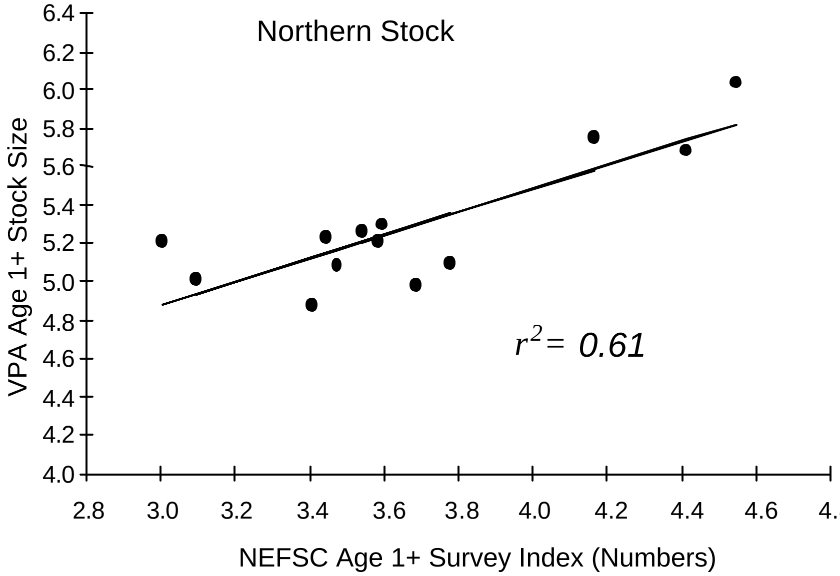
E.7.2.1.1.1 Methodology: Bioeconomic Model

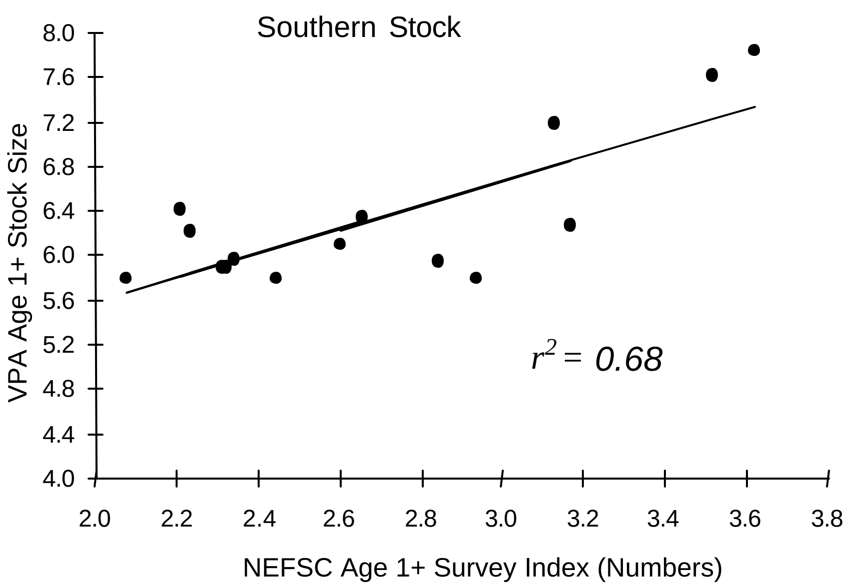
Bioeconomic projection model results provide 10-year simulation trajectories of spawning stock biomass, fishery yield, and economic performance indicators such as net returns, cost per day fished, and net present value (see Section E.7.3 for economic results). These indicators or performance measures serve as the basis for comparing the predicted outcomes of management actions with the status quo. Expected spawning stock biomass and yield over time are reported for each stock area. The northern area consists of the area north of the Gulf of Maine/Georges Bank Regulated Mesh Area line, and the southern area is that area below the Gulf of Maine/Georges Bank Regulated Mesh Area line. The bioeconomic projection model incorporates uncertainty in the stock-recruitment relationship to capture the stochastic nature of the stock's population dynamics through time. Stock and recruitment are modeled according to Ricker's (1954) S-R function, and parameters are presented in Thunberg et al. (1998) along with the other parameters used to initialize the projection model. One important departure in this analysis is that efforts were made to update the initial stock sizes at age, which serve as the starting conditions for subsequent years in the projections.

Stock sizes estimated from Virtual Population Analysis (VPA) are only available through 1989 (NEFSC 1990). In order to initialize the bioeconomic projection model with more current estimates, a predictive regression relationship between VPA and NEFSC survey-based relative abundance estimates was explored. Data used in the analysis were taken from VPA estimated stock sizes and NEFSC spring and fall survey indices from 1975 to 1988 (NEFSC 1990). These years represent the tuned portion of the most recent VPA using survey indices. The years 1973 and 1974 were excluded because of problematic residual patterns. Regressions of VPA age 1+ stock size on NEFSC age 1+ survey indices were highly significant for both silver hake stocks ($p < 0.01$). The best predictive regression relationship for the Gulf of Maine/northern Georges Bank (northern) stock was based on NEFSC age 1+ spring survey indices. For the southern Georges Bank/Mid-Atlantic (southern) stock, VPA age 1+ stock sizes were best predicted from the average of spring and autumn (lagged) age 1+ survey indices **(Figure E.37)**. The regression equations were:

Log_e(VPA age 1+ stock size) = 3.0519 + 0.6083*Log_e(age 1+ Survey Index), and
Log_e(VPA age 1+ stock size) = 3.4371 + 1.0787*Log_e(age 1+ Survey Index)
for the northern and southern whiting stocks, respectively.

Figure E.37 Regressions of Natural Logarithm of VPA Age 1+ Stock Sizes on Natural Logarithm of NEFSC Age 1+ Survey Indices (Numbers) from 1975 – 1988
Northern stock survey indices use spring age 1+, while southern stock indices are based on the average of spring and autumn stratified mean number per tow.

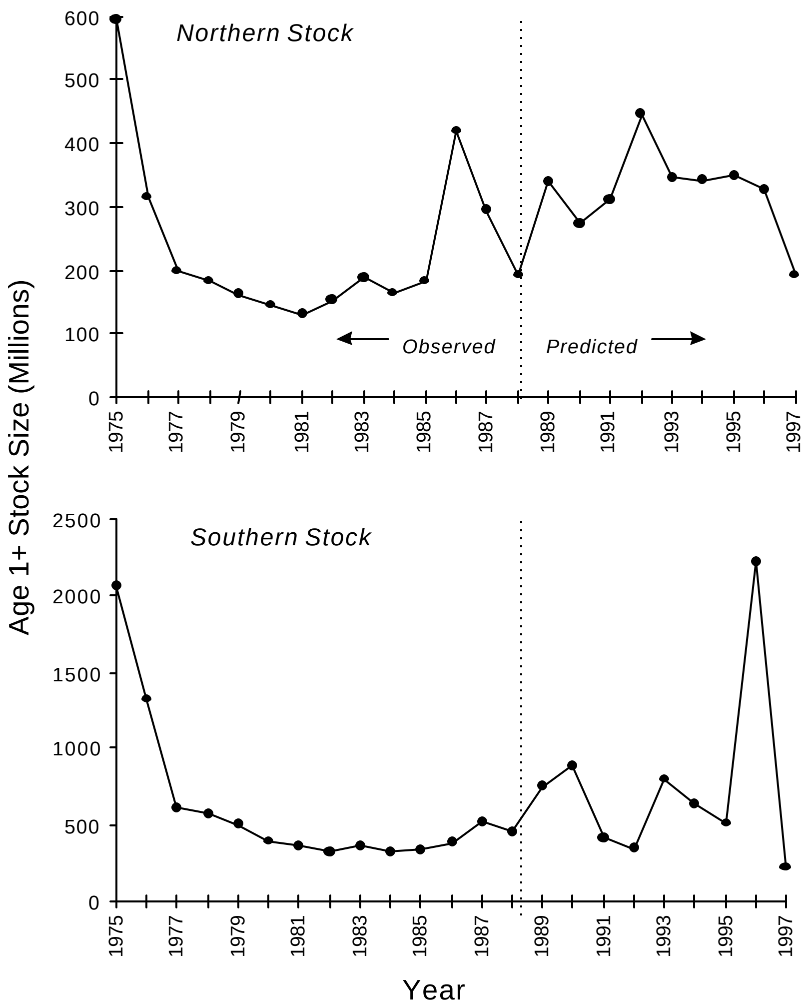




Coefficients of determination (r^2) were 0.61 and 0.68 for the northern and southern stocks, respectively, indicating reasonably strong predictive power. Linear regression parameters were then used to predict age 1+ stock sizes from 1988 to 1997. Statistical prediction can be invalid when extrapolating beyond the empirical data used in the regressions. However, extrapolations of predicted age 1+ stock sizes from these regressions are probably valid since predicted stock sizes (>1988) generally fall within the range of observed values from 1975 to 1988 **(Figure E.38)**. For the northern silver hake stock, age 1+ stock sizes are on average greater than observed values before 1988: 300 million after 1988 compared to about 170 million before 1988. The upward trend in stock sizes since the mid-1980's generally reflect the same pattern observed in NEFSC survey indices (the independent variable in the regression). For the southern stock, predicted age 1+ stock sizes remain depressed at levels comparable to the observed values before 1988, although in some years values are greater than 500 million. The predicted age 1+ stock size was then dis-aggregated into age-specific stock sizes at age by applying this value to the proportions at age from NEFSC survey (spring and autumn combined). Since 1995 is the most current year with aged NEFSC survey data, the predicted age 1+ stock size in that year was dis-aggregated into age groups based on the proportions of samples at age. NEFSC age samples of silver hake are routinely used to construct the catch-at-age matrix to which the VPA is applied.

Figure E.38 Age 1+ Stock Sizes (Millions) for Northern and Southern Stocks of Silver Hake from 1975 – 1997

***Stock sizes prior to 1988 were estimated from VPA, while stock sizes after 1988 were predicted from VPA/NEFSC survey regressions.**



E.7.2.1.1.2 Methodology: Mesh Selection and Partial Recruitment

The age-specific selectivity or partial recruitment pattern can only be roughly approximated from different mesh sizes of interest in this analysis. In practice, the partial recruitment pattern represents an interaction between the process of gear selectivity (i.e. different mesh sizes) and other biological factors such as the strength of the recruiting year-class to the fishing grounds and the distribution of fish. For this analysis, the partial recruitment pattern was approximated from mesh selectivity experiments (Mass. DMF and Maine DMF) and silver hake growth studies (Helser 1996) (**Figure E.39** and **Figure E.40**). First, the lengths at 25, 50, and 75% selection (selection parameters L25, L50, and L75) were predicted by fitting linear regression models to calculated selection parameters for the different mesh sizes for which information was available from gear experiments (1.75", 2.5", 2.75", 3.5", and 4.5" codend mesh sizes). For each selection parameter, the regression model was linear and highly significant with respect to mesh size ($r^2 > 0.90$). The partial recruitment pattern was then constructed or mapped directly from the ages corresponding to the predicted lengths at 25, 50, and 75% selectivity for the 2.0", 2.5", and 3.0" mesh sizes of interest in this analysis **(Table E.57)**.

Table E.57 Partial Recruitment Pattern Constructed from Ages Corresponding to the Predicted Lengths at 25, 50, and 75% Selectivity for Mesh Sizes of Interest

	Mesh Selection Parameter					
MESH SIZE	**L25**	**L50**	**L75**	**Predicted Age**		
2.0	17.6	21.0	23.6	1.5	1.8	2.2
2.5	20.5	24.5	27.6	1.8	2.3	2.8
3.0	23.4	28.6	31.6	2.2	2.9	3.6

Age-Specific Partial Recruit

	1	2	3	4	5+
PR 2.0	0.35	0.61	1.00	1.00	1.00
PR 2.5	0.25	0.5	0.86	1.00	1.00
PR 3.0	0.00	0.25	0.50	0.86	1.00

Figure E.39 Predicted Silver Hake Lengths Corresponding to Selection Parameters (L25, L50, and L75) from Mesh Selectivity Experiments

Figure E.40 Predicted Silver Hake Lengths Corresponding to Predicted Ages from Growth Studies

E.7.2.1.1.3 Methodology: Simulating Management Alternatives

Biological and economic performance measures were generated from the projection model and used to evaluate likely outcomes from each management scenario. Specifically, biological performance outcomes are reported as percent changes (from the base year) in median spawning stock biomass (SSB), total fishery yields, and fishery yields by market category for both northern and southern whiting stocks. Coefficients of variation (CV) for each performance indicator are reported in an attempt to capture the stochastic nature of recruitment variation over time. Note that each alternative is compared to its own base year, not to a common base year value across all alternatives. In this manner, the status quo indicators are compared to the projected status quo base year (i.e. Year 1 of the status quo simulation period). Similarly, the base year for the proposed management action is the projected value in Year 1 for the proposed management action simulation time period.

E.7.2.1.1.4 Assumptions and Uncertainties

The results from the bioeconomic analysis characterize the long term biological and economic impacts projected to result from a set of management actions. Ten-year projections are based on estimates of stock sizes, fishing mortality rates, and the selectivity patterns associated with particular mesh sizes. Consequently, the results from the bioeconomic projections should be interpreted carefully, and consideration should be given to the uncertainty inherent in the estimates of both starting stock sizes and fishing mortality rates.

As previously discussed, estimates of stock size are unavailable for both the northern and southern stocks of whiting. The most recent age-based analytical assessment (VPA) for silver hake was rejected at SAW/SARC 17 (Autumn 1993) for a number of reasons, including questions about stock structure, shifts in resource distribution, poor estimates of discarding, inadequate port sampling, and poor performance of the analytical model as indicated by statistical diagnostics. For this reason, the PDT explored a predictive regression relationship between the most recent VPA estimates of stock size (1989) and NEFSC survey-based relative abundance estimates. From this regression, the PDT estimated age 1+ stock sizes for both stocks from 1988 to 1997. These estimates provide the starting stock sizes for the bioeconomic projections.

Whiting fishing mortality rates from 1992 – 1995 were estimated by subtracting an assumed, constant natural mortality rate (0.4) from the survey-based estimates of instantaneous total mortality. In general, the recent high levels of fishing mortality are the result of an increasingly truncated age distribution of the stocks. Large incoming year classes detected by research vessel surveys disappear from survey catches before reaching age 3, indicating a high level of total instantaneous mortality. Although high levels of total mortality are apparent in both stocks, the proportion of total mortality accounted for by fishing (landings and discards) and natural sources (starvation, predation, cannibalism, disease) is not known.

Recent trends in the commercial whiting fishery in the northern stock area seem to contradict recent trends in total mortality and resulting fishing mortality rates derived from research vessel surveys. While research survey-based estimates of fishing mortality appear to be increasing significantly in the northern stock, survey estimates of biomass are increasing as well, and landings have remained relatively constant and at modest levels since the 1980s. In addition, opportunities to fish for whiting have declined substantially in the northern area during the 1990s, primarily due to multispecies restrictions on small mesh fishing.

Two factors, inappropriate stock definition and emigration, could potentially produce artificially high estimates of fishing mortality. If there is significant net migration of adult silver hake between the two stock areas, this could result in an artificially high estimate of total mortality for one stock and an artificially low estimate for the other stock. It is unlikely that this is occurring since the estimates of total mortality are high and approximately equal for both stocks. If adult fish are emigrating from the research survey area to areas outside the area covered by the survey (the Scotian Shelf, for example), this could also produce artificially high estimates of total mortality. Since historical estimates of total mortality were significantly lower than current estimates, a substantial change in emigration patterns would have had to occur over the past decade.

Despite these uncertainties, the bioeconomic analysis is useful in providing directional changes in stock sizes and fishing mortality rates in relation to the economic outputs from the fishery. Given the apparent level of uncertainty in the input parameters for this analysis, the results are more useful for making qualitative judgements about potential trends in the stocks and the fishery rather than quantitative estimates of the potential impacts of the proposed management action. Thus, the results from the bioeconomic analysis are presented as percent changes from the base year rather than as absolute numbers. As with any model, its predictive ability decreases as projections are made for each year subsequent to the base year. Further refinement of this analysis (as well as other contained in this document) will be possible and should be completed once updated stock assessment information becomes available for both stocks of silver hake.

E.7.2.1.2 Bioeconomic Results: Status Quo/No Action

Under the status quo alternative, median spawning stock biomass (SSB) declines rapidly from the initial year levels for both whiting stocks. Median SSB declines by as much as 99% and 96% from base year levels for the northern and southern stocks, respectively, over the ten-year simulation horizon **(Figure E.41)**. Total median fishery landings generated under the status quo option follow a pattern similar to median SSB over the ten-year simulation. In short, northern and southern stock fishery landings are projected to decline by as much as 100% from the initial projection year when the status quo fishing mortality rate and selection pattern are maintained **(Figure E.43)**. As expected, coefficients of variation (CV) on total fishery landings increased over the ten-year simulation horizon, but CVs associated with the management action are generally smaller than those under the status quo alternative. Under the status quo, CVs on total fishery landings approach 110% and 130% by the 10^{th} year for the northern and southern silver hake stocks respectively **(Figure E.44)**.

Expected median fishery landings by market component are also examined. This is important because some segments of the whiting fleet target certain size/age categories of silver hake for different markets (i.e. the juvenile Spanish export market). Further, some management tools (minimum mesh size increase, for example) may result in market specific yield consequences on projection forecasts. In the northern stock, the status quo option results in median yield trajectories for each market component that are similar to total fishery yields. Fishery landings from all market categories are projected to decline rapidly to approximately –100% of base year levels by the 10th year **(Figure E.45)**. In the southern silver hake stock, median fishery landings for each market component decline again by as much as 100% from the based year under the status quo option **(Figure E.46)**. This result is not unexpected, given the high rates of fishing mortality and a selection pattern favoring younger whiting under the status quo. However, as previously discussed (Section E.7.2.1.1.4), due to the uncertainties inherent in some of the assumptions applied in the bioeconomic model, the results may or may not characterize what would actually occur in the fishery if the status quo were maintained for ten years. It is difficult to assess the behavior of the model relative to real-time when such uncertainties exist.

Coefficients of variation (CV) associated with median fishery landings by market category under the status quo scenarios for the northern and southern silver hake stocks exhibit a similar pattern as overall fishery yields (**Figure E.47** and **Figure E.48**). Generally, CVs associated with the status quo are considerably greater than those associated with the proposed management action. Under the status quo option, CVs on median fishery landings by market component approach 100% to 140%, whereas under the proposed management action, CVs generally range from 60 to 80 percent.

E.7.2.1.3 Bioeconomic Results: Proposed Management Action

In contrast to the status quo, SSB is projected to increase substantially for both the northern and southern stocks as management actions are implemented. In the northern stock, SSB increases steadily from the initial year, rebuilding by as much as 53% by the 10th year. Similarly, SSB in the southern stock rebuilds exponentially, increasing 600% from the initial year **(Figure E.41)**. These results indicate that there is a more rapid build-up of SSB in the southern stock when compared to the northern stock, even though phase-in exploitation rate reductions are applied equally to both stocks, and the same partial recruitment patterns corresponding to 3.0" mesh are used. More substantial impacts on southern stock are partially due to the fact that recruitment potential is much higher in the southern area (historically as many as 1.0 billion recruits) and partially because the population structure of the southern stock contains proportionally greater biomass in younger age classes than does the northern stock. This means that as the selectivity of the mesh in the commercial fishery shifts to older ages (i.e. from a mesh increase), proportionally more fish become contributors to SSB, resulting in a more rapid accumulation of SSB in the southern stock.

Another important feature associated with the overall increase in SSB under the proposed management action is that the level of variability, as measured by the coefficient of variation (CV) on SSB, is significantly lower than that associated with the status quo option **(Figure E.42)**. Under any of the scenarios evaluated, CVs on SSB increase over the 10-year simulation horizon, which is to be expected since variability always increases the further away forecasts are made from the initial projection year. However, CVs on SSB under the proposed management action are approximately half of the CVs from the status quo. In the northern stock, CVs on SSB approach 120% under the status quo, compared to only 60% during the later years of the management plan. Similarly, in the southern stock, CVs on SSB are approximately 130% under the status quo in the out years, whereas under the proposed management action, they are as low as 68 percent.

Figure E.41 Percent Change in Spawning Stock Biomass (SSB) over a Ten-Year Simulation Horizon for Northern and Southern Silver Hake Stocks From: the Status Quo and the Proposed Management Action

Figure E.42 Coefficient of Variation (CV) on Spawning Stock Biomass (SSB) Over a Ten-Year Simulation Horizon for Northern and Southern Silver Hake Stocks From: the Status Quo and the Proposed Management Action

Total median fishery landings under the proposed management action for both silver hake stocks initially decline for the first 3-4 years of the simulation horizon, but then turn upward in the out years **(Figure E.43)**. In the northern stock, total median fishery landings decline by 40% by the fourth year compared to the initial projection year, but then steadily increase, reaching – 20% by the 10th year. Similarly, in the southern stock, total median fishery landings decline by approximately 30% by Year 3. However, median landings rapidly increase, reaching +240% by the 10th year of the simulation under the proposed management action. This suggests that short-term losses (< 4-6 years) will be compensated for by large long-term gains in potential fishery yields, particularly from the southern silver hake stock. The reason that total median fishery landings from the northern stock remain at negative values over the entire ten-year period is because stock biomass is already extremely depressed, and this analysis phased in the reductions in fishing mortality over the first three years of the time horizon. It is likely that the more rapidly fishing mortality rates decrease during the first three years of the plan, the more rapidly total potential fishery yields will increase. In addition, the upward trend of the landings trajectory for the northern stock suggests that landings would increase to levels above the baseline year if the projection was expanded beyond ten years.

In contrast to the status quo, the CVs associated with total fishery landings under the proposed management action are about 87% in the northern stock and 80% in the southern stock **(Figure E.44)**. Lower variation associated with potential fishery yield from the proposed action has important implications for fishery harvesters. In particular, higher variability in potential yields associated with the status quo may result in economic consequences for fishery harvesters, affecting costs of capital investments and returns from variable relative prices and, in general, making planning difficult.

Under the proposed management action, median fishery landings from all market components in the northern stock initially decline during the first 2 – 4 years (-75% and –50%), but then turn upward over the remaining years of the ten-year simulation **(Figure E.45)**. While median landings from the juvenile and round market components increase after the initial decline, values remain negative (-60% and –20%) throughout the simulation horizon. In contrast, median landings of king whiting increase significantly after Year 3 (8000%), decline after Year 5 (4000%), and then stabilize as steadily increasing values. Two important factors must be recognized when interpreting these results. First, although values of percent change in fishery landings remain negative over the entire ten-year period, the upward trend indicates that landings of juvenile and round whiting would eventually increase (>0%) and build-up potential yields in later years. Second, the relatively large values of percent change in king whiting landings that result from the proposed action may translate into only modest gains in actual potential yield because observed landings from this market category have been comparatively small. For example, if initial year landings of king whiting were 13 mt (30,000 pounds), then an 8000% increase in landings would only result in landings around 960 mt.

In the southern stock of silver hake, the proposed action results in increased median fishery landing trajectories for each market component **(Figure E.46)**. Median juvenile whiting landings fluctuate around 0% change for the first three years, but trajectories then increase significantly to about 220% by the 10th year. For the round whiting market category, which has historically had the greatest market share, median landings decline from roughly 30 – 50%

during the first three years, after which landing trajectories steadily increase over the remaining 6 years of the simulation horizon. By the 10th year, median round landings reach about 196% of the initial year. Median king whiting landings achieve the greatest gains (in terms of percent change from base year) of all market categories; landings trajectories of king whiting steadily increase by as much as 3500% by the 10th year. As with the tremendous percentage gains in king whiting in the northern stock, here again such large percent increases may not necessarily translate into actual large yields.

Coefficients of variation (CV) associated with median fishery landings by market category under the scenarios for the northern and southern silver hake stocks exhibit a similar pattern as overall fishery yields (**Figure E.47** and **Figure E.48**). Generally, CVs associated with the status quo option are considerably greater than those associated with the proposed management action. Under the status quo option, CVs on median fishery landings by market component approach 100% to 140%, whereas under the proposed management action, CVs generally range from 60 to 80 percent.

Figure E.43 Percent Change in Total Fishery Landings over a Ten-Year Simulation Horizon for Northern and Southern Silver Hake Stocks From: the Status Quo and the Proposed Management Action

Figure E.44 Coefficient of Variation (CV) on Total Fishery Landings Over a Ten-Year Simulation Horizon for Northern and Southern Silver Hake Stocks From: the Status Quo and the Proposed Management Action

Figure E.45 Percent Change in Fishery Landings by Market Category Over a Ten-Year Simulation Horizon for the Northern Stock of Silver Hake From: the Status Quo and the Proposed Management Action

Figure E.46 Percent Change in Fishery Landings by Market Category Over a Ten-Year Simulation Horizon for the Southern Stock of Silver Hake From: the Status Quo and the Proposed Management Action

Figure E.47 Coefficient of Variation (CV) on Fishery Landings by Market Category Over a Ten-Year Simulation Horizon for the Northern Stock of Silver Hake From: the Status Quo and the Proposed Management Action

Figure E.48 Coefficient of Variation (CV) on Fishery Landings by Market Category Over a Ten-Year Simulation Horizon for the Southern Stock of Silver Hake From: the Status Quo and the Proposed Management Action

E.7.2.1.4 Bioeconomic Results: Biological Conclusions

The bioeconomic analysis provides a framework with which expected biological (and economic) benefits to the U.S. silver hake fishery can be evaluated from alternative fishery management strategies. In particular, the projection model is used to examine the differences in the likely outcomes from the proposed management action and from taking no action. It should be noted, however, that it is currently unknown whether the projected significant increase in SSB resulting from the proposed management action implies that the stocks will achieve rebuilding to MSY levels. There are several reasons for this. First, stock sizes (used to initialize the projections), and therefore stock biomass levels, are presently unknown due to the lack of a currently accepted analytical assessment (VPA). This is why the bioeconomic simulation results are expressed in values of SSB, yield, revenues, etc., corresponding to percent change in median quantities from the initial projection year. Second, biological reference points for SSB levels consistent with MSY have not yet been determined for either whiting stock (see **Appendix I,** *Evaluation of Existing Overfishing Definitions and Recommendations for New Overfishing Definitions to Comply with the Sustainable Fisheries Act (relevant portions only)*). Therefore, it remains unknown whether a 50% or 600% (or other) increase in SSB levels from the initial year would rebuild to SSB targets levels and provide a basis for plan compliance with the SFA. Despite this uncertainty, the simulation results do provide guidance about the potential biological and economic performance of the proposed management action compared to the status quo.

The simulation results suggest that maintaining the status quo would probably reduce long-term whiting stock biomass. Under the status quo, spawning stock biomass and fishery landings for both whiting stocks are projected to decline rapidly after the initial year and stabilize at approximately 100% below initial yield and biomass levels. For reasons discussed previously, this predicted effect may or may not occur if the status quo were maintained for ten years. However, it is likely that maintaining a selection pattern targeting younger whiting (<2.0" mesh), when combined with the high exploitation rates (0.66) associated with the status quo option, would not meet the requirements of the SFA in relation to the management of overfished stocks. In contrast, adopting the proposed management measures should result in a substantial increase in both spawning stock biomass and potential fishery yields. For example, in the northern area, SSB is projected to increase by 53% within ten years from initial year levels, and in the southern area, SSB is projected to increase as much as 600% over the simulation horizon.

Potential fishery yields for the northern stock do not accrue as would be expected from an increase in SSB over the ten-year simulation horizon. Although initially declining for the first three years of the horizon and ultimately remaining negative in terms of percent change, fishery landings in the north begin to steadily increase over the remainder of the ten-year time period. These results suggest that fishery landings in the northern area would eventually increase beyond initial year levels, although more than ten years would be required to do so. Here, a phase-in of exploitation rate reductions may not be immediate enough to promote increased yields, and current northern stock SSB levels may be significantly below those needed to generate more substantial year-classes to support potential increases in fishery yield. This result will change and fishery yields will accrue more rapidly if management measures reduce fishing mortality on whiting more quickly than the analysis assumes. Finally, significantly lower variation (CVs) associated with potential fishery yields from the proposed action has important implications for fishery harvesters. In particular, higher variability in potential yields associated with the status quo may result in economic consequences for fishery harvesters, affecting costs of capital investments and returns from variable relative prices and, in general, making planning difficult.

E.7.2.2 Conservation Effects of the Proposed Management Action: Analysis of Expected Reductions in Exploitation

The primary conservation objective of this amendment is to decrease current estimates of fishing mortality on silver hake in the north and in the south to the target fishing mortality rates of 0.36 and 0.34 for the northern and southern whiting stocks respectively. The target fishing mortality rates for both the northern and southern stocks (from the current silver hake overfishing definition) equate to exploitation rates of approximately 25%. This means that silver hake exploitation rates should decline by about 63% in order to end overfishing and achieve the targets specified in the current overfishing definition. Section E.7.2.1 illustrates what may occur if these targets are reached. In order to assess whether implementing the proposed management action may achieve the conservation objectives of this amendment, an analysis was completed to estimate the decline in whiting exploitation rates resulting from the proposed management measures. Since the most current estimates of fishing mortality (and therefore exploitation rates) are based on data from 1993 – 1995, the results of this analysis reflect reductions in exploitation from 1993 –1995 levels and are consistent with the goals and objectives of this amendment. A similar analysis was also performed to assess the impacts of the proposed management measures on current levels of activity and effort in various fisheries (1995 – 1997). Those results are presented in Section E.7.2.3, *Analysis of Fishery Impacts.*

This management plan relies upon a combination of possession limits (also referred to as trip limits in this analysis) and mesh regulations to achieve its conservation objectives. These two measures were combined into a single model to predict reductions in whiting fishery exploitation. Procedurally, data from individual trips that landed any one or more of the three small mesh multispecies during the 1995 – 1997 calendar years were assembled. A set of decision rules, based on trip economics, were then applied to these data to project how individual trip decision-making would change when faced with a trip limit. The results of this analysis are reported in Sections E.7.2.2.3, E.7.2.2.4, and E.7.2.2.5 for the northern area (north of the Gulf of Maine/Georges Bank Regulated Mesh Area Line), the Cultivator Shoal Whiting Fishery Area, and the southern area (south of the GOM/GB Regulated Mesh Area line) respectively. Aggregate (coast-wide) reductions are reported in Section E.7.2.2.2. Note that since the data and analysis are organized at a trip level, the results may be aggregated by vessel, port, or region. For this reason, the trip limit model output forms the basis for not only the analysis of reductions in exploitation, but also for the fishery impact assessment reported in Section E.7.2.3, the assessment of impacts on small entities (Section E.7.3.2), and the assessment of impacts on significant whiting ports (Section E.7.3.3).

E.7.2.2.1 Data and Methodology

The trip limit model described in this section was used to predict both the reductions in exploitation (from a 1993 – 1995 baseline) from the proposed management action and the impacts of the management action on current small mesh fishery levels (from a 1995 – 1997 baseline). This section provides a technical description of the data used and the trip limit model generated for these analyses and notes differences between the methodologies for the two analyses.

E.7.2.2.1.1 Trip Limit Model

The trip limit model, developed to analyze the conservation impacts of the proposed management measures, is based upon the assumption that, for a given trip, individuals seek to maximize revenues net of operating costs. In the absence of a trip limit (possession limit), net revenues (NR) may be calculated as:

$$NR = \sum_{i}^{I} \sum_{j}^{J} p_{ij} q_{ij} - VC$$

(1)

where: p is price, q is quantity, VC is variable costs, i denotes the species (silver hake, red hake, and offshore hake) that may be subject to a trip limit, and j denotes incidental species. For any given trip, Equation **(1)** remains unchanged if q_i (i.e. landings on the trip) are less than the trip limit.

For trips where q_i exceeds the trip limit, q_i is replaced by the trip limit (TL_i) and net returns are calculated as:

$$NR = p_i\left(TL_i\right) + \sum_{j}^{J} p_j q_j - VC$$

(2)

Unless discard survival is high, imposition of a trip limit must be expected to induce some change in fishing strategy; otherwise, there would be little conservation benefit afforded to selecting a trip limit as a management option. Whether a trip limit will affect fishing patterns depends upon the interaction of several variables including the trip limit itself, revenues earned from incidental catch, and fishing costs. To explore these relationships further, it is necessary to express Equation **(1)** in terms of unit time:

$$NR_t = \left[\sum_{i}^{I} p_i\left(CPU_i\right) + \sum_{j}^{J} p_j\left(CPU_j\right)\right] - VC_t$$

(3)

where days absent (DA) is used as the time unit (t), VC_t is variable costs per day absent, CPU_i is landings per day absent for species subject to the trip limit, and CPU_j is landings per day absent for incidental species. This expression of trip economics also lends itself to incorporation of the joint effects of trip limits and mesh changes through adjustments to CPU.

Based upon PDT analysis of available mesh selectivity data, this adjustment has been set to a 15% reduction in aggregate landings per ½ inch increase in mesh. Specifically, a mesh size of

2.5-inches is assumed to result in a 15% reduction in total landings of all species that would normally be retained and marketed with 2.0-inch mesh. Similarly, an increase to 3.0-inch mesh is assumed to result in a 30% reduction in total landings of all species that would normally be retained and marketed with 2.0-inch mesh. The sensitivity of this assumption was investigated, the results of which are reported in subsequent sections of this analysis.

As previously noted, if DA times CPU_i is less than the trip limit, then the trip limit would not be exceeded. In cases where DA times CPU_i exceeds the trip limit, the vessel owner is confronted with a choice between continuing to fish while discarding any fish in excess of the trip limit, switching to another fishery or area where discard rates might be lower, or ending the trip and returning to port. Since the trip limit analysis relies upon observed trips, the second possibility of switching to another fishery or area is not incorporated into the model.

In cases where the trip limit/possession limit is exceeded, the individual is assumed to choose the strategy (continue to fish while discarding all fish above the trip limit *or* to return to port once the trip limit has been reached) that yields highest net return. If the latter choice is made, revenues from the species subject to the trip limit will be equal, but revenues from incidental species will be lower. Lower trip revenues may be offset by lower trip costs, however, since the trip duration would be shorter. In general, the individual will continue to fish as long as the revenue from incidental species is greater than the difference between trip costs. That is, if a vessel can earn more money from the sale of incidental species by continuing to fish than it would save in operating costs by returning to port early, then the trip will continue.

Given the different qualification possibilities and management measures that will apply to each, there are two possible fishing strategies for both non-qualifiers (open access multispecies permit) and possession limit qualifiers (limited access small mesh multispecies possession limit permit) and a total of six possible fishing strategies for limited access qualifiers (limited access small mesh multispecies permit). Each of these possibilities is listed in **Table E.58**.

For every trip, revenues net of operating costs for each fishing strategy are calculated and compared. The fishing strategy that yields highest net return is assumed to be adopted, and the landings and discards by species are calculated as appropriate.

Table E.58 Summary of Possible Fishing Strategies by Qualification Status

QUALIFICATION STATUS	FISHING STRATEGY
Non-Qualifiers **(Open Access Multispecies Permit – 100 pounds)**	**Strategy 1:** Fish with current mesh for observed days absent, discard all small mesh species above 100 pounds **Strategy 2:** Fish with current mesh, return when trip limit is reached, discards equal 0
Possession Limit Qualifiers **(Limited Access Small Mesh Multispecies Permit – 2,500 pounds)**	**Strategy 1:** Fish with current mesh for observed days absent, discard all small mesh species above 2,500 pounds **Strategy 2:** Fish with current mesh, return when trip limit is reached, discards equal 0
Limited Access Qualifiers **(Limited Access Small Mesh Multispecies Permit)**	**Strategy 1:** Fish with current mesh for observed days absent, discard all small mesh species above 3,500 pounds **Strategy 2:** Fish with current mesh, return when trip limit is reached, discards equal 0 **Strategy 3:** Fish with 2.5-inch mesh for observed days absent, discard all small mesh species above 7,500 pounds **Strategy 4:** Fish with 2.5-inch mesh, return when trip limit is reached, discards equal 0 **Strategy 5:** Fish with 3.0-inch mesh for observed days absent, discard all small mesh species above 30,000 pounds **Strategy 6:** Fish with 3.0-inch mesh, return when trip limit is reached, discards equal 0

E.7.2.2.1.2 Data

The trip limit model requires trip-level data for pounds of small mesh multispecies (silver hake, red hake, and offshore hake), pounds of incidental species, prices by species, and fishing costs. Since 1994, commercial fishing data has been gathered from both dealers (the dealer weighout) and vessel owners (logbooks or vessel trip report (VTR)). The dealer information is the principal source of data on pounds and value by species and on market categories, but it cannot be used to identify area fished or to estimate fishing time. The VTR is the principal source of data on area fished and effort (days fished). The VTR also contains data on kept pounds by species, but it cannot be used to estimate landed value. Unfortunately, the dealer and VTR data cannot be linked to form a one-to-one match of dealer and VTR records. This means that the key variables for the trip limit model (prices, landings, area and fishing time) could not be constructed from a single unified data set. Instead, the VTR data is used as the primary source of trip level information for landings by species, area fished, and days absent. The dealer data is used as the primary source of price information.

Landings by trip were obtained for the calendar years 1995 – 1997. Since fishing conditions vary, this three-year period was selected to reflect current fishery conditions as well as those that may prevail under longer run average conditions. All trips were retained on which one or more pounds of any of the three small mesh multispecies (red hake, silver hake, offshore hake) were landed. Note that the VTR data differs from the dealer data in two respects. First, reported weight is an estimated weight, not an actual weight sold to a dealer. Second, the unit of observation is kept pounds, not sold pounds. Discrepancies between the VTR and dealer data can arise due to captain error in estimated weight, or because some portion of kept pounds does not get sold due to poor quality or use as bait. For each trip, data were retained for kept pounds by species, area fished, days absent, port, and date of landing.

In addition to trips where small mesh multispecies were landed, all other trips by any vessel that landed any one of the small mesh multispecies are retained in the trip limit model database. These additional data have no bearing on the analysis of exploitation reductions, but they are used to assess impacts on small entities that actively participated in small mesh multispecies fisheries from 1995 to 1997. In order to assess the impacts of the proposed management action on current levels of activity in various fisheries, landings from the 1995 – 1997 time period form the baseline period from which all fishery, port, and small entity impacts are compared. However, the expected reductions in exploitation resulting from the proposed management action are compared to a 1993 – 1995 baseline, similar to the time period from which the target reductions in exploitation were derived.

Baseline (1993 – 1995) landings of silver hake, offshore hake, and red hake are reported in **Table E.59**. Silver hake and offshore hake landings are combined since the two species are often mixed and reported together as either silver hake, offshore hake, or a mixture of both. The baseline landings by area were estimated from dealer data for 1993 and were estimated from a combination of dealer and logbook data for 1994 and 1995. Estimated landings from both the dealer data and logbook data for 1995 – 1997 are also reported in **Table E.59**. These data are reported because the trip limit model was applied to data from 1995 – 1997. Note that the 1995 – 1997 logbook and dealer data yield different estimates of fishery landings, with values from the logbook being consistently below those from the dealer data. Since logbook data was used to estimate changes in landings, the calculated landings were prorated to the dealer data by dividing logbook data by the proportion of logbook to dealer data.

Table E.59 Landings of Small Mesh Multispecies by Area, Years, and Data Set
The northern and southern areas refer to the areas north and south of the Gulf of Maine/Georges Bank Regulated Mesh Area.

	1993 – 1995 Baseline: Dealer Data (million lbs)		1995 – 1997 Dealer Data (million lbs)		1995 – 1997 Logbook Data (million lbs)		Proration Factor for Silver and Offshore Hake (%)
AREA	Silver and Offshore Hake	Red Hake	Silver and Offshore Hake	Red Hake	Silver and Offshore Hake	Red Hake	
Northern	16.7	4.6	17.6	2.7	14.0	2.9	79.6
Cultivator Shoal	9.5	0.2	8.8	0.1	6.8	0.1	77.5
Southern	78.9	6.2	77.9	6.0	69.5	6.3	89.2

Landings by species category from both the dealer data and VTR data for the vessels that participated in red hake, silver hake, or offshore hake fisheries from 1995 to 1997 are reported in **Table E.60**. For the purposes of the fishery impact analysis, red hake, silver hake, offshore hake, squids (loligo and illex), and shrimp are kept as separate species, while remaining species are combined into two separate categories labeled “large” and “small” mesh species. The distinction is not based on a given management plan. Rather, the distinction is based upon whether or not a change in mesh size (up to 3-inches) would affect the quantity of fish that could be legally retained. For example, the quantity of skates or dogfish that would be retained and legally sold using 3-inch mesh is not likely to differ from what would be retained using smaller mesh. Similarly, even though the retention rate of scup would probably decrease as mesh increases to 3-inches (from 1 7/8-inches), the amount of legal-sized scup that could be sold is not likely to change. By contrast, marketable quantities of species like herring and mackerel would be affected by an increase in mesh; thus, those species are designated “small mesh” species. The species that comprise the two categories are listed as a footnote to **Table E.60** and were assigned to those categories by Whiting PDT consensus.

Both the landings and value of species by all vessels during calendar years 1995 – 1997, as reported through the dealer data, are presented in the first column of **Table E.60**. Note that landings by unidentifiable vessels and vessels that were retired through the buyout program are not included in these data. The second column of **Table E.60** reports the total pounds and value of all species from the dealer data by vessels on trips where small mesh multispecies were landed during 1995 – 1997, while the third column provides the data reported by these vessels on their VTRs. The values associated with the VTR data are estimated values from the price data described below and may not be as reliable as those reported in the dealer data. The final column in **Table E.60** indicates the proportion of pounds and value reported in the VTR data compared to dealer data for the vessels that landed small mesh multispecies. Silver hake landings and value reported in the dealer and logbook data are nearly identical. By contrast, offshore hake landings reported in the VTR are substantially greater than those reported in the dealer data for the same vessels. This discrepancy may be due to either species misidentification or the lumping of silver hake and offshore hake at the dealer level for convenience purposes or as a way of getting a better price. Kept pounds reported in the VTR data for red hake are also higher than the dealer data, but the discrepancy is not as great as it is for offshore hake.

Species' prices were constructed from the dealer data by species, port, and day of the year. These prices were averaged for the three-year period to minimize the number of possible missing observations. In cases where there were no data for a given port or day of the year, an average coast-wide price was assigned. These data were merged with the landings data to assign a value to each species retained on a trip. Prices were estimated separately for trips where small mesh multispecies were retained and for trips where no small mesh multispecies were retained in order to reflect any possible differences in pricing when small mesh is likely to have been used versus when larger mesh is likely to have been used.

Fishing costs were estimated by using data from otter trawl vessels participating in the Capital Construction Fund (CCF). To estimate costs per day, a simple linear regression was fit to CCF and vessel characteristics (main engine horsepower and gross registered tons). The cost model includes only operating costs (ice, water, food, fuel, oil, gear, supplies, lumping, auction, and packing fees). The resulting coefficients are used to provide an estimate of cost per day for each vessel included in the trip limit data set, based upon individual vessel characteristics.

For the purposes of the fishery impact analysis (Section E.7.2.3), a complete trip record requires an observation for landings, area, days absent, vessel horsepower, and gross tons. Records that had one or more of these variables missing were deleted from the database. This is why the landings data reported in **Table E.60** differ from those reported in **Table E.59**.

Table E.60 Summary of Landings and Value by Species Groups from Dealer and VTR Data (1995-1997)

	Dealer Data	Dealer Data	VTR Data	
	All Trips/ All Vessels	Trips That Landed Small Mesh Multispecies	Trips That Landed Small Mesh Multispecies	Percent Activity in VTR Data
Species Pounds and Value	**(millions)**	**(millions)**	**(millions)**	**(percent)**
Large Mesh Species (pounds)[a]	1022.39	479.89	399.72	83.26
Large Mesh Species (value)	1051.34	411.36	325.13	79.03
Offshore Hake (pounds)	0.30	0.30	4.10	1378.71
Offshore Hake (value)	0.12	0.12	1.92	1618.46
Silver Hake (pounds)	82.80	81.27	81.78	100.62
Silver Hake (value)	34.37	33.85	34.75	102.66
Red Hake (pounds)	6.92	6.78	9.08	133.91
Red Hake (value)	1.89	1.86	2.77	149.33
Loligo and Illex Squid (pounds)	194.73	132.49	101.87	76.89
Loligo and Illex Squid (value)	87.67	61.81	48.31	78.15
Shrimp (pounds)	45.56	37.01	31.64	85.48
Shrimp (value)	36.32	29.62	25.43	85.87
Small Mesh Species (pounds)[b]	470.96	140.20	93.23	66.60
Small Mesh Species (value)	49.31	21.04	33.17	157.65

a Large Mesh Species consist of the ten regulated multispecies plus bluefish, monkfish, scup, skates, dogfish, black sea bass, summer flounder, lobster, and all other species not listed above or listed as a small mesh species.

b Small Mesh Species consist of butterfish, mackerel, herring, croaker, and ocean pout.

As the baseline data reported in **Table E.60** indicates, in some instances, the amount of available VTR data exceeds that of reported dealer data, and in other instances, it is less than reported dealer data. The trip limit model was applied to the VTR data because the dealer data could neither be used to assign area fished, nor could it be used to estimate fishing time.

E.7.2.2.1.3 Sensitivity Trials

One of the critical assumptions embedded in the trip limit model is the relationship between losses in production and changes in mesh size. Given the available data, the Whiting PDT developed its best estimate of the joint effects of possession limits and mesh changes under the proposed management action. The PDT recommended that the model apply an assumption that each ½-inch increase in mesh size would result in a 15% reduction in retention of marketable species. Increasing to 2.5-inch mesh results in a 15% reduction, and increasing to 3-inch mesh results in a 30% reduction. However, industry advisors expressed concern about the PDT's mesh selectivity assumption. To address these concerns, three additional analyses were performed in order to determine the sensitivity of the exploitation reduction estimates to the assumed relationship between production losses and mesh changes. Due to the importance of squid in the southern New England mixed trawl fishery, squid losses are assumed to be at twice the rate of the assumed loss of whiting, red hake, offshore hake, and other small mesh species. The PDT assumption for production losses at 2.5-inch mesh (15%) was set to 20% and 25%, and the PDT's assumed production loss at 3.0-inch mesh (30%) was set to 40% and 50%. Combining these alternatives with assumed squid loss rates results in the three trials indicated in **Table E.61**. These sensitivity trials were performed for both the analysis of expected reductions in exploitation and the analysis of fishery impacts.

Table E.61 Summary of Sensitivity Trials of Production Losses due to Mesh Changes

	PDT Best Estimate		Trial 1		Trial 2		Trial 3	
	2.5-inch	3-inch	2.5-inch	3-inch	2.5-inch	3-inch	2.5-inch	3-inch
All Small Mesh Species	15%	30%	15%	30%	20%	40%	25%	50%
Squid	15%	30%	22.5%	45%	30%	60%	37.5%	75%

E.7.2.2.2 Results: Aggregate Reductions in Exploitation

The estimated aggregate exploitation rate reductions resulting from the proposed management action for Years 1 – 3 and the Year 4 default are reported in **Table E.62**, including results from the sensitivity trials. The results reported in **Table E.62** are combined exploitation rate reductions for small mesh multispecies fisheries as a whole (i.e. coast-wide reductions from 1993 – 1995 baseline levels). Based on the synergistic effects of mesh changes and possession limits, the PDT estimates of exploitation rate reductions are 32% for the Year 1 – 3 measures and 54% for the Year 4 default measure. The sensitivity trials indicate that the Year 1 – 3 and the Year 4 default reductions could be as high as 44% and 67% respectively, depending on which mesh selectivity assumption is chosen. The projected exploitation rate reductions for red hake are similar to those of combined silver and offshore hake, indicating that the proposed management measures should afford protection to small mesh multispecies as a group, not just to silver hake. In general, the target exploitation rate reductions necessary to end overfishing and promote stock rebuilding fall within the range of expected aggregate fishery reductions provided in **Table E.62**. The estimated exploitation rate reductions for the PDT and sensitivity trials are reported by area in subsequent sections of this document.

Table E.62 Aggregate Exploitation Rate Reductions for Years 1 – 3 and the Year 4 Default Measure Including Sensitivity Trials

		YEAR 1 – 3 REDUCTION (%)				YEAR 4 DEFAULT REDUCTION (%)			
SPECIES	1993 – 1995 Baseline (million lbs)	PDT	Trial 1	Trial 2	Trial 3	PDT	Trial 1	Trial 2	Trial 3
Silver and Offshore Hake	104.5	33	39	44	49	58	60	64	68
Red Hake	11.0	34	35	39	43	54	55	60	65
TOTAL (Including Discards)	115.5	32	36	40	44	54	56	61	67

E.7.2.2.3 Results: Reductions in Exploitation in the Northern Area

Total combined kept pounds from VTR data of all three small mesh multispecies during calendar years 1995 – 1997 were 16.9 million pounds for the northern area, the area north of the GOM/GB Regulated Mesh Area line. Vessels that participated in the buyout program account for 3.6% (0.6 million pounds) of this total, and removal of their activity is counted as conservation savings. The estimated exploitation rate reductions resulting from the proposed management action in the northern area for Years 1 – 3 and the Year 4 default are reported in **Table E.63**.

Based upon PDT examination of data on the experimental whiting separator trawl (grate) fishery, it was determined that the combination of current bar spacing (40 mm) and a 3-inch codend would effectively eliminate that fishery if the default measure is implemented. While it is possible that grate fishery participants could continue to fish by relocating to the Gulf of Maine Small Mesh Areas or to open areas outside the Gulf of Maine, it is assumed that a redirection of effort to other whiting areas is unlikely. This assumption is based upon the smaller size of vessels involved in the grate fishery, making relocation outside the Gulf of Maine infeasible. Further, given the relatively small area and short season of the Small Mesh Areas in the Gulf of Maine, it seems unlikely that substantial whiting effort will be redirected there. Therefore, observed trips by whiting grate fishery participants (approximately 33% of 1995-97 baseline landings) are assumed to not be taken, and landings from these trips are treated as a conservation savings. Hence, approximately half of the Year 4 default reduction comes from the elimination of the experimental grate fishery. Additionally, if the grate fishery does not become an exempted fishery (by meeting the less-than-five-percent groundfish bycatch provision), then the expected exploitation reductions for the northern area may be much higher than those reported for Years 1 – 3 in **Table E.63**.

The estimated reduction in silver hake/offshore hake exploitation from the Year 1 – 3 management measures is 17%, but it is projected to be as high as 23% depending on which mesh selectivity assumption is applied. This reduction is low when compared to other areas, primarily because the possession limits for Years 1 – 3 affect a relatively small proportion of (observed) total trips in the northern area that landed small mesh multispecies. However, the Year 4 default measure is substantially more restrictive and results in an estimated silver hake/offshore hake exploitation rate reduction in the northern area ranging from 62 to 71 percent. Projected exploitation reductions from the default measure for all small mesh multispecies in the northern area range from 61 to 71 percent. These results fall within the range of exploitation rate reductions necessary to end overfishing and to advance stock rebuilding.

Table E.63 Northern Area Exploitation Rate Reductions for Years 1 – 3 and the Year 4 Default Measure Including Sensitivity Trials

		YEAR 1 – 3 REDUCTION (%)				YEAR 4 DEFAULT REDUCTION (%)			
SPECIES	**1993 – 1995 Baseline (million lbs)**	**PDT**	**Trial 1**	**Trial 2**	**Trial 3**	**PDT**	**Trial 1**	**Trial 2**	**Trial 3**
Silver and Offshore Hake	16.7	17	17	20	23	62	62	66	71
Red Hake	4.6	49	49	51	52	66	66	70	75
TOTAL (Including Discards)	21.3	24	24	26	28	61	61	66	71

E.7.2.2.3.1 Other Factors Affecting the Northern Area

There are additional factors, primarily management measures implemented to conserve other species, that may also affect the recovery of the northern whiting and red hake stocks and may further increase the likelihood that this amendment will achieve its objectives. The potential conservation benefits for whiting and red hake provided by the following measures cannot be quantified for the purposes of this biological impact analysis, but they should be considered in addition to the estimated reductions in exploitation resulting from the proposed management action.

First, the Council implemented several management measures in the Gulf of Maine that will continue, as they have in the past, to offer protection to the northern whiting and red hake stocks. They include:

- The Gulf of Maine/Georges Bank Regulated Mesh Area (RMA): The minimum mesh requirement of 6-inches in the RMA precludes fishing for small mesh multispecies in most areas of the Gulf of Maine. The large mesh allows for significant whiting and red hake escapement (almost total escapement). Unless a vessel is fishing under a Multispecies DAS and using at least 6-inch mesh, fishing for small mesh multispecies is only allowed in exempted fisheries with less than 5% incidental catch of regulated groundfish species. Aside from two seasonal experimental fisheries, the small mesh Northern Shrimp Exemption Area, and the Cultivator Shoal Whiting Fishery, Small Mesh Areas 1 and 2 provide the only opportunity for vessels to fish for small mesh multispecies in the Gulf of Maine, and these two areas are limited spatially and seasonally.
- Groundfish Closed Areas: Closed Areas 1 and 2, as well as half of the Nantucket Lightship Closed Area, offer a great deal of protection to silver hake in areas where they are known to

congregate to spawn. These areas have been closed for more than four years and continue to remain closed to gear capable of catching multispecies.

- Western Gulf of Maine Closed Area: This closure, implemented with Framework 25 in May 1998, decreased the size of Small Mesh Area 2 by approximately 106 nautical miles. The area comprising Small Mesh Area 2 is currently about 3/4 of what it was before Framework 25. A decrease in available fishing grounds for small mesh multispecies in the northern area should decrease whiting exploitation to some degree. However, this effect has yet to be measured.
- Framework 25 and 26 Inshore "Rolling" Closures: A series of inshore Gulf of Maine area closures, deemed "rolling closures," were implemented for 1998 and 1999 through Framework 25 and 26 to the Northeast Multispecies FMP. In 1999, the "rolling" closures will effectively eliminate more than ½ of the area available for fishing for small mesh multispecies in Small Mesh Area 2 during the months of April and May. The southern half of Small Mesh Area 2 will be closed during April, and the northern half will be closed during May. (Framework 25 closed ½ of Small Mesh Area 2 during April 1998 as well.) Again, a decrease in available fishing grounds for small mesh multispecies should decrease exploitation, but the impacts of these frameworks on small mesh multispecies effort have yet to be quantified. In addition, while fishing opportunities in Small Mesh Area 1 will remain unaffected by the "rolling closures," the closures themselves should provide increased shelter and protection for whiting and red hake stocks during the time when groundfish gear is prohibited from fishing in that area for any species.
- Raised Footrope Trawl Requirement: The raised footrope trawl requirement for fishing in Small Mesh Areas 1 and 2, implemented through Framework 25, will decrease regulated groundfish species bycatch. However, the industry has also suggested that using the raised footrope trawl decreases red hake catch, although this has not yet been proven. To the extent that red hake catches are decreased, the raised footrope trawl requirement may aide in the recovery of the northern red hake stock.

Second, impending management action for Gulf of Maine cod could also indirectly contribute to the recovery of northern whiting and red hake stocks. This includes:

- Framework 27: Recently, the Council approved management measures to be included in Framework 27 to the Northeast Multispecies FMP (for protecting Gulf of Maine cod), which should be implemented May 1, 1999. The seasonal Gulf of Maine area closures included in Framework 27 will decrease opportunities for small mesh fishing in the Gulf of Maine. First, the western Gulf of Maine area closure will remain closed under Framework 27. This closure decreases the size of Small Mesh Area 2 (see above). Second, the "rolling closures" eliminate about ½ of the area included in Small Mesh Area 2 during the month of April. In addition, the closures eliminate the opportunity to fish at all in Small Mesh Area 2 during the month of May. To the extent that these closures decrease the available small mesh fishing grounds in the northern area, they will decrease whiting exploitation. According to the information presented in Section E.6.5.3.1.2, the months of April and May have been peak months for fishing for small mesh multispecies in Small Mesh Area 2, so the closures implemented with Framework 27 will likely affect whiting exploitation in the area. Third, while fishing opportunities in Small Mesh Area 1 will remain unaffected by the "rolling closures" proposed in Framework 27, the closures themselves should provide increased shelter and protection for whiting and red hake stocks during the time when groundfish gear is prohibited from fishing in that area.

E.7.2.2.4 Results: Reductions in Exploitation in the Cultivator Shoal Whiting Fishery

Total combined kept pounds from VTR data of all three small mesh multispecies during calendar years 1995-1997 were 6.9 million pounds for the Cultivator Shoal Whiting Fishery. Cultivator Shoal landings were determined by matching vessel activity with the dates of participation in the Cultivator Shoal fishery between 1995 and 1997. Over this period, vessels landed a total of 9.1% (0.6 million pounds) during the month of October. For this analysis, vessels are not assumed to replace these October trips by taking more trips during the rest of the season. Therefore, landings in October are assumed to be a conservation savings for the Cultivator area. Vessels that participated in the buyout program account for 5.2% (0.4 million pounds) of the total Cultivator Shoal production, and removal of their activity is counted as conservation savings.

The estimated exploitation rate reductions (from the 1993 – 1995 baseline) resulting from the proposed management action in the Cultivator Shoal Whiting Fishery for Years 1 – 3 and the Year 4 default measure are reported in **Table E.64**. The estimated reduction in whiting/offshore hake exploitation rates on the Cultivator is 40% for Years 1 – 3 and 73% for the Year 4 default measure. Estimated exploitation rate reductions for all small mesh multispecies combined are 41% for Years 1 – 3 and 72% for the Year 4 default measure. The results suggest that the proposed management action will afford a great deal of protection to red hake stocks on the Cultivator Shoal as well. In fact, red hake exploitation rates are projected to decrease 62% on the Cultivator from the Year 1 – 3 measures alone. Since vessels participating in the Cultivator Shoal Whiting Fishery were required to use 3-inch mesh between 1995 and 1997, no sensitivity trials were performed.

For the Cultivator Shoal Area, the expected exploitation rate reductions resulting from the proposed management action exceed the targets necessary to end overfishing and promote stock rebuilding by about ten percent. Since whiting on the Cultivator Shoal are believed to originate from both the northern and southern stocks (and congregate on the Cultivator Shoal seasonally), additional reductions in exploitation rates, and consequently fishing mortality rates, in the Cultivator Shoal Whiting Fishery will ultimately benefit both whiting stocks. It is important to acknowledge this benefit because the analysis cannot quantify the differential impacts of additional exploitation reductions in the Cultivator Shoal Whiting Fishery on the northern and southern stocks of whiting individually. However, one can assume that an extra ten percent reduction on the Cultivator will translate into some added benefits for both whiting stocks.

Table E.64 Expected Exploitation Rate Reductions in the Cultivator Shoal Whiting Fishery for Years 1 – 3 and the Year 4 Default Measure

	PDT		
SPECIES	**1993-1995 Baseline (million lbs)**	**Year 1-3 Reduction (%)**	**Year 4 Default Reduction (%)**
Silver and Offshore Hake	9.5	40	73
Red Hake	0.2	62	70
Total	9.7	41	72

E.7.2.2.5 Results: Reductions in Exploitation in the Southern Area

Total combined kept pounds from VTR data of all three species during calendar years 1995 – 1997 were 72.6 million pounds for the southern area, the area south of the GOM/GB Regulated Mesh Area line. Vessels that participated in the buyout program account for 0.2% (0.2 million pounds) of this total, and removal of their activity is counted as conservation savings. The estimated exploitation rate reductions (from the 1993 – 1995 baseline) resulting from the proposed management action in the southern area for Years 1 – 3 and the Year 4 default are reported in **Table E.65.**

Applying the PDT assumptions to the model results in a silver hake/offshore hake exploitation rate reduction of 36% for Years 1 – 3 and 55% for the Year 4 default measure. The estimated reductions in red hake exploitation are 22% and 44% for the Year 1 – 3 measures and the Year 4 default measure respectively. Depending on the assumed relationship between retention rates and mesh size increases, the estimated silver hake/offshore hake exploitation rate reductions range from 36 – 48 percent for Years 1 – 3 and 55 – 63 percent for the Year 4 default measure. Total small mesh multispecies reductions range from 32 – 41 percent for Years 1 – 3 and 50 – 61 percent for the Year 4 default measure. Based on the trip limit analysis, these results indicate that the proposed management action alone may reach the target exploitation rates necessary to end overfishing and advance stock rebuilding in the southern area (the target rates are based solely on silver hake exploitation). These results have been considered independently of any extra reductions that may occur in the southern area due to the additional reductions in exploitation on the Cultivator Shoal Whiting Fishery or due to other factors affecting the southern area.

Table E.65 Southern Area Exploitation Rate Reductions for Years 1 – 3 and the Year 4 Default Measure Including Sensitivity Trials

		YEAR 1 – 3 REDUCTION (%)				YEAR 4 DEFAULT REDUCTION (%)			
SPECIES	1993 – 1995 Baseline (million lbs)	PDT	Trial 1	Trial 2	Trial 3	PDT	Trial 1	Trial 2	Trial 3
Silver and Offshore Hake	78.9	36	37	42	48	55	55	59	63
Red Hake	6.2	22	22	28	33	44	44	50	56
TOTAL (Including Discards)	85.1	32	32	37	41	50	50	56	61

E.7.2.2.5.1 Other Factors Affecting the Southern Area

There are additional factors that, when considered in combination with the proposed management action, may also affect the recovery of the southern whiting and red hake stocks and may further increase the likelihood that this amendment will achieve its objectives. The potential conservation benefits for whiting and red hake provided by the following cannot be quantified for the purposes of this biological impact analysis, but they should be considered in addition to the estimated reductions in exploitation resulting from the proposed management action. The Council is confident that the synergy of the proposed management action with the following factors will produce results in the southern area consistent with the objectives of this management plan.

Both the New England and the Mid-Atlantic Council implemented several management measures in southern New England and the Mid-Atlantic that will continue, as they have in the past, to offer protection to southern whiting and red hake stocks. They include:

- Groundfish Closed Areas: Half of the Nantucket Lightship Closed Area is located in the southern area. The Nantucket Lightship Closed Area offers protection to silver hake in areas where they are known to congregate. The industry has testified that the area comprising the Nantucket Lightship Closed Area has historically been a productive whiting area where a small mesh multispecies fishery once thrived. Closed areas not only provide a refugia for fish that congregate in the area, but also allow for habitat rejuvenation which may increase available shelter from predation for juvenile fish.
- Lobster Restricted Gear Areas: The Lobster Restricted Gear Areas (RGAs), recently established to moderate gear conflicts between lobster vessels and trawl vessels, seasonally rotate small closed areas for either mobile gear fishing or lobster pot fishing. While closed to mobile gear fishing, these areas offer protection to whiting and red hake stocks similar to other closed areas. In addition, during public hearings, the industry testified that the area contained within the RGAs is known for large congregations of whiting, particularly offshore hake. To the extent that these congregations of whiting can be protected by the seasonal area closures, the RGAs may aide in the recovery of the southern whiting and red hake stocks.

- Scallop Emergency Closures: Two Closed Areas in the Mid-Atlantic were recently implemented through emergency action to protect the sea scallop resource. In addition to offering protection to younger scallop beds, these closures may provide additional conservation benefits for small mesh multispecies stocks, especially red hake. Because of a symbiotic relationship that appears to exist between juvenile red hake and sea scallops, the emergency closures, as well as management measures implemented through Amendment 7 to the Sea Scallop FMP, could indirectly aide in the recovery of red hake stocks. Juvenile red hake are commonly found associated with sea scallops, either under them in the sediment or within the scallops' mantle cavity (see EFH Species Report for Red Hake). Small scallops tend to shelter small juvenile red hake, but larger scallops shelter a range of juvenile sizes. An increase in the abundance (and average size) of sea scallops in the southern area should increase the availability of protection from predation for juvenile red hake. This could lead to stronger juvenile age classes of red hake and greater recruitment into the fishery.

E.7.2.3 Analysis of Fishery Impacts

This section characterizes the impacts of the proposed management measures on current levels of activity and effort in various fisheries, including those for small mesh multispecies. This analysis was conducted in a manner identical to the analysis of expected reductions in exploitation (the trip limit model) described in Section E.7.2.2.1. Results are also reported similarly; that is, results from this analysis are reported as percent reductions in exploitation. The difference between the two analyses is that the fishery impacts reflect exploitation rate reductions from 1995 – 1997 levels, not from the 1993 – 1995 baseline. Market conditions, stock status, and regulations in other fisheries have changed the face of many small mesh multispecies fisheries since 1995. In addition, several experimental whiting fisheries have since emerged, including the whiting grate fishery and the experimental raised footrope trawl fishery. Therefore, it is important to acknowledge any reductions in exploitation that may have occurred in these fisheries (without the implementation of any additional management measures for small mesh multispecies) since the 1993 – 1995 estimates were derived. To the extent that reductions in exploitation have already occurred, the impacts of the management measures contained in the amendment will be lessened. While the analysis presented in Section E.7.2.2 assesses the likelihood that the proposed management action will achieve the objectives of the plan, this section more accurately characterizes how the measures will impact those vessels currently prosecuting small mesh multispecies (as well as other species).

E.7.2.3.1 Fishery Impacts: Aggregate

As the baseline data reported in **Table E.60** indicates, in some instances, the amount of available VTR data exceeds that of reported dealer data, and in other instances, it is less than reported dealer data. The trip limit model was applied to the VTR data because the dealer data could neither be used to assign area fished, nor could it be used to estimate fishing time. Therefore, aggregate fishery impacts were estimated in the following manner:

> First, changes in VTR landings and values were prorated by the proportion of VTR to dealer estimates of landings and value for the participating vessels.
> Second, the prorated reduction in aggregate landings by participating vessels was used to estimate the change in coast wide landings by all species categories.

Given the available data, the Whiting PDT provided its best estimate of the joint effects of possession limits and mesh changes under the proposed management action. However, as previously discussed, industry advisors expressed concern about the PDT's mesh selectivity assumptions. To address these concerns, three additional analyses were performed in order to determine the sensitivity of the impact estimates to the assumed relationship between production losses and mesh changes. These sensitivity trials are presented in **Table E.61** in Section E.7.2.2.1.3.

The results of the aggregate fishery impact assessment of the measures for Years 1 – 3, including the sensitivity trials, are reported in **Table E.67**. Based on the PDT's best estimate of production losses due to an increase in mesh size, the Year 1 – 3 management measures are projected to result in a 30% reduction in silver hake landings and value from 1995 – 1997 levels. The results range from 30% to almost 41% depending on the mesh selectivity assumptions. Red hake landings and value are also estimated to decrease between 20% and 30% from 1995 – 1997 values under the Year 1 – 3 management measures. These results indicate that, on a coast-wide basis, the proposed management action should afford protection to all small mesh multispecies, not just silver hake.

The results of the sensitivity trials for Years 1 – 3 show increasing reductions in offshore hake, red hake, and silver hake landings and revenues as the assumed proportional production losses increase from Trial 1 to Trial 3. This amounts to about an 11% difference in estimated reductions in landings of small mesh multispecies between different trials. By contrast, the estimated reductions in landings and revenues for "large mesh species" and "small mesh species" (as defined in **Table E.60**) remain relatively unchanged, and the estimated reduction in squid increases at first, but then decreases as the assumed squid production loss becomes more extreme. Although seemingly counterintuitive, the finding is a consequence of the fact that under the Year 1 – 3 measures, individuals retain the choice of fishing with 3-inch or 2.5-inch mesh, or continuing to fish with mesh less than 2.5-inches. This means that as the production losses of squid and all "small mesh species" increase, the fishing strategies maximizing net returns switch from strategies that favor using large mesh (to take advantage of higher trip limits) to strategies that favor using smaller mesh with a lower trip limit (but with substantially lower losses of incidental species catch). This tendency is particularly strong for trips where revenue losses from squid would make switching to larger mesh financially unattractive. The tendency to favor strategies where smaller mesh is used also results in higher discards of silver hake, red hake, and offshore hake as trip limits are more likely to become binding. This effect is shown in **Table E.66** where projected discards more than double when compared to the PDT's best estimate. The results in **Table E.66** also indicate that when discarding is considered, the difference in the estimated reduction in combined red hake, silver hake, and offshore hake mortality is not as sensitive to the assumption about production loss with mesh changes as might have been expected.

Table E.66 Estimated Landings and Discards for Alternative Production Loss (Due to Mesh Change) Assumptions

SCENARIO	Estimated Landings (millions)	Estimated Discards (millions)	Total Mortality (millions)	Percent Reduction
PDT Mesh Assumption	67.51	2.11	69.62	-26.69
Trial 1	66.93	2.93	69.86	-26.43
Trial 2	62.06	4.05	66.11	-30.38
Trial 3	57.22	5.54	62.76	-33.91

Table E.67 Aggregate Fishery Impacts: Results of Sensitivity Analysis of Production Losses with Mesh Changes for Management Measures During Years 1-3 (From 1995 – 1997 Baseline)

	PDT		Trial 1		Trial 2		Trial 3	
Species Pounds (Lbs.) and Value	Estimated Change From VTR Data (percent)	Estimated Change in Coast Wide Landings and Revenues (percent)	Estimated Change From VTR Data (percent)	Estimated Change in Coast Wide Landings and Revenues (percent)	Estimated Change From VTR Data (percent)	Estimated Change in Coast Wide Landings and Revenues (percent)	Estimated Change From VTR Data (percent)	Estimated Change in Coast Wide Landings and Revenues (percent)
Large Mesh Species (lbs.)	-0.19	-0.09	-0.19	-0.09	-0.19	-0.09	-0.21	-0.10
Large Mesh Species (value)	-0.20	-0.08	-0.20	-0.08	-0.21	-0.08	-0.22	-0.09
Offshore Hake (lbs.)	-20.74	-20.73	-21.55	-21.54	-26.46	-26.45	-30.53	-30.51
Offshore Hake (value)	-20.61	-20.59	-21.33	-21.31	-26.24	-26.21	-30.24	-30.21
Silver Hake (lbs.)	-30.26	-29.70	-30.89	-30.32	-36.11	-35.44	-41.36	-40.59
Silver Hake (value)	-30.31	-29.85	-30.98	-30.51	-36.31	-35.76	-41.63	-40.99
Red Hake (lbs.)	-20.36	-19.95	-20.66	-20.24	-25.11	-24.60	-29.32	-28.73
Red Hake (value)	-20.52	-20.15	-20.82	-20.45	-25.39	-24.93	-29.84	-29.30
Loligo and Illex Squid (lbs.)	-1.49	-1.02	-1.87	-1.28	-1.75	-1.19	-1.72	-1.17
Loligo and Illex Squid (value)	-2.13	-1.50	-2.69	-1.89	-2.47	-1.74	-2.42	-1.71
Shrimp (lbs.)	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Shrimp (value)	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Small Mesh Species (lbs.)	-1.01	-0.30	-0.98	-0.29	-0.95	-0.28	-0.93	-0.28
Small Mesh Species (value)	-2.45	-1.04	-2.36	-1.01	-2.44	-1.04	-2.42	-1.03

Unlike the Year 1 – 3 management measures, the Year 4 default measure requires the use of 3-inch mesh unless a vessel is participating in an exempted fishery. For the purposes of analysis, it is assumed that if observed combined landings of silver hake, red hake, and offshore hake are less than 100 pounds (the non-qualifier possession limit), then the observed trip would likely meet the requirements for an exempted fishery (ten percent by weight of fish on board). Consequently, the estimated reductions for red hake, silver hake, offshore hake, other small mesh species, and squid are more sensitive to the assumed relationship between 3-inch mesh and production losses. The results of the sensitivity trials for the Year 4 default measure are reported in **Table E.68**. Aggregate reductions in landings for offshore hake increase from 44% for the PDT's best estimate to 57.7% under Trial 3. Similarly, as the assumed production losses associated with 3-inch mesh increase from 30% to 50%, silver hake reductions increase from 55.5% to 63.6%, and reductions in red hake increase from 44.2 to 56.8 percent. The largest difference between the PDT's best estimate and the investigated production losses was for squid.

Currently, there are no known selectivity data for squid. Therefore, the results reported in **Table E.68** should be regarded as speculative, although they do indicate that if squid production losses are as high as 75% with 3-inch mesh, then losses to vessels that participate in small mesh multispecies fisheries could be as high as 20.6%, and coast-wide losses could be as high as 14 percent. Note that squid landings by all vessels included in the trip limit analysis represent only 27.4% of landings when combined landings of silver hake, red hake, and offshore hake exceeded 100 pounds. This means that 72.8 percent of observed squid landings by these vessels would likely remain unaffected by the default measure.

The results of the fishery impact assessment indicate that the proposed Year 1 –3 measures should generally reduce exploitation of silver hake and offshore hake (combined) by 25 – 35% from 1995 – 1997 levels, and the default measure should reduce exploitation by 45% – 60% from current levels. For comparison purposes, results from the exploitation reduction analysis (measured from the 1993 – 1995 baseline) indicate that the Year 1 – 3 management actions should reduce silver hake/offshore hake exploitation between 33% and 49%, while the Year 4 measures should reduce exploitation by 58% – 68%. These results suggest that some portion, approximately ten percent, of the target reduction in exploitation has already occurred since the 1993 – 1995 baseline period. To the extent that the necessary reductions in whiting exploitation rates have already occurred, the coast-wide (negative) impacts of the proposed management action will be diminished.

Table E.68 Aggregate Fishery Impacts: Results of Sensitivity Analysis of Production Losses With Mesh Changes for the Year 4 Default Measure (From 1995 – 1997 Baseline)

	PDT		Trial 1		Trial 2		Trial 3	
Species Pounds (Lbs.) and Value	Estimated Change From VTR Data (percent)	Estimated Change in Coast Wide Landings and Revenues (percent)	Estimated Change From VTR Data (percent)	Estimated Change in Coast Wide Landings and Revenues (percent)	Estimated Change From VTR Data (percent)	Estimated Change in Coast Wide Landings and Revenues (percent)	Estimated Change From VTR Data (percent)	Estimated Change in Coast Wide Landings and Revenues (percent)
Large Mesh Species (lbs.)	-0.19	-0.09	-0.19	-0.09	-0.18	-0.09	-0.17	-0.08
Large Mesh Species (value)	-0.16	-0.06	-0.16	-0.06	-0.16	-0.06	-0.15	-0.06
Offshore Hake (lbs.)	-44.01	-43.99	-44.01	-43.99	-50.54	-50.51	-57.69	-57.66
Offshore Hake (value)	-43.97	-43.93	-43.97	-43.93	-50.54	-50.49	-57.72	-57.67
Silver Hake (lbs.)	-55.50	-54.47	-55.50	-54.47	-59.32	-58.22	-63.65	-62.48
Silver Hake (value)	-54.90	-54.07	-54.90	-54.07	-58.84	-57.95	-63.31	-62.35
Red Hake (lbs.)	-44.21	-43.31	-44.21	-43.31	-50.32	-49.31	-56.82	-55.67
Red Hake (value)	-45.71	-44.89	-45.71	-44.89	-51.49	-50.56	-57.61	-56.57
Loligo and Illex Squid (lbs.)	-8.41	-5.72	-12.45	-8.47	-16.55	-11.26	-20.61	-14.02
Loligo and Illex Squid (value)	-11.42	-8.05	-16.91	-11.92	-22.46	-15.83	-27.95	-19.70
Shrimp (lbs.)	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.02
Shrimp (value)	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.02
Small Mesh Species (lbs.)	-8.56	-2.55	-8.57	-2.55	-11.27	-3.36	-13.96	-4.16
Small Mesh Species (value)	-14.29	-6.10	-14.31	-6.10	-18.80	-8.02	-23.27	-9.93

E.7.2.3.2 Fishery Impacts: Northern Area

In this section, the estimated impacts of the proposed management action on current small mesh multispecies fishery levels are reported for the northern area, the area north of the GOM/GB Regulated Mesh Area. These impacts are described in terms of impacts on silver hake, offshore hake, and red hake landings and discards. The estimated impacts, including results from the mesh change sensitivity trials, are reported in **Table E.69**. These results reflect estimated reductions from 1995 – 1997 landings.

Total combined kept pounds from VTR data of all three small mesh multispecies during calendar years 1995-1997 were 16.9 million pounds for the northern area. Vessels that participated in the buyout program account for 3.6% (0.6 million pounds) of this total, and removal of their activity is counted as conservation savings. The Year 1 – 3 reductions from 1995 – 1997 levels, based on the trip limit model and the PDT's estimate of productivity changes with increased mesh sizes, are estimated to be 21% for the northern area, including both landings and discards. Estimated reductions by species are based upon reductions relative to base landings and do not include discards. The estimated Year 1 – 3 reductions from 1995 – 1997 levels for silver hake (21.9%) and red hake (20.3%) are similar, while the estimated reduction in offshore hake landings is lower (13.9%). Results of the sensitivity trials range from 21 to 25.5 percent. As previously noted, this relatively small range of results is due to the tendency for the fishing strategies maximizing net returns to change as productivity declines.

Given the assumptions about the whiting experimental grate fishery (see Section E.7.2.2.3), the default measure is estimated to result in a 59.2% reduction in total landings plus discards of combined silver hake, red hake, and offshore hake in the northern area. As previously discussed, when compared to the Year 1 – 3 measures, the results of the analysis are more sensitive to the assumed relationship between productivity and mesh size for the default measure. The sensitivity trials for the default measure range from 59.2 to 69.7 percent.

When compared to **Table E.63**, the results in **Table E.69** indicate that very little reduction in whiting exploitation has occurred in the northern area since the 1993 – 1995 baseline period. Therefore, the impacts of the proposed management action on current fishery levels are likely to resemble the impacts of the proposed management action from the 1993 – 1995 baseline. In other words, vessels in the northern area will be required to reduce their whiting exploitation rates proportionately more than vessels in other areas where more reduction has occurred since the 1993 – 1995 baseline period.

Table E.69 Fishery Impacts: Estimated Northern Area Reductions (From 1995 – 1997 Landings) for Years 1 – 3 and the Year 4 Default Measure

SPECIES	1995-1997 Base Landings	1995-1997 Buyout Landings (%)	PDT Estimate: Year 1-3 Reduction (%)	Trial 1: Year 1-3 Reduction (%)	Trial 2: Year 1-3 Reduction (%)	Trial 3: Year 1-3 Reduction (%)	PDT Estimate: Year 4 Default Reduction (%)	Trial 1: Year 4 Default Reduction (%)	Trial 2: Year 4 Default Reduction (%)	Trial 3: Year 4 Default Reduction (%)
Silver Hake	13,061,788	2.99	21.87	21.94	24.56	27.15	63.49	63.49	67.81	72.24
Red Hake	2,914,418	7.35	20.28	20.34	22.31	23.87	46.30	46.30	53.40	60.66
Offshore Hake	938,051	0.49	13.88	13.88	16.56	18.88	64.00	64.00	68.86	73.73
Total	16,914,257	3.60	21.00	21.03	23.36	25.46	59.16	59.16	64.35	69.67

E.7.2.3.3 Fishery Impacts: Cultivator Shoal Whiting Fishery

In this section, the estimated impacts of the proposed management action on current small mesh multispecies fishery levels are reported for the Cultivator Shoal Whiting Fishery Area. These impacts are described in terms of impacts on silver hake, offshore hake, and red hake landings and discards. The estimated impacts are reported in **Table E.70**. These results reflect estimated reductions from 1995 – 1997 landings.

Total combined kept pounds from VTR data of all three small mesh multispecies during calendar years 1995 – 1997 were 6.9 million pounds for the Cultivator Shoal Whiting Fishery. Vessels that participated in the buyout program account for 5.2% (0.4 million pounds) of the total Cultivator Shoal production, and removal of their activity is counted as conservation savings. In addition, the removal of observed trips to the Cultivator Shoal area during the month of October is counted as a conservation savings. The Year 1 – 3 reductions from 1995 – 1997 levels, based on the trip limit model and the PDT's estimate of productivity changes with increased mesh sizes, are estimated to be 34.8%, including landings and discards. Estimated reductions by species are based upon reductions relative to base landings and do not include discards. The Estimated Year 1 – 3 reductions are similar for silver hake (32.7%) and offshore hake (33.2%). Reductions in red hake landings are lowest at 16.9 percent. The Year 4 default measure is estimated to result in a 69% reduction from current levels in total landings plus discards of combined silver hake, red hake, and offshore hake in the Cultivator Shoal Whiting Fishery Area. No sensitivity trials were performed for the Cultivator area since 3-inch mesh was required throughout the 1995 – 1997 period.

The results in **Table E.70**, when compared to the results in **Table E.64**, indicate that at least some portion of the necessary reduction in whiting exploitation rates in the Cultivator Shoal Whiting Fishery has already occurred since the 1993 – 1995 baseline period. For the Year 1 – 3 measures, results differ by approximately five percent, suggesting that exploitation on the Cultivator Shoal decreased by five percent between 1995 and 1997. This effect is much more substantial for red hake; results indicate that a significant reduction in red hake exploitation has occurred since the 1993 – 1995 baseline. Again, it is important to emphasize that the proposed management action is projected to decrease whiting exploitation in the Cultivator Shoal Whiting Fishery by more than the target 63 percent. Since whiting on Cultivator Shoal are believed to originate from both the northern and southern stocks, additional reductions in exploitation rates, and therefore fishing mortality rates, in the Cultivator Shoal Whiting Fishery will ultimately benefit both whiting stocks.

Table E.70 Fishery Impacts: Estimated Cultivator Shoal Whiting Fishery Area Reductions (From 1995 – 1997 Landings) for Years 1 – 3 and the Year 4 Default Measure

SPECIES	1995-1997 Base Landings	1995-1997 October Landings (%)	1995-1997 Buyout Landings (%)	Estimated Year 1-3 Reduction (%)	Estimated Year 4 Default Reduction (%)
Silver Hake	6,638,357	9.13	5.27	35.19	70.49
Red Hake	111,430	0.00	9.13	16.94	34.54
Offshore Hake	142,130	15.57	0.00	33.16	71.86
Total	6,891,917	9.12	5.23	34.78	69.02

E.7.2.3.4 Fishery Impacts: Southern Area

In this section, the estimated impacts of the proposed management action on current small mesh multispecies fishery levels are reported for the southern area, the area south of the GOM/GB Regulated Mesh Area. These impacts are described in terms of impacts on silver hake, offshore hake, and red hake landings and discards. The estimated impacts, including results from the mesh change sensitivity trials, are reported in **Table E.71**. These results reflect estimated reductions from 1995 – 1997 landings.

Total combined kept pounds from VTR data of all three species during calendar years 1995 – 1997 were 72.6 million pounds for the southern area. Vessels that participated in the buyout program account for 0.2% (0.2 million pounds) of this total, and removal of their activity is counted as conservation savings. The Year 1 – 3 reductions from current levels, based on the trip limit model and the PDT's estimate of productivity changes with increased mesh sizes, are estimated to be 28.7 percent, including landings and discards. Estimated reductions by species are based upon reductions relative to base landings and do not include discards. Estimated Year

1 – 3 reductions are greatest for silver hake (32.7%) and are identical for red hake and offshore hake (23.4%). Results of the sensitivity trials range from 28.3 to 37.1 percent.

The Year 4 default measure requires the use of 3-inch mesh unless a vessel is fishing in an exempted fishery. The Year 4 default measure is estimated to result in a 46.5 percent reduction (from current levels) in total landings plus discards of combined silver hake, red hake, and offshore hake in the southern area. As previously discussed, when compared to the Year 1 – 3 measures, the results of the analysis are more sensitive to the assumed relationship between productivity and mesh size for the default measure. The results of the sensitivity trials range from 46.8 to 59.4 percent.

The projected reductions in exploitation listed in **Table E.71** differ from those reported in **Table E.65** (exploitation reduction analysis) by almost ten percent in some instances. This suggests that some portion of the necessary reduction has already occurred in the southern area since the 1993 – 1995 baseline period. To the extent that the reduction has already occurred, the projected (negative) impacts of the management plan on the fishery in the southern area should be diminished.

Table E.71 Fishery Impacts: Estimated Southern Area Reductions (From 1995 – 1997 Landings) for Years 1 – 3 and the Year 4 Default Measure

SPECIES	1995-1997 Base Landings	1995-1997 Buyout Landings (%)	PDT Estimate: Year 1-3 Reduction (%)	Trial 1: Year 1-3 Reduction (%)	Trial 2: Year 1-3 Reduction (%)	Trial 3: Year 1-3 Reduction (%)	PDT Estimate: Year 4 Default Reduction (%)	Trial 1: Year 4 Default Reduction (%)	Trial 2: Year 4 Default Reduction (%)	Trial 3: Year 4 Default Reduction (%)
Silver Hake	63,211,138	0.21	32.73	33.53	39.74	45.99	53.07	53.07	57.12	61.81
Red Hake	6,284,023	0.27	23.39	23.80	29.31	34.67	45.46	45.46	51.01	57.02
Offshore Hake	3,063,953	0.55	23.39	24.48	30.23	34.96	37.40	37.40	44.65	52.73
Total	72,559,114	0.23	28.67	28.32	32.95	37.07	46.53	46.79	53.10	59.38

E.7.2.4 Impacts on Endangered and Threatened Species and Other Marine Mammals

Amendment 12 to Northeast Multispecies FMP proposes to eliminate overfishing on silver hake (whiting) and red hake and rebuild the resource within a ten-year period. The amendment also will incorporate offshore hake into the multispecies management unit to provide basic protection for the species, to improve the information database, to expedite the recovery of silver hake stocks and allow for the development of a sustainable fishery. Silver hake, red hake, and offshore hake will be identified as "small mesh multispecies" under the proposed action. The rebuilding program to accomplish these goals relies primarily on increases in mesh sizes combined with whiting/offshore hake possession limits. Other important elements include a moratorium on commercial permits to fish for small mesh multispecies (limited access) and a default measure to take effect in Year 4 of plan implementation if fishing mortality objectives are not being met. A full discussion of the proposed action is provided in Section 4.0 of this combined document.

The operation of the whiting fishery represents potential impacts to endangered and threatened species. This determination, however, is not expected to change the basis for the conclusions in earlier consultations conducted by NMFS pursuant to Section 7 of the Endangered Species Act on the impacts of fishing activities managed under the Northeast Multispecies FMP. The proposed action may provide benefits though a stock rebuilding program that could produce an expanded forage base for several listed species.

E.7.2.4.1 Recent Protected Species Management Actions Affecting the Multispecies FMP

Silver hake and red hake have been managed under the Northeast Multispecies FMP since 1991, although Amendment 12 represents the first comprehensive approach undertaken by the Council. A description of the New England and Mid-Atlantic commercial whiting and red hake fisheries, which are currently prosecuted almost exclusively with otter trawl gear, is contained in Section E.6.5.2 of this document. As part of the multispecies management unit, the impacts of these fisheries were considered in formal consultations pursuant to Section 7 of the Endangered Species Act (ESA) for Amendment 5 in 1993 and Amendment 7 in 1996. Both Biological Opinions concluded that existing fishing activities and related management measures proposed under these amendments may affect, but were not likely to jeopardize, the continued existence of any endangered or threatened species under NMFS jurisdiction.

Following an unprecedented number of northern right whale deaths in 1996, consultation was reinitiated for the Multispecies FMP. At that time, NMFS determined that the continued operation of fishing under the FMP was likely to jeopardize the continued existence of the right whale. To remove the threat of jeopardy, the Council adopted the reasonable and prudent alternative provided by NMFS in the December 13, 1996 Biological Opinion. The action was implemented as Framework 23 to the Northeast Multispecies FMP and closed right whale critical habitat in Cape Cod Bay and the Great South Channel to sink gillnet gear during times of peak whale abundance. In addition, in July, 1997 NMFS published the interim rule for the Atlantic Large Whale Take Reduction Plan (ALWTRP), a program to reduce takes of right, humpback, fin, and minke whales in four east coast fisheries, including the multispecies sink gillnet fishery.

Accordingly, consultation was reinitiated again in 1997 to consider the ALWTRP and the operation of the sink gillnet fishery, among others. With the conclusion that the fishery may affect but would not jeopardize the continued existence of any listed species of whale or turtle under NMFS jurisdiction, the ALWTRP was substituted as an expanded reasonable and prudent alternative. It is anticipated that implementation of the ALWTRP in November, 1997, in concert with other recovery efforts by NMFS and other agencies, will remove the threat of jeopardy to the northern right whale represented by the multispecies fishery.

Although NMFS has made a final determination that listing the Gulf of Maine/Bay of Fundy population of harbor porpoise as threatened under the Endangered Species Act is not warranted at this time, concerns remain because of the high level of bycatch in the multispecies (and monkfish) sink gillnet as well as several other fisheries. Because of this concern, a number of framework adjustments to the Multispecies FMP (4, 12, 14, 16 and 19) were proposed by the Council and implemented specifically to protect harbor porpoise beginning in 1994. Building on several of the time/area closures implemented under the Northeast Multispecies FMP, NMFS published a Harbor Porpoise Take Reduction Plan (HPTRP) for the Gulf of Maine and mid-Atlantic waters in December 1998. The plan is intended to meet the Potential Biological Removal level of 483 animals established for this species by requiring the expanded use of acoustic deterrents, in addition to time and area closures. The effect of HPTRP is further enhanced by the implementation of Framework Adjustments 25 and 26 to Multispecies FMP, actions that reduce catches of Gulf of Maine cod and protect the stock during the spring spawning season. Coupled with the HPTRP, these closures of additional areas to all gear capable of catching groundfish provide more protection for harbor porpoise as well as endangered whales by reducing the risk of entanglement.

E.7.2.4.2 Endangered Species

Although a number of threatened and endangered species inhabit the Amendment 12 action area, those with the potential to interact with the directed whiting fishery include the humpback whale, and loggerhead, Kemp's ridley, leatherback, and green sea turtles. While the NMFS Sea Sampling data base shows no takes of marine mammals or sea turtles on trips landing greater than 50 percent by weight of silver hake, the potential for interactions is based on a number of factors. These include the close similarity between the fishing gear used in the whiting fishery and other bottom trawl gear, target species, seasons and areas fished, and the overlap of the fishery and the distribution of threatened and endangered species.

The bottom trawl fishery in the North Atlantic has been classified historically as a Category III fishery under the MMPA, that is one with a remote likelihood of causing incidental mortality or serious injury to marine mammals. Interactions with threatened and endangered species, however, have occurred, although findings may be affected by the extremely low observer coverage assigned to this gear sector. Whiting, red hake and offshore hake are harvested with otter trawls (bottom trawls) that may be minimally modified to harvest these small mesh species in various levels of the water column. Additionally, trawl gear used in the summer flounder and squid, mackerel, and butterfish small mesh fisheries in the mid-Atlantic, where whiting may account for a significant level of bycatch, has documented takes of a number of threatened and endangered species, particularly sea turtles. Despite the risk of potential interactions, there is no reason to conclude that the whiting fishery at this time represents a major source of human-induced serious injury or mortality for any ESA listed species.

E.7.2.4.3 Right Whales and Harbor Porpoise

These species are of particular concern, either because of their low stock status, in the case of right whales, or because of the high levels of bycatch in commercial fishing gear. No takes of either species have been documented in small mesh otter trawls, the principle gear type employed in the whiting and red hake fisheries. As with other species discussed above, the potential for interaction with this gear exists, given the overlap of right whale and porpoise distribution with the prosecution of the fishery, but appears unlikely to occur based on the historic low level of documented takes. Both species are currently managed under established Take Reduction Plans.

E.7.2.4.4 Other Marine Mammals

As required by Section 118 of the MMPA, NMFS issues an annual List of Fisheries (LOF), which classifies U.S. fisheries according to the rate of serious injury and mortality of marine mammal stocks taken incidentally in each fishery. Rates are quantified relative to a Potential Biological Removal level (PBR) assigned to each stock. (PBR is the number of animals that can be removed from a stock annually by human activities without preventing the stock from reaching or maintaining its optimum sustainable population size.)

Fisheries are placed in one of three categories, with Category I representing the highest level of take (50 percent or more of PBR). Consistent with their evaluation in previous years, NMFS lists the North Atlantic bottom trawl as a Category III fishery in 1998 as well as the mid-Atlantic mixed species trawl fishery. While long and short-finned pilot whales, white sided dolphin, striped dolphin, and the coastal and offshore stocks of bottlenose dolphins are listed as marine mammal species that have been either incidentally injured or killed in the bottom trawl fishery, the mixed species trawl fishery lists no documented takes. In contrast, the Atlantic squid, mackerel, and butterfish trawl fishery, which may target whiting as a bycatch, is classified as Category II in the LOF. Marine mammals taken in the fishery include common, Risso’s, and white-sided dolphin, and both long and short-finned pilot whales. While there is a close association between the whiting and squid fisheries, as illustrated in Section E.6.5.3.2 of this document, the impacts to threatened and endangered species and other marine mammals will be addressed by NMFS through consultations conducted for the Mid-Atlantic Fishery Management Council’s Squid, Mackerel, and Butterfish FMP. To date, the fisheries discussed above are not part of Take Reduction Team planning efforts.

E.7.2.4.5 Critical Habitat

Actions affecting right whale critical habitat under the Northeast Multispecies Plan are described above. The proposed action should not affect the area or right whale utilization of the area.

E.7.2.4.6 Effects of the Proposed Action

Given that the Council’s primary management objective for Amendment 12 is to reduce fishing mortality (F) on silver hake and red hake over three years to levels that will rebuild and sustain stocks capable of producing MSY on a continuing basis, the management program may also benefit a number of marine mammals that utilize silver hake as a prey species. Harbor porpoise commonly feed on silver hake in the Gulf of Maine during autumn (Gannon *et. al*., 1998), and there is evidence that whiting is also a major prey item for white- sided dolphins (Smith and Gaskin, 1974; Katona *et. al.*, 1978; Sergeant *et. al*., 1980) and harbor seals (Selzer *et. al.*, 1986). Overholtz *et. al* (1991) report that pilot whales and common dolphins feed on the southern stock of silver hake.

E.7.2.4.6.1 Management Measures

The delineation of stock boundaries may be used for management purposes at some future date. Impacts of the measure will be evaluated at the time it is proposed, if at all, along with the current conditions in the fishery and the status of protected resources.

The moratorium on commercial permits is likely to have a negligible effect on threatened and endangered species and other marine mammals relative to the whiting fishery, not only because the low level of takes by otter trawl gear, but because of the confines of the qualification criteria. Despite liberal criteria which accommodate both historical and recent participants, participants in the whiting experimental fisheries, and those who have obtained a multispecies permit since the publication of a control date, the limiting factor is the possession of a valid multispecies permit. This caveat will ensure that effort does not expand beyond that which currently exists under the Multispecies FMP. Additionally, only about 400 vessels qualify for the directed fishery. Otherwise, boats are confined to 2,500 pounds – an amount that is unlikely to encourage effort shifts given that whiting is a high volume and low value product. This scenario could change if the landings requirements for limited access small mesh multispecies permits is eliminated under a sunset provision.

The incidental catch allowance for the open access multispecies permit category is proposed as 100 pounds combined of small mesh multispecies (whiting, red hake, offshore hake) and unlimited amounts of ocean pout. Because whiting and red hake are often caught incidentally in mixed trawl fisheries throughout New England and the mid-Atlantic, creation of this category may provide an incentive to record landings and improve the overall quality of the of the fisheries landings database on which scientific evaluations are based in the Northeast.

In view of the carefully monitored Cultivator Shoal whiting fishery, which has no documented interactions with ESA-listed species or other marine mammals, the management measures proposed for that area should have negligible impacts on protected resources.

The mesh size restrictions and possession limits proposed by the Council are intended to provide an incentive for vessels to use larger mesh to fish for small mesh multispecies while accounting for the different impacts of mesh size increases on different sized vessels and considering the individual characteristics of different small mesh fisheries. During the first three years of this plan, fishermen may change their fishing strategies by using larger mesh specifically to target whiting, finding times and areas where whiting is more separated from other small mesh species, and working to develop more selective gear that decreases the incidental catch of whiting and red hake.

In the event that this approach does not produce the expected results, the default measure for this plan requires a minimum 3-inch mesh for all fishing activities, including fishing for loligo squid and other species generally caught with small mesh. This mesh size change may significantly impact the catch of not only small mesh multispecies, but also many other commercially important species caught with small mesh. Effort shifts could result from the imposition of the possession limits and the default measure, but depend largely on market conditions, restrictions in other fisheries, and possibly other factors that affect vessel owners. However, that cannot be predicted with any degree of certainty. As yet unregulated fisheries could absorb some effort, but, at least in the case of spiny dogfish and monkfish, fishery management plans have either been completed and are not yet implemented, or are in development. Both cap and severely restrict fishing effort.

The transfer of a small quantity of small mesh multispecies, up to 500 pounds, is unlikely to affect listed species or other marine mammals in any foreseeable manner. This is also true of the codend specification and the net strengthener provisions, which address multispecies conservation and enforcement issues. Any management changes proposed via a framework adjustment would be evaluated at the time of submission to NMFS relative to impacts on ESA-listed species and other marine mammals. Likewise, plan monitoring has no inherent relationship to impacts on these species, although rebuilding the whiting and red hake stocks to sustainable levels provides provide benefits from a forage base perspective.

E.7.2.4.6.2 Impacts of the Status Quo (No Action) and Other Alternatives

Under the No Action alternative, fishing for whiting and red hake would remain virtually unregulated, with the exception of the existing management measures which are inadequate to address the current overfished condition of these stocks. Impacts could occur at an ecosystem level or as the result of effort shifts into fisheries with a higher incidence of endangered species and marine mammal takes than occurs in the small mesh otter trawl fishery.

The impacts of the alternatives described in Section E.5.2.2 of this document are similar to the impacts resulting from the proposed management action. This outcome is chiefly a consequence of the infrequent interactions between the otter trawl fishery and threatened and endangered species and other marine mammals. As discussed earlier, although potential impacts exist and species may be affected by the various scenarios presented in the alternatives, risk to listed and other marine mammals appears to be low, based on past interactions in this fishery.

E.7.2.4.7 Conclusion

As a result of the management measures proposed in Amendment 12, whiting and red hake fishing mortality is expected to decrease, and fishing practices may be significantly altered, at least by Year 4 of plan implementation. Because of the low level of interactions with otter trawl vessels participating in the whiting fishery, and given the measures in place to protect right whales and harbor porpoise, the proposed action may affect, but is not likely to jeopardize the continued existence of endangered and threatened species. The Council recognizes that this conclusion does not change the basis for the previous determination that overall operation of fisheries under the Northeast Multispecies FMP, without modification, is likely to jeopardize the continued existence of endangered species under NMFS jurisdiction or result in adverse modification of critical habitat. Should activities associated with the Multispecies FMP change significantly or new information become available that changes this determination, the Council will reinitiate consultation.

E.7.2.5 Impacts on Stellwagen Bank Marine Sanctuary

The designation of Stellwagen Bank as a National Marine Sanctuary does not restrict commercial fishing in the area and is intended to protect and enhance sanctuary resources. To the extent that the proposed action is expected to end overfishing and rebuild fish stocks, the impacts are expected to be positive and consistent with the sanctuary objectives.

E.7.2.6 Impacts on Other Stocks

Section E.6.4.3 identifies other commercial fish stocks in the Northeast and the Mid-Atlantic that tend to interact, either directly or indirectly, with whiting and red hake. The proposed management action is likely to impact stocks that directly interact with small mesh multispecies fisheries.

During Years 1 – 3, vessels will have the opportunity to choose a mesh size/possession limit category in which to fish for small mesh multispecies. Vessels participating in other fisheries can maintain their current practices in those fisheries without being forced to discard whiting and red hake. The intent of the mesh size/possession limit categories is to provide an incentive to use larger mesh by allowing vessels to retain more whiting when they do so. It is likely that most vessels targeting herring and loligo squid will choose the smallest mesh size/possession limit category and continue to fish with traditional mesh in those fisheries (less than 2.5-inches) because those fisheries are usually more profitable. However, during some times of the year, these vessels may want to choose the larger mesh/size possession limit categories in order to land more whiting. Vessels participating in the southern New England mixed trawl fishery are expected to change mesh size possession limit categories according to whiting market conditions and resource availability. To the extent that vessels increase the mesh size they use (on average) to target a "mixed bag" of species, the regulations may have a positive effect on those stocks. Increased mesh allows for escapement of smaller-sized fish, which may contribute to increased spawning stock biomass.

The results reported in **Table E.67** indicate that the management measures proposed for Years 1 – 3 should not have a significant effect on the landings and value of other species. The projected reduction in squid landings (loligo and illex) ranges from one to 1.8 percent, and the reduction in revenues from squid range from 1.5% to 2.7% on a coast-wide basis. Landings of other "small mesh species" are expected to decrease less than one percent, and revenues are expected to decrease less than 2.5 percent. Projected losses in landings and value in the shrimp fishery are inconsequential.

If implemented, the Year 4 default measure could have more significant impacts on small mesh fisheries like the squid, herring, and mixed trawl fisheries. Vessels will be required to participate in exempted fisheries with less-than-ten-percent incidental catch of small mesh multispecies if they want to use mesh smaller than 3-inches. It is likely that the default measure would impact the level of activity in these fisheries. To the extent that this occurs, the default measure could contribute to the rebuilding of other stocks, some of which are also overfished. However, the economic impacts on the vessels participating in these fisheries will be negative.

The results reported in **Table E.68** indicate that compared to 1995 – 1997 levels, the default measure may result in a decrease in squid landings on the order of 5 – 14 percent. The revenues generated from squid are projected to decline between 8 and 20 percent. Coast-wide landings of other small mesh species are expected to decline 2 – 4 percent, and the revenues from other small mesh species could decrease as much as ten percent. If the default measure is implemented, it is likely that other fisheries, particularly small mesh fisheries, will experience positive biological effects from the management action. Economic effects are projected to be negative in the short term but may improve as whiting stocks, as well as other stocks, recover.

E.7.3 ECONOMIC IMPACTS OF THE PROPOSED MANAGEMENT ACTION

In this section, the impacts of the proposed action on the economics of small mesh multispecies fisheries, participating vessels, and other commercial fisheries are discussed. In general, the economic impact analysis contains two portions: a bioeconomic analysis (Section E.7.3.1) and an analysis of the impacts of the proposed management action on small commercial fishing entities, also part of the Regulatory Flexibility Analysis (Section E.7.3.2). These portions, as well as discussion of other economic impacts, are presented in the subsections below.

E.7.3.1 Bioeconomic Analysis of Proposed Management Action

This analysis evaluates the expected long-term (biological and economic) outcomes of the proposed management action as compared to the status quo in terms of changes in mesh selectivity and reductions in fishing mortality rates consistent with the required reductions in exploitation rates to meet target levels. The results of this bioeconomic projection model represent the conceptual, strategic framework by which the more detailed management tools (possession limits and minimum mesh size increases, for example) will achieve the exploitation rate reductions necessary to meet the current overfishing definition targets. In other words, the results of this analysis predict long-term biological and economic impacts that are likely to occur as target fishing mortality rates are realized, independent of which management actions are implemented to achieve that objective. They characterize the possible biological (stock rebuilding) and economic outcomes from the proposed management actions over a ten-year time period. Results from the biological component of this analysis are presented in Sections E.7.2.1.2 and E.7.2.1.3. In addition, the management actions proposed in this amendment are analyzed to assess the likelihood that they will achieve target fishing mortality rates in Section E.7.2.2.

The management scenario evaluated in this bioeconomic analysis is slightly different than that which the Council is implementing in this amendment. This analysis assumes that the minimum mesh size to retain small mesh multispecies increases to 3-inches in all areas and that declines in fishing mortality to target levels are phased-in over a three-year time period. While this plan does intend to decrease fishing mortality rates to target levels within a three-year time period, the declines are not actually phased-in. Instead, a suite of management measures will be implemented in Year 1, and the Whiting Monitoring Committee will annually assess the success of these measures in decreasing fishing mortality rates to target levels. The Monitoring Committee may recommend annual adjustments, if necessary, to ensure that targets Fs can be achieved within the intended time frame.

This plan provides an incentive to use 3-inch mesh during the first three years, but does not require minimum 3-inch mesh until the default measure is implemented at the beginning of Year 4 (see Section 4.15). Prior to Year 4, a portion of vessels will increase their mesh size to 3-

inches, but the selectivity pattern associated with 3-inch mesh will not be realized unless the default measure is implemented in Year 4. Therefore, the results of this analysis incorporate the biological impacts of the default measure and the selection pattern corresponding to 3-inch mesh. Since this management plan is intended to achieve the same objectives as those assumed in the bioeconomic analysis within a similar time frame, the long-term predicted impacts of such action will be the same. If the objectives of the plan are achieved during Year 3 and the default measure becomes unnecessary, then it can be assumed that the long-term positive economic impacts of this plan (described in the following sections) will be similar to, if not greater than, those impacts predicted in this analysis.

E.7.3.1.1 Methodology

A description of the methodology for the bioeconomic analysis can be found in Section E.7.2.1.1.

Measures of economic performance are based on price models, fishery cost relationships, productivity changes, and fleet characteristics as described in Helser et. al., 1996 and Thunberg et. al., 1998 (see **Appendix IV**, *Bioeconomic Analysis of Alternative Selection Patterns in the United States Atlantic Silver Hake Fishery,* for more detail). As such, the modeling procedures for this analysis maintain the same assumptions used in these previous studies and are also subject to the same caveats discussed therein.

Economic performance outcomes from the bioeconomic model are reported as percent differences (from the base year) in median nominal revenues by market category and area. Median discounted returns net of operating costs are reported in a similar manner, and the probability that net present value will be positive after 10 years is presented. Last, the present value of returns net of the status quo is presented. This section constitutes the Benefit Cost Analysis for the proposed management action.

E.7.3.1.2 Bioeconomic Results: Benefit-Cost Analysis

E.7.3.1.2.1 Benefit-Cost Analysis Results: Status Quo

Percent differences from the base year in median nominal gross revenues by market category are presented in **Figure E.49** and **Figure E.50** for the northern and southern areas respectively. In each case, the general trajectories of projected median gross revenues match those of the landings trajectories reported in **Figure E.45** and **Figure E.46**. Under the status quo, revenues for all market categories are projected to decrease with landings to levels less than five percent of the base year. This is especially true for juvenile and round market categories in both the northern and southern areas. Since recruitment provides the only source of variation in the bioeconomic simulation model, the CVs for the revenue trajectories follow the same general patterns as those shown in **Figure E.47** and **Figure E.48** and are not reported for gross revenues.

The percent difference in median discounted returns net of operating costs is shown in **Figure E.51**. Operating costs consist of costs such as fuel, ice, food, and other trip related expenses. They do not include the crew or captain's share and fixed costs items like insurance or loan payments. Crew share is excluded since it is based on revenue from all species on a trip, not just silver hake. Fixed costs are excluded because the vessel could be used in any one of several alternative fisheries, and no means was available to apportion these costs to silver hake. Thus, net returns reported in this analysis constitute a partial budget, representing returns to labor, fixed costs, and returns to the vessel owner from the sale of silver hake. Negative net returns indicate that insufficient revenues are earned from the sale of silver hake alone to cover all trip costs. This does not necessarily mean that fishery profits are negative since any number of other species may be caught and sold in conjunction with silver hake. By contrast, positive returns indicate that earnings from silver hake are sufficient to cover operating costs while also making a contribution to labor and fixed costs, but they do not necessarily mean that the fishery is profitable. All net returns are discounted at a rate of seven percent.

Under the status quo, discounted fishery net returns in the northern area initially drop well below the base, but increase steadily throughout the simulation period. By Year 6, the present value of the status quo is equal to the status quo base year and exceeds that of the base year in all subsequent years. This result seems counter intuitive when it is compared to the landings and revenue trajectories which indicate continued declines in landings and revenues throughout the simulation period. However, the reduced landings and revenues under the status quo are matched by cost savings associated with reductions in fishing effort (measured in days fished; see Thunberg et. al., 1998). In this manner, net returns can, and do, increase while gross revenues are decreasing. Further, discounting means that nominal values in the future are worth less in present value terms and are discounted at an increasing rate the further into the future they accrue. For example, the discounted Year 6 net returns under the status quo are equal to the status quo base year net returns. In nominal terms, the Year 6 net returns are, in fact, less than the base year. In effect, the base year net returns are being compared to future values that are discounted at an increasing rate, resulting in the pattern illustrated in **Figure E.51** for the status quo in the northern area.

Summing discounted net returns across all years of the simulation results in an estimate of the net present value of the management alternative. **Figure E.52** illustrates the probability distribution for 500 realizations of the projected present value of net returns for the proposed management action. The status quo probability distribution is not shown in **Figure E.52** because none of the status quo realizations result in a positive net present value.

E.7.3.1.2.2 Benefit-Cost Analysis Results: Proposed Management Action

Percent differences from the base year in median nominal gross revenues by market category are shown in **Figure E.49** and **Figure E.50** for the northern and southern areas respectively. In each case, the general trajectories of projected median gross revenues match those of the landings trajectories reported in **Figure E.45** and **Figure E.46**. In the northern area, revenues from both the juvenile and round market categories are projected to fall below base year levels, similar to the status quo. The difference is that, under the proposed management action, projected revenues stabilize by Year 4 at levels approximately 65% below the base year (in contrast to the status quo, where revenues are predicted to drop to 95% below the base year). Results from the southern area indicate, however, that relative to the base year, projected revenues significantly increase after declines during the few years of the simulation horizon. Projected revenues (southern area) for the king market category exceed that of the base in every year, but, like revenues from the round market category, do not increase at the same rate as landings increase for the following reason:

There were insufficient data to estimate a reliable price model for the juvenile market category, so juvenile prices were assumed to remain constant. Because of this, changes in juvenile revenue are directly proportional to changes in juvenile landings, but this is not so for round or king revenues. Prices are assumed to be affected by aggregate supplies, not just supplies from one area. While landings in the northern area are projected to decline relative to the base year, landings of whiting in the round market category are projected to increase in the southern area, resulting in a net increase in aggregate market supplies and a concomitant overall reduction in prices. Thus, relative to the base year, revenues for the round market category in the northern area are projected to decline proportionally more than landings.

Revenues from the king market category follow the same pattern but do not increase in the same proportion to the landings trajectory illustrated in the lower panel of **Figure E.45**. This is due to the fact that aggregate market supplies are increasing, causing prices to decline proportionally more than landings. Thus, while king landings are projected to increase by nearly 6000% in the northern area, gross revenues are projected to increase by only 1400% in the out years of the simulation period.

Since recruitment provides the only source of variation in the bioeconomic simulation model, the CVs for the revenue trajectories follow the same general patterns as those shown in **Figure E.47** and **Figure E.48** and are not reported for gross revenues.

The percent difference in median discounted returns net of operating costs is shown in **Figure E.51**. Operating costs consist of costs such as fuel, ice, food, and other trip related expenses. They do not include the crew or captain's share and fixed costs items like insurance or loan payments. Crew share is excluded because it is based on revenue from all species on a trip, not just silver hake. Fixed costs are excluded since the vessel could be used in any one of several alternative fisheries, and no means was available to apportion these costs to silver hake. Thus, net returns reported in this analysis constitute a partial budget, representing returns to labor, fixed costs, and returns to the vessel owner from the sale of silver hake. Negative net returns indicate that insufficient revenues are earned from the sale of silver hake alone to cover all trip costs. This does not necessarily mean that fishery profits are negative since any number of other species may be caught and sold in conjunction with silver hake. By contrast, positive returns indicate that earnings from silver hake are sufficient to cover operating costs while also making a contribution to labor and fixed costs, but they do not necessarily mean that the fishery is profitable. All net returns are discounted at a rate of seven percent.

In the northern area, the proposed management action results in a consistent upward trend to Year 4, when discounted net returns stabilize at approximately 60% higher than the base year **(Figure E.51)**. The stable trajectory for discounted net returns (in Year 4 and beyond) indicates that, in nominal terms, returns for the northern area are increasing at approximately the same rate as the discount rate (7%). In the southern area, on the other hand, discounted net returns under the proposed action are projected to increase throughout the simulation period relative to the base year. This means that net returns in the southern area increase at a much faster rate than the discount rate.

Summing discounted net returns across all years of the simulation results in an estimate of the net present value of the management alternative. **Figure E.52** illustrates the probability distribution for 500 realizations of the projected present value of net returns for the proposed management action. The status quo probability distribution is not shown because none of the status quo realizations result in a positive net present value. In short, the proposed management action is projected to result in a less-than 1% chance of net returns less than zero, and a 99% chance of net returns greater than or equal to zero.

The economic performance of the proposed action relative to the status quo is illustrated in **Figure E.53**. Relative to the status quo, the proposed management action yields lower net returns in Year 1, but returns under the management action are projected to exceed that of the status quo quickly (by approximately 50% by Year 2). The proposed management action continues to yield a higher present value of net returns than the status quo for all remaining years of the simulation horizon. At the simulation medians (50^{th} percentile), the present value of the proposed management action exceeds that of the status quo by approximately $137 million. Note that these values are net of operating costs and thus reflect increased incomes available to the crew and the captain as well as increased revenues available to cover vessel fixed costs and owner profits. Within the context of the bioeconomic simulation, given the fact that the probability distributions for the status quo and proposed management action do not overlap, there is a zero probability that maintaining the status quo can yield higher net returns after ten years than implementing a management program similar to the one proposed in this amendment.

Figure E.49 Percent Change in Fishery Revenues by Market Category Over a Ten-Year Simulation Horizon for the Northern Stock of Silver Hake From: the Status Quo and the Proposed Management Action

Figure E.50 Percent Change in Fishery Revenues by Market Category Over a Ten-Year Simulation Horizon for the Southern Stock of Silver Hake From: the Status Quo and the Proposed Management Action

Figure E.51 Percent Change in Returns Net of Operating Costs by Area Over a Ten-Year Simulation Horizon for the Northern and Southern Silver Hake Stocks From: the Status Quo and the Proposed Management Action

Figure E.52 Probability Distribution of the Present Value of Revenues Net of Operating Costs Over a Ten-Year Simulation Horizon for the Proposed Management Action

The status quo is not included because none of the realizations result in a positive value.

Figure E.53 Percent Change in Combined Northern and Southern Area Discounted Returns Net of the Status Quo for the Proposed Management Action

E.7.3.2 Impacts on Small Businesses

The trip limit model described in Section E.7.2.2.1 forms the basis from which the economic impacts on vessels that participated in small mesh multispecies fisheries from 1995 – 1997 are assessed. For the purposes of analysis, a small entity engaged in the commercial fishing sector is defined in accordance with the Small Business Administration's (SBA) definition of a "small fishing entity:" that with an average annual gross sales of $3 million or less. There are a total of 1,156 vessels (hereafter referred to as "participating vessels") that reported landing one or more combined pounds of small mesh multispecies during calendar years 1995 to 1997. Every one of these vessels meets the SBA definition of a small entity, and every vessel would be required to comply with one or more measures implemented under the proposed management action. The following provides descriptive statistics for the 1,156 participating vessels that may be affected by the proposed measures and provides an estimate of the magnitude of impacts on these small entities.

E.7.3.2.1 Description of Small Commercial Fishing Entities

The degree of dependence on small mesh multispecies among participating vessels from 1995 – 1997 is reported in **Table E.72**. For a majority of vessels (85.2%), revenues earned from small mesh multispecies were ten percent or less of cumulative gross sales from 1995 to 1997. Of the remaining vessels, 134 relied on small mesh multispecies for between 11% and 50% of their cumulative gross sales. Gross sales of small mesh multispecies were in excess of 50% of cumulative sales for only 37 participating vessels (3.2%) between 1995 and 1997.

Table E.72 Small Mesh Multispecies as a Percentage of Participating Vessels' Total Gross Sales (1995 – 1997 Logbook Data)

SMALL MESH MULTISPECIES DEPENDENCY	NUMBER OF VESSELS	PERCENT OF TOTAL
0 to 10 Percent	985	85.2
11 to 20 Percent	68	5.9
21 to 30 Percent	36	3.1
31 to 40 Percent	20	1.7
41 to 50 Percent	10	0.9
51 to 60 Percent	16	1.4
61 to 70 Percent	6	0.5
71 to 80 Percent	6	0.5
More than 80 Percent	9	0.8

The number of participating vessels by length category is reported in **Table E.73**. The length categories are consistent with the vessel length categories selected by the Council for reporting estimated impacts of the alternatives proposed for public hearings. These categories were selected based upon consensus agreement of the Whiting Committee and the Whiting Advisory Panel and are believed to characterize important distinctions among vessels participating in small mesh multispecies fisheries. The majority of participating vessels (592) are less than 50 feet in overall vessel length. Of the remaining vessels, 310 are 50 – 70 feet in overall length, and 254 participating vessels are greater than 70 feet.

Table E.73 Number of Participating Vessels by Overall Length

VESSEL LENGTH CATEGORY	NUMBER OF VESSELS	PERCENT OF TOTAL
Less than 50 Feet	592	51.2
50 to 70 Feet	310	26.8
More than 70 Feet	254	22

The number of participating vessels by home state is reported in **Table E.74**. Home state is defined as the state where the vessel may be berthed when not in use. This designation is self-reported by vessel owners when they apply for a northeast federal fishery permit. The majority of owners (507) report a Massachusetts port as their vessel's home port. By contrast, the state with the fewest participating vessels is Delaware (6). The "Other" category consists of vessels from Pennsylvania, West Virginia, Florida, and Vermont. In most of these instances, the reported state may be owner's home state rather than a coastal state that contains an active commercial port.

Table E.74 Number of Participating Vessels by Home State

HOME STATE	NUMBER OF VESSELS	PERCENT OF TOTAL
Connecticut	11	1.0
Delaware	6	0.5
Massachusetts	507	43.9
Maryland	9	0.8
Maine	128	11.1
North Carolina	27	2.3
New Hampshire	52	4.5
New Jersey	91	7.9
New York	183	15.8
Rhode Island	86	7.4
Virginia	15	1.3
Other	41	3.5

The number of participating vessels by state of principal port is reported in **Table E.75**. Principal port state is defined as the state where the vessel owner expects to land the vessel most often. Like the home state **(Table E.74)**, the designation is self-reported by vessel owners when they apply for a northeast federal fishery permit. The majority of vessel owners (401) report a Massachusetts port as their vessel's principal port. Note that the number of Maine principal port vessels is nearly double when compared to the numbers reported for home port. Maine vessel owners tend to list Maine ports as both home and principal ports. The increase in the number of vessels with a principal port in Maine is primarily the result of vessels that are home-ported in Massachusetts but land most of their product in Maine ports.

Table E.75 Number of Participating Vessels by Principal Port State

PRINCIPAL PORT STATE	NUMBER OF VESSELS	PERCENT OF TOTAL
Connecticut	24	2.1
Delaware	2	0.2
Massachusetts	401	34.7
Maryland	13	1.1
Maine	204	17.6
North Carolina	28	2.4
New Hampshire	64	5.5
New Jersey	131	11.3
New York	148	12.8
Rhode Island	127	11.0
Virginia	10	0.9
Other	4	0.3

The number of participating vessels by moratorium qualification category is reported in **Table E.76**. Of the participating vessels, 365 (31.6%) qualify for a limited access small mesh multispecies permit based upon the necessary history and permit conditions. The majority of participating vessels (675) qualify for a limited access small mesh multispecies possession limit permit, while the remaining vessels (116) currently do not qualify for a limited access small mesh multispecies permit of any kind. Of the 116 potential non-qualifiers, 24 had sufficient documented history to qualify for a limited access small mesh multispecies permit (i.e. more than 50,000 pounds of landings), but they were lacking one of the multispecies permits required for qualification. However, 112 of the 116 potential non-qualifiers could still qualify if they were to obtain either an open access or limited access multispecies permit prior to the implementation date (October 1999). Only four non-qualifying vessels have a current permit but do not have a documented multispecies permit on or before the 9/9/96 control date. Any one of these four vessels could qualify if it was to present evidence that it did indeed have such a permit. By definition, the participating vessels had demonstrated history in small mesh multispecies fisheries for at least the 1995 – 1997 calendar years.

Table E.76 Number of Participating Vessels by Small Mesh Multispecies Permit Qualification Category

QUALIFICATION STATUS	NUMBER OF VESSELS	PERCENT OF TOTAL
Limited Access Small Mesh Multispecies Permit	365	31.6
Limited Access Small Mesh Multispecies Possession Limit Permit	675	58.4
Non-Qualifiers:	116	10.0
No Current Permit	112	96.6
No Control Date Permit	4	3.4

E.7.3.2.2 Impacts on Small Commercial Fishing Entities

The economic effects of the proposed management action on small commercial fishing entities are estimated by examining short run and long run break-even. Short run break-even is defined as the difference between gross revenues and operating costs. Long run break-even is defined as the difference between gross revenues and the sum of operating costs, crew and captain share, and fixed costs. The short and long run effects of vessel break-even are based upon a comparison between estimated costs and revenues during the 1995 – 1997 calendar years and the predicted costs and revenues due to the combined management measures for Years 1 – 3 and for the Year 4 default measure. These predicted changes in costs and revenues are predicated upon the data that are used as well as the assumed productivity losses and behavioral responses to the combined management measures embedded in the trip limit model described earlier (Section E.7.2.2.1). Note that all reported data are presented as cumulative three-year totals. These data could be converted to an annual average by dividing by three.

E.7.3.2.2.1 Short Run Break-Even Effects on Small Commercial Fishing Entities

The estimated changes in short run break-even for the status quo, Years 1 – 3, and the Year 4 default measure are reported in **Table E.77**. Average, median, 25th, and 75th percentiles of the estimated impacts on gross revenues, operating costs, and returns above operating costs are reported. Note that mean (average) values are consistently above median values, indicating that the data are skewed toward higher values of gross revenues and operating costs. In these instances, the median is a better indicator of central tendency. For the Year 1 – 3 measures, there are a total of 860 vessels (74.4%) (column 1) for which gross revenues and operating costs are projected to remain unchanged from the 1995 – 1997 baseline (status quo). These vessels are unaffected by the Year 1 – 3 measures because their landings of small mesh multispecies for all trips taken from 1995 – 1997 were below the proposed possession limits. Median returns above operating costs for these unaffected vessels are estimated at $69 thousand.

There are a total of 270 vessels (23.4%) for which short run net returns under the status quo (column 2) exceed the predicted net returns under the Year 1 – 3 management measures (column 3). Median net returns for these vessels are estimated to fall 4.9% from $378 to $360 thousand. Median gross revenues fall 6.7% from $585 to $546 thousand, while operating costs fall 1.2% from $190 to $188 thousand. Thus, the reduced gross revenues are partially offset by reductions in operating costs. Operating costs decrease due to predicted reductions in trip duration and due to trips that are assumed to no longer occur once the management measures are implemented.

There are a total of 26 vessels (2.3%) (columns 4 and 5 of **Table E.77**) for which short run net returns are predicted to increase under the proposed Year 1 – 3 management measures. For these vessels, the proportional reduction in median operating costs exceeds the proportional reduction in gross revenues, resulting in a net improvement in short run break-even.

Under the Year 4 default measure, there are a total of 492 vessels (42.6%) (column 6) for which gross revenues and operating costs are projected to remain unchanged relative to the status quo. These vessels are unaffected by the Year 4 default measure because none of their activity from 1995 – 1997 exceeded the default possession limits. Median returns above operating costs for these unaffected vessels are estimated at $44 thousand.

The number of vessels predicted to experience a decline in returns above operating costs increases from 270 to 538 with the implementation of the Year 4 default measure (columns 7 and 8 of **Table E.77**). Median returns above operating costs are predicted to decline 9.2% from $247 to $224 thousand for these vessels. By contrast, 126 vessels (10.9%) are predicted to experience increased returns above operating costs under the Year 4 default measure. As is the case for the Year 1 – 3 measures, operating costs for these vessels fall proportionally more than gross revenues, resulting in a net improvement in short run break-even.

Table E.77 Short Run Break-Even: Mean, 25th Percentile, Median, and 75th Percentile of Estimated Gross Revenues, Operating Costs, and Net Returns for Years 1 – 3 and the Year 4 Default Measure

	Status Quo Compared to Year 1 – 3 Measures					Status Quo Compared to Year 4 Default Measure				
	No Change	Reduced Break-Even		Increased Break-Even		No Change	Reduced Break-Even		Increased Break-Even	
		Status Quo	Years 1-3	Status Quo	Years 1-3		Status Quo	Year 4	Status Quo	Year 4
Number of Vessels	**860**	**270**	**270**	**26**	**26**	**492**	**538**	**538**	**126**	**126**
Gross Revenues ($)										
Mean	298,402	747,159	695,435	159,010	157,996	231,772	608,289	549,350	168,266	166,093
25th Percentile	46,053	271,874	252,645	3,868	3,519	21,008	203,210	187,483	28,217	27,862
Median	170,592	584,900	545,973	70,052	69,834	118,243	442,976	422,175	106,295	103,806
75th Percentile	381,450	1,041,221	972,628	189,032	188,484	296,099	835,567	763,788	209,817	208,360
Operating Costs ($)										
Mean	114,952	219,819	214,228	86,534	84,137	86,719	192,130	189,126	114,510	109,954
25th Percentile	33,594	121,230	118,328	17,070	12,338	21,961	98,319	95,527	29,568	23,422
Median	84,080	189,844	187,606	63,244	62,336	60,847	168,161	165,667	76,385	72,118
75th Percentile	166,135	286,675	281,681	132,708	120,450	121,052	248,214	245,491	145,862	145,297
Return above Operating Costs ($)										
Mean	183,450	527,341	476,809	72,471	73,859	145,053	416,159	360,224	53,756	56,139
25th Percentile	3,441	134,294	114,041	-9,468	-8,072	-1,435	73,955	68,662	-5,036	-2,379
Median	68,562	378,189	359,554	1,305	2,393	43,668	246,855	224,082	9,356	13,127
75th Percentile	236,981	771,848	689,802	62,626	62,864	187,158	591,229	514,147	72,074	74,838

The results reported in **Table E.77** show that returns above operating costs may remain unchanged, decline, or increase upon implementation of the proposed management measures. The number of vessels that fall into each of these categories is presented in **Table E.78** and **Table E.79** by reported home port state and principal port state. Whether by home or principal port, the states of Maine, Massachusetts, Rhode Island, New York, and New Jersey comprise the majority of vessels that participated in small mesh multispecies fisheries during calendar years 1995 – 1997. Among these states, Rhode Island contains the highest proportion of participating home port vessels that are predicted to experience a reduction in returns above operating costs for Years 1 – 3 (52% of Rhode Island's participating vessels). New York has the second highest proportion of negatively impacted vessels (38%), followed by New Jersey (24%), Maine (20%), and Massachusetts (16%). Similarly, Rhode Island has the highest proportion of negatively affected home port vessels under the Year 4 default measure, with an estimated 71% of all participating home port vessels in Rhode Island experiencing a reduction in returns above operating costs. New York has the second highest proportion of negatively affected vessels under the default measure (54%), followed by New Jersey (51%), Maine (40%), and Massachusetts (39%). Although the estimated proportions of negatively affected vessels differ, the state rankings are the same for principal port state as those for home port state.

Table E.78 Summary of Impacts on Short Run Break-Even by Home Port State (Number of Vessels)

	YEARS 1 – 3			YEAR 4 DEFAULT		
HOME PORT STATE	**No Change**	**Reduction**	**Increase**	**No Change**	**Reduction**	**Increase**
Connecticut	8	3	0	3	7	1
Delaware	2	4	0	0	5	1
Massachusetts	416	83	8	260	199	48
Maryland	9	0	0	5	4	0
Maine	95	25	8	45	52	31
North Carolina	23	2	2	10	13	4
New Hampshire	42	8	2	14	26	12
New Jersey	69	22	0	38	46	7
New York	110	70	3	72	98	13
Rhode Island	40	45	1	21	61	4
Virginia	13	0	2	11	3	1
Other	33	8	0	13	24	4
TOTAL	**860**	**270**	**26**	**492**	**538**	**126**

Table E.79 Summary of Impacts on Short Run Break-Even by Principal Port State (Number of Vessels)

	YEARS 1 – 3			YEAR 4 DEFAULT		
PRINCIPAL PORT STATE	No Change	Reduction	Increase	No Change	Reduction	Increase
Connecticut	12	12	0	7	16	1
Delaware	2	0	0	1	1	0
Massachusetts	330	65	6	207	162	32
Maryland	13	0	0	8	5	0
Maine	158	36	10	77	80	47
North Carolina	24	2	2	14	10	4
New Hampshire	53	9	2	20	31	13
New Jersey	102	27	1	56	61	14
New York	91	55	2	58	80	10
Rhode Island	64	62	1	37	86	4
Virginia	8	0	2	5	4	1
Other	3	2	0	2	2	0
TOTAL	**860**	**270**	**26**	**492**	**538**	**126**

The results reported in **Table E.77**, **Table E.78**, and **Table E.79** only indicate whether or not a vessel's returns above operating costs are affected by the proposed management action. The relative magnitude of impacts is reported in **Table E.80** for vessels that are projected to be negatively impacted under the Year 1 – 3 measures and the Year 4 default measure. Of the negatively impacted vessels, the majority (77% in Years 1 – 3 and 67% in Year 4) are affected by less than a ten percent reduction in net returns. A total of 61 vessels (23%) are estimated to lose 10% or more in net returns under the Year 1 – 3 measures, while 178 vessels (33%) are estimated to experience a similar loss (ten percent or greater) under the Year 4 default measure. Only nine vessels (3.3%) are projected to lose more than 50% of their net returns under the Year 1 – 3 measures; this number increases to 28 vessels (5.2%) under the Year 4 default measure.

Table E.80 Short Run Break-Even: Summary of Negatively Affected Participating Vessels by Percent Impact on Net Returns (Number of Vessels)

Percent Reduction in Returns Above Operating Costs	YEARS 1 – 3	YEAR 4 DEFAULT
< 10 Percent	209	360
>= 10 and < 20 Percent	30	82
>= 20 and < 30 Percent	10	38
>= 30 and < 40 Percent	8	21
>= 40 and < 50 Percent	4	9
>= 50 Percent	9	28
Total Vessels	270	538

The negatively affected vessels by vessel length, moratorium qualification status, and degree of dependence on small mesh multispecies are summarized in **Table E.81**, **Table E.82**, and **Table E.83**. Smaller vessels (less than 50 feet in overall length) tend to have a higher proportion affected by a less than ten percent reduction in net returns. Among vessels for which net returns are projected to decline by ten percent or more, 16.4% are less than 50 feet in length for the Year 1 – 3 measures, and 20.2% are less than 50 feet for the Year 4 default measure. For the Year 1 – 3 measures, approximately half of the vessels affected by more than a ten percent reduction in net returns are vessels in excess of 70 feet in overall length. For the Year 4 default measure, the number of affected vessels is about equally divided among vessels 50 to 70 feet (72) and vessels that are greater than 70 feet in overall length.

The number of affected vessels by moratorium qualification status is reported in **Table E.82**. Vessels are grouped according to whether or not their net returns are projected to decrease by more than 10 percent. Among those negatively affected vessels for both the Year 1 – 3 measures and the Year 4 default, the majority are limited access small mesh multispecies qualifiers. Among those non-qualifiers listed in **Table E.82**, every vessel could qualify for one of the limited access permits if the owner was to obtain a multispecies permit prior to the implementation of this amendment. If they chose to obtain a multispecies permit and therefore qualify, the economic impacts on these vessels would likely be quite different from those reported herein.

The number of affected vessels by small mesh multispecies dependence (as a percentage of cumulative gross sales) is reported in **Table E.83**. Vessels are grouped according to whether or not their net returns are projected to decrease by more than ten percent. For the Year 1 – 3 measures, 21.3% of vessels affected by more than a ten percent reduction in net returns earned ten percent or less of their baseline revenues from small mesh multispecies. By contrast, 31.1% of those vessels relied on small mesh multispecies for more than 50% of their baseline revenues.

Table E.81 Short Run Break-Even: Summary of Negatively Affected Participating Vessels by Vessel Length Category (Number of Vessels)

	YEARS 1 – 3		YEAR 4 DEFAULT	
LENGTH CATEGORY	Less Than 10 Percent Reduction	>= 10 Percent Reduction	Less Than 10 Percent Reduction	>= 10 Percent Reduction
Less Than 50 Feet	47	10	143	36
50 to 70 Feet	90	20	127	72
Greater Than 70 Feet	72	31	90	70
TOTAL	209	61	360	178

Table E.82 Short Run Break-Even: Summary of Negatively Affected Participating Vessels by Moratorium Qualification Category (Number of Vessels)

	YEARS 1 – 3		YEAR 4 DEFAULT	
MORATORIUM QUALIFICATION CATEGORY	Less Than 10 Percent Reduction	>= 10 Percent Reduction	Less Than 10 Percent Reduction	>= 10 Percent Reduction
Limited Access Permit	172	37	152	154
Possession Limit Permit	26	6	186	15
Non-Qualifier	11	18	22	9
TOTAL	209	61	360	178

Table E.83 Short Run Break-Even: Summary of Negatively Affected Participating Vessels by Small Mesh Multispecies Dependence Category (Number of Vessels)

	YEARS 1 – 3		YEAR 4 DEFAULT	
SMALL MESH MULTISPECIES DEPENDENCE	Less Than 10 Percent Reduction	>= 10 Percent Reduction	Less Than 10 Percent Reduction	>= 10 Percent Reduction
<= 10 Percent	129	13	350	48
> 10 and <= 20 Percent	46	5	8	46
> 20 and <= 30 Percent	17	11	1	31
> 30 and <= 40 Percent	10	9	0	19
> 40 and <= 50 Percent	3	4	1	8
> 50 Percent	4	19	0	26
TOTAL	209	61	360	178

E.7.3.2.2.2 Long Run Profitability Effects on Small Commercial Fishing Entities

In the short run, a small commercial fishing entity may be able to continue business operations as long as it can cover its operating costs and at least some portion of its fixed costs. However, a small entity must be able to cover all costs (operating and fixed costs) over the longer run if it expects to maintain business operations. The following section reports the estimated long run profitability of small mesh multispecies fishery participants under the Year 1 – 3 measures and the Year 4 default measure.

In commercial fishing, captain and crew are considered co-venturers with the vessel owner (who may also be the captain) and are paid on the basis of a share system. There are numerous share remuneration possibilities. For the purposes of this analysis, the crew and captain share are assumed to comprise the remainder of one-half of gross revenues less operating expenses. Fixed costs are estimated as 35% of gross baseline revenues (1995 – 1997). This proportion is based upon estimated fixed costs as a share of gross revenues from the Capital Construction Fund (CCF) program participants. Vessel owners who, for any reason, did not hold a multispecies permit for some portion of the baseline period may have no logbook data for the corresponding period. Thus, the estimation of fixed costs as a proportion of baseline gross revenues reflects the fact that not all vessels in the trip limit database are included for all three baseline years.

Based on estimated costs and revenues, there are a total of 634 vessels for which combined profits for 1995 – 1997 were greater than zero, and there are 522 vessels that operated at a net loss. Individual vessel financial situations are quite variable. Shares paid to labor may be adjusted as necessary, and a variety of strategies may be adopted to reduce fixed costs. The finding that 45% of small mesh multispecies fishery participants were not profitable between 1995 and 1997 does not account for individual financial situations, nor does it account for adaptations that vessel owners may have made to improve profitability. The number of vessels estimated to remain profitable under the Year 1 – 3 measures declines 3.9% from 634 to 609 vessels, while the number of vessels projected to operate at a net loss increases 4.8% from 522 to 547. Compared to the status quo baseline (1995-1997), the number of vessels expected to remain profitable under the proposed management action declines to 577 vessels, and the number of vessels expected to operate at a net loss increases 10.9% to 579 vessels.

The estimated changes in profitability for the status quo baseline, Years 1 – 3, and the Year 4 default are reported in **Table E.84**. Average, median, 25^{th}, and 75^{th} percentiles of the estimated impacts on gross revenues, operating costs, labor payments, fixed costs, and profits are reported. Note that average values are consistently above median values, indicating that the data are skewed toward higher values of gross revenues and operating costs. In these instances, the median is a better indicator of central tendency. For the Year 1 – 3 measures, there are a total of 860 vessels (74%) (column 1) for which profitability is projected to remain unchanged from the 1995 – 1997 baseline (status quo). These vessels are unaffected by the Year 1 – 3 measures because their landings of small mesh multispecies from all trips between 1995 and 1997 were below the proposed possession limits. Median profits for these unaffected vessels are estimated at -$667. This value is cumulative for three years, so the median vessel in this category is operating at just below break-even profit.

There are a total of 268 affected vessels (23.2%) for which profitability under the status quo (columns 2 and 3 of **Table E.84**) exceeds expected profitability under the Year 1 – 3 management measures (column 3). Their median profits are estimated to fall 36.1% from $52 to $33 thousand. Under the status quo, profitability for these vessels was low, yet positive ($1,806) at the 25th percentile, but it turns negative (-$3,785) under the Year 1 – 3 measures. Of the 268 negatively affected vessels, profitability is estimated to decrease, but remain positive, for 184 vessels (69%) for both the status quo and Years 1 – 3. Fifty nine of the negatively affected vessels (22%) operated at a net loss under the status quo and are projected to do so under the Year 1 – 3 measures as well. Last, 25 of the vessels (9%) earned positive profits under the status quo but are projected to operate at a net loss under the Year 1 – 3 measures. There are a total of 28 vessels (columns 4 and 5 of **Table E.84**) for which profits are predicted to increase under the proposed Year 1 – 3 management measures. For these vessels, the proportional reduction in operating median costs exceeds the proportional reduction in gross revenues, resulting in a net improvement in profitability.

There are a total of 492 vessels (42.6%) (column 6) for which profitability remains unchanged under the Year 4 default measure relative to the status quo. These vessels are unaffected by the Year 4 default measure because none of their activity between 1995 and 1997 exceeded the proposed default possession limits. Median profitability for these vessels is estimated at -$972, but it is not affected by the proposed default measure. One hundred twenty eight vessels (11%) (columns 9 and 10 of **Table E.84**) are predicted to experience increased profitability under the Year 4 default measure. As is the case for the Year 1 – 3 measures, operating costs for these vessels are projected to fall proportionally more than gross revenues, resulting in a net improvement in profitability.

The number of vessels predicted to experience a decline in profitability increases 100% from 268 to 536 under the Year 4 default measure (columns 7 and 8 of **Table E.84**). Their median profitability is predicted to decline 61.1% from $26 thousand to $10 thousand. Of these negatively affected vessels, 322 (60%) are predicted to earn positive profits under both the status quo and the Year 4 default. One hundred fifty three vessels (28.5%) operated at a loss from 1995 – 1997 and are predicted to continue to operate at a loss under the Year 4 default. Sixty one vessels (11.4%) earned positive profits under the status quo but are predicted to operate at a net loss under the Year 4 default measure.

Table E.84 Long Run Profitability: Mean, 25th Percentile, Median, and 75th Percentile of Estimated Gross Revenues, Costs, and Profits for Years 1 – 3 and the Year 4 Default Measure

	Status Quo Compared to Year 1 – 3 Measures					Status Quo Compared to Year 4 Default Measures				
		Reduced Break-Even		Increased Break-Even			Reduced Break-Even		Increased Break-Even	
	No Change	Status Quo	Years 1 – 3	Status Quo	Years 1 – 3	No Change	Status Quo	Year 4	Status Quo	Year 4
Number of Vessels	**860**	**268**	**268**	**28**	**28**	**492**	**536**	**536**	**128**	**128**
Gross Revenues ($)										
Mean	298,402	747,429	695,360	198,435	197,102	231,772	609,477	550,321	170,167	168,015
25th Percentile	46,053	268,662	251,543	4,508	4,231	21,008	203,722	188,122	29,252	28,233
Median	170,592	584,900	545,973	77,558	77,341	118,243	442,976	422,175	108,472	107,909
75th Percentile	381,450	1,047,520	981,957	309,818	308,702	296,099	836,140	764,924	212,758	209,274
Operating Costs ($)										
Mean	114,952	218,584	212,984	107,877	105,336	86,719	192,295	189,282	115,034	110,540
25th Percentile	33,594	121,166	118,185	17,446	14,327	21,961	98,392	96,343	29,983	23,905
Median	84,080	189,243	187,606	80,651	79,232	60,847	168,161	165,667	77,421	73,376
75th Percentile	166,135	286,515	280,009	141,052	138,640	121,052	248,716	245,562	147,119	146,774
Labor Costs ($)										
Mean	66,035	196,316	175,254	38,955	38,847	52,580	152,131	127,785	24,079	24,067
25th Percentile	2,614	36,642	33,179	4	4	570	23,152	20,790	1,471	1,472
Median	19,368	131,709	119,655	3,708	3,707	11,664	77,172	68,902	6,585	6,585
75th Percentile	74,009	269,684	248,907	27,447	27,447	56,973	207,386	171,733	19,657	19,657
Fixed Costs ($)										
Mean	104,441	261,600	261,600	69,452	69,452	81,120	213,317	213,317	59,558	59,558
25th Percentile	16,119	94,032	94,032	1,578	1,578	7,353	71,303	71,303	10,238	10,238
Median	59,707	204,715	204,715	27,145	27,145	41,385	155,042	155,042	37,965	37,965
75th Percentile	133,508	366,632	366,632	108,436	108,436	103,635	292,649	292,649	74,465	74,465
Profits ($)										
Mean	12,974	70,930	45,523	-17,849	-16,533	11,353	51,735	19,938	-28,505	-26,151
25th Percentile	-13,459	1,806	-3,785	-30,368	-29,506	-11,083	-2,272	-16,286	-31,853	-26,621
Median	-667	52,281	33,397	-7,374	-6,679	-972	25,689	10,004	-12,057	-9,883
75th Percentile	28,599	119,376	93,852	-575	-432	22,855	95,850	60,870	-2,429	-458

The descriptive statistics on profitability for each of the groups of vessels listed in **Table E.84** for the Year 1 – 3 and Year 4 default measures are reported in **Table E.85**. Median profit for negatively affected vessels with reduced, yet still positive, profitability is predicted to decline 22.7% from $88 thousand to $68 thousand (columns 1 and 2 of the top portion of **Table E.85**) under the Year 1 – 3 measures. For vessels earning positive profits under both the status quo and the Year 4 default (columns 1 and 2 of the bottom portion of **Table E.85**), median returns are projected to decline 25.3 percent. Similar changes in net returns are projected for vessels operating at a net loss under both the status quo and Year 1 – 3 conditions. Median net losses for these vessels are projected to increase 21.7%, while Year 4 losses are projected to increase 25.2 percent. Median profits for vessels estimated to earn a positive return under the status quo but not under the Year 1 – 3 measures decline from $9 thousand to -$5 thousand, a net loss of $14 thousand. Median profit under the Year 4 default is projected to fall from $28 thousand to -$21 thousand, a net loss of $49 thousand for those affected vessels.

Table E.85 Long Run Profitability: Mean, 25th Percentile, Median, and 75th Percentile of Profits for All Categories of Negatively Affected Vessels

	Status Quo and Year 1-3 Profit > 0		Status Quo and Year 1-3 Profit < 0		Status Quo Profit > 0 Year 1-3 Profit < 0	
Profit ($)	**Status Quo**	**Years 1-3**	**Status Quo**	**Years 1-3**	**Status Quo**	**Years 1-3**
Mean	109,236	87,927	-45,452	-48,590	63,655	-44,465
25th Percentile	41,274	29,720	-53,190	-58,184	1,693	-31,439
Median	88,480	68,352	-16,685	-20,308	8,506	-5,244
75th Percentile	153,693	130,047	-5,961	-6,958	57,371	-1,559
	Status Quo and Year 1-3 Profit > 0		**Status Quo and Year 1-3 Profit < 0**		**Status Quo Profit > 0 Year 1-3 Profit < 0**	
Profit ($)	**Status Quo**	**Year 4**	**Status Quo**	**Year 4**	**Status Quo**	**Year 4**
Mean	88,525	66,809	-35,050	-41,082	75,206	-74,432
25th Percentile	22,363	16,116	-44,256	-53,455	3,143	-60,128
Median	65,015	48,565	-20,914	-26,189	27,529	-21,110
75th Percentile	125,470	96,322	-6,388	-9,331	116,574	-6,063

The results reported in **Table E.84** show that profits may remain unchanged, decline, or increase upon implementation of the proposed management action. The number of vessels that fall into each of these categories by reported home port state and principal port state is presented in **Table E.86** and **Table E.87**. Whether by home or principal port, the states of Maine, Massachusetts, Rhode Island, New York, and New Jersey comprise the majority of vessels that participated in small mesh multispecies fisheries during calendar years 1995 – 1997. Among these states, Rhode Island contains the highest proportion of its participating vessels that are predicted to experience a reduction in profits for Years 1 – 3 (52% of Rhode Island's home port vessels). New York has the second highest proportion of negatively impacted home port vessels (38%), followed by New Jersey (23%), Maine (20%), and Massachusetts (16%). Rhode Island also has the highest proportion of negatively affected home port vessels under the Year 4 default measure, with 71% of all participating home port vessels in Rhode Island estimated to experience a reduction in profits. New York has the second highest proportion of negatively affected vessels (54%), followed by New Jersey (51%), Maine (41%), and Massachusetts (39%). Although the estimated proportions of negatively affected vessels differ, the state rankings (by order of impact) for principal port state are the same as those for home port state.

Table E.86 Summary of Impacts on Profitability of Participating Vessels by Home Port State

	YEARS 1 – 3			YEAR 4 DEFAULT		
HOME PORT STATE	**No Change**	**Reduction**	**Increase**	**No Change**	**Reduction**	**Increase**
Connecticut	8	3	0	3	7	1
Delaware	2	4	0	0	5	1
Massachusetts	416	83	8	260	197	50
Maryland	9	0	0	5	4	0
Maine	95	25	8	45	52	31
North Carolina	23	2	2	10	13	4
New Hampshire	42	8	2	14	26	12
New Jersey	69	21	1	38	46	7
New York	110	69	4	72	98	13
Rhode Island	40	45	1	21	61	4
Virginia	13	0	2	11	3	1
Other	33	8	0	13	24	4
TOTAL	**860**	**268**	**28**	**492**	**536**	**128**

Table E.87 Summary of Impacts on Profitability of Participating Vessels by Principal Port State

	YEARS 1 – 3			YEAR 4 DEFAULT		
PRINCIPAL PORT STATE	No Change	Reduction	Increase	No Change	Reduction	Increase
Connecticut	12	12	0	7	16	1
Delaware	2	0	0	1	1	0
Massachusetts	330	65	6	207	161	33
Maryland	13	0	0	8	5	0
Maine	158	36	10	77	80	47
North Carolina	24	2	2	14	10	4
New Hampshire	53	9	2	20	30	14
New Jersey	102	27	1	56	61	14
New York	91	54	3	58	80	10
Rhode Island	64	62	1	37	86	4
Virginia	8	0	2	5	4	1
Other	3	1	1	2	2	0
TOTAL	**860**	**268**	**28**	**492**	**536**	**128**

The results reported in the previous tables only indicate whether or not a vessel's profit are affected by the management action or not. The relative magnitude of impacts are reported in **Table E.88** for vessels that are negatively impacted under the Year 1 – 3 and the Year 4 default measures. Of the negatively impacted vessels, 50% in Years 1 – 3 and 49% in Year 4 are affected by less than a ten percent reduction in profits. A total of 133 vessels are estimated to lose ten percent or more of profits under the Year 1-3 measures, while 273 vessels are estimated to have a similar loss under the Year 4 default measure. Fifty four vessels (20%) are projected to experience reductions in profits greater than or equal to 50% under the Year 1 – 3 measures; this number increases to 142 vessels (26%) under the Year 4 default measure.

Table E.88 Summary of Negatively Affected Participating Vessels by Magnitude of Impact (Percent Impact on Profits)

PERCENT REDUCTION IN PROFIT	YEARS 1 – 3	YEAR 4 DEFAULT
< 10 Percent	135	263
>= 10 and < 20 Percent	39	54
>= 20 and < 30 Percent	19	30
>= 30 and < 40 Percent	12	22
>= 40 and < 50 Percent	9	25
>= 50 Percent	54	142
TOTAL	**268**	**536**

The numbers of negatively affected vessels by vessel length, moratorium qualification status, and degree of dependence on small mesh multispecies (as a percentage of cumulative gross sales) are summarized in **Table E.89**, **Table E.90**, and **Table E.91**. Vessels are grouped according to whether or not their profits are projected to decrease by more than ten percent. Smaller vessels (less than 50 feet in overall length) tend to have a higher proportion affected by less than a ten percent reduction in profitability. Among vessels for which profits are projected to decline by ten percent or more, 18.8% are less than 50 feet for the Year 1 – 3 measures, and 25.3% are less than 50 feet for the Year 4 default measure **(Table E.89)**. For the Year 1 – 3 measures, the number of vessels affected by more than a ten percent reduction in profit is almost evenly divided between vessels greater than 70 feet in length and vessels between 50 and 70 feet. For the Year 4 default measure, the majority of affected vessels are between 50 and 70 feet in overall length.

The number of negatively affected vessels by moratorium qualification status is reported in **Table E.90**. Vessels are grouped according to whether or not their profits are projected to decrease by more than ten percent. Among negatively affected vessels for both the Year 1 – 3 measures and the Year 4 default measure, the majority are limited access small mesh multispecies permit qualifiers. Among the non-qualifiers listed in **Table E.90**, every vessel could still qualify if the owners were to obtain multispecies permits prior to the implementation of this amendment. If they obtain multispecies permits and therefore qualify, the economic impacts for these vessels would likely be quite different from those reported herein.

The number of affected vessels by small mesh multispecies dependence (as a percentage of cumulative gross sales) is reported in **Table E.91**. Vessels are grouped according to whether or not their profits are projected to decrease by more than ten percent. For the Year 1 – 3 measures, 25.6% of vessels affected by more than a ten percent reduction in profits earned ten percent or less of their baseline revenues from small mesh multispecies. By contrast, 15% relied on small mesh multispecies for more than 50% of their baseline revenues. Under the Year 4 default measure, only four of the 259 vessels affected by a reduction in of profits of ten percent or less relied on small mesh multispecies for more than ten percent of their 1995 – 1997 baseline revenues. By contrast, approximately 50% of the vessels experiencing a reduction in profits greater than ten percent relied on small mesh multispecies for more than ten percent of their 1995 – 1997 baseline revenues.

Table E.89 Long Run Profitability Effects: Summary of Negatively Affected Participating Vessels by Vessel Length Category (Number of Vessels)

	YEARS 1 – 3		YEAR 4 DEFAULT	
LENGTH CATEGORY	Less than 10 Percent Reduction	>= 10 Percent Reduction	Less than 10 Percent Reduction	>= 10 Percent Reduction
Less than 50 Feet	31	25	108	69
50 to 70 Feet	57	53	87	112
Greater than 70 Feet	47	55	68	92
TOTAL	**135**	**133**	**263**	**273**

Table E.90 Long Run Profitability Effects: Summary of Negatively Affected Participating Vessels by Moratorium Qualification Status (Number of Vessels)

	YEARS 1 – 3		YEAR 4 DEFAULT	
QUALIFICATION CATEGORY	Less than 10 Percent Reduction	>= 10 Percent Reduction	Less than 10 Percent Reduction	>= 10 Percent Reduction
Limited Access Small Mesh Multispecies Permit	106	101	90	216
Possession Limit Permit	21	11	158	41
Non-Qualifier	8	21	15	16
TOTAL	**135**	**133**	**263**	**273**

Table E.91 Long run Profitability Effects: Summary of Negatively Affected Participating Vessels by Small Mesh Multispecies Dependence (Number of Vessels)

	YEARS 1 – 3		YEAR 4 DEFAULT	
SMALL MESH MULTISPECIES DEPENDENCE	Less than 10 Percent Reduction	>= 10 Percent Reduction	Less than 10 Percent Reduction	>= 10 Percent Reduction
<= 10 Percent	107	34	259	137
> 10 and <= 20 Percent	19	31	1	53
> 20 and <= 30 Percent	4	24	1	31
> 30 and <= 40 Percent	2	17	0	19
> 40 and <= 50 Percent	0	7	1	8
> 50 Percent	3	20	1	25
TOTAL	**135**	**133**	**263**	**273**

E.7.3.2.2.3 Impacts on Seafood Dealers

There were 540, 545, and 466 seafood dealers permitted for multispecies during calendar years 1995, 1996, and 1997 respectively. Of those dealers, a total of 191 reported having purchased one or more pounds of small mesh multispecies during the combined calendar years 1995 – 1997. The Small Business Administration (SBA) defines a small entity engaged in the seafood wholesale trade sector (SIC code 5146) as one with 100 or fewer employees. Federally permitted seafood dealers are not required to report numbers of employees to NMFS, so no data is available to determine how many of the 191 dealers that purchased small mesh multispecies between 1995 and 1997 would be defined as small entities under the SBA standards. However, it is likely that the majority, if not all, of those dealers would be defined as small entities.

The number of small mesh multispecies dealers between the calendar years 1995 and 1997 are reported by state in **Table E.92**. The majority are from the states of Massachusetts, New Jersey, New York, and Rhode Island. The relative dependence on small mesh multispecies of these dealers is reported by state in **Table E.93**. The data is sorted by whether or not the ratio of the dealer's small mesh multispecies purchases to all ex-vessel seafood purchases was greater than ten percent between 1995 and 1997. Note that the data reported in **Table E.93** is based on purchases from federally permitted vessels. Dealers may also purchase product from vessels permitted only in state waters as well as from other dealers. Thus, it is likely that the data reported in **Table E.93** represents a portion of the total business conducted by any one of those dealers. Further, available data only indicate purchases by dealers and not their sales. While these purchases are revenues for the vessels, they are input costs for the dealers. If dealers operate on relatively stable marketing margins, then reductions in gross sales will be roughly proportional to reductions in seafood purchases.

Of the 191 dealers reported in **Table E.93**, there are 136 for whom small mesh multispecies comprised ten percent or less of their total purchases from federally permitted vessels between 1995 and 1997. Of the 55 dealers with a small mesh multispecies dependence greater than ten percent, the majority are located in the states of New York (24) and New Jersey (13). Of the 24 dealers located in New York, eleven relied on small mesh multispecies for between 25% and 50% of their total seafood purchases from federally permitted vessels between 1995 and 1997. Small mesh multispecies comprised more than fifty percent of total purchases for ten dealers.

Table E.92 Number of Federally Permitted Seafood Dealers who Purchased Small Mesh Multispecies Between 1995 and 1997 (By State)

STATE	NUMBER OF DEALERS
Massachusetts	52
Maryland	3
Maine	11
North Carolina	7
New Hampshire	5
New Jersey	24
New York	42
Rhode Island	36
Virginia	7
Other[a]	4
TOTAL	**191**

a Includes states with fewer than 3 dealers or unknown state.

Table E.93 Relative Dependence of Dealers on Small Mesh Multispecies Between 1995 and 1997 (By State)

	Ratio of Small Mesh Multispecies Purchases to Ex-Vessel Purchases of all Seafood Products (Number of Dealers)	
State	**<= 10 Percent**	**> 10 Percent**
Massachusetts	46	6
Maryland	3	0
Maine	8	3
North Carolina	7	0
New Jersey	18	6
New York	18	24
Rhode Island	23	13
Other[a]	13	3
TOTAL	**136**	**55**

a Includes states with fewer than 3 dealers or unknown state.

The proposed management action will not create any new regulations applicable to seafood dealers, so there will be no new compliance requirements for the wholesale seafood trade sector. However, seafood dealers will be affected by a reduction in the supply of small mesh multispecies as well as any other species that they may purchase from vessels likely to be affected by the proposed management action. These effects on the wholesale seafood trade sector are described in this section.

Due to the inability to directly link dealer data with logbook data, dealer impacts are estimated by prorating port impacts to dealer shares of activity by species and by port. Impacts by port are estimated by prorating total fishery impacts to specific ports. The methodology by which the port impacts are estimated is detailed in Section E.7.3.3. Since dealers tend to purchase seafood in numerous ports, dealer impacts are estimated by multiplying market shares of purchased product (by species and port) by the proportion of product transacted between identifiable dealers and identifiable vessels (by port). This calculation yields an estimate of the value of purchased products by port. Aggregating across all ports yields an estimate of the total value of seafood products by dealer.

The estimated impacts of the Year 1 – 3 and Year 4 default measures on small mesh multispecies dealers are reported in **Table E.94**. The results are sorted by dealers for whom small mesh multispecies was ten percent or less of their total 1995 – 1997 product purchases (by federally permitted vessels) and by dealers for whom small mesh multispecies was greater than ten percent of their total purchases between 1995 and 1997. On average, dealers with less than ten percent dependence on small mesh multispecies purchased a total of $3.8 million of seafood products from federally permitted vessels from 1995 – 1997. Indicative of a highly skewed distribution, median seafood product purchases were substantially lower at $173 thousand. For dealers with less than ten percent dependence on small mesh multispecies, the estimated reduction in purchases of all seafood products range from 1.7% to 10.8% at the mean and the 75th percentile respectively under both the Year 1 – 3 and Year 4 default measures. The Year 1 – 3 and Year 4 estimated impacts are nearly identical for these dealers because of the relatively minor contribution of small mesh multispecies to their total business operation. For example, purchases of combined small mesh multispecies for the average dealer were less than one percent ($33 thousand) of their total purchases from 1995 – 1997. By contrast, for dealers whose purchases of small mesh multispecies comprised more than ten percent of their seafood purchases, the average contribution of small mesh multispecies was 27.4% ($514 thousand) and 35.6% ($261 thousand).

Given the relatively greater reliance on small mesh multispecies, dealers whose business was comprised of ten percent or greater of small mesh multispecies are projected to experience greater losses under both the Year 1 – 3 and the Year 4 default measures. The estimated reductions in total purchases for these dealers range from 8.7 to 19.0% for the 75th percentile and the median dealer respectively under the Year 1 – 3 management measures. In terms of small mesh multispecies, these dealers are estimated to experience a reduction in purchases between 28.2 and 32.8 percent. Under the Year 4 default measure, the projected reduction in total seafood purchases for small mesh multispecies dependent dealers range from 17.5 to 36.3 percent. Purchases of small mesh multispecies are estimated to decline between 46.2 and 53% under the default measure.

Table E.94 Projected Impacts of the Year 1 – 3 and Year 4 Default Measures on Seafood Dealers

	10 PERCENT OR LESS DEPENDENCE ON SMALL MESH MULTISPECIES (1995 – 1997)					
	All Species (Percent Reduction in $)			Small Mesh Multispecies (Percent Reduction in $)		
	Base ($)	Years 1-3	Year 4	Base ($)	Years 1-3	Year 4
Mean	3,799,906	-1.7	-2.4	33,079	-20.7	-60.8
25th Percentile	172,749	-9.7	-9.7	37	-8.1	-29.7
Median	798,377	-2.9	-3.0	438	-13.5	-33.8
75th Percentile	2,940,492	-10.8	-10.8	4,288	-21.5	-44.6
	GREATER THAN 10 PERCENT DEPENDENCE ON SMALL MESH MULTISPECIES (1995 – 1997)					
	All Species (Percent Reduction in $)			**Small Mesh Multispecies (Percent Reduction in $)**		
	Base ($)	**Years 1-3**	**Year 4**	**Base ($)**	**Years 1-3**	**Year 4**
Mean	1,879,362	-10.2	-18.1	514,124	-32.3	-52.4
25th Percentile	240,784	-17.8	-29.6	106,071	-32.3	-51.4
Median	731,640	-19.0	-36.3	260,938	-28.2	-46.2
75th Percentile	2,191,352	-8.7	-17.5	672,262	-32.8	-53.0

The range of projected reductions in gross purchases for small mesh multispecies dealers is reported in **Table E.95** for both the Year 1 – 3 and Year 4 measures. For the Year 1 – 3 measures, 134 dealers (70.2%) are projected to experience reduced product purchases of less than five percent. Of the remaining dealers, 40 are projected to experience reduced purchases of 5% to 20%, and purchases are estimated to decline by 20% or more for 17 dealers (8.9%). For the Year 4 default measure, seafood purchases are estimated to decline by less than five percent for 118 dealers (61.8%). Of the dealers projected to be affected by a reduction in seafood purchases of more than five percent, 38 are projected to experience reduced sales between 5% and 20%, and the remaining 35 dealers (18.3%) are projected to experience reduced purchases of 20% or more. These results are summarized by state in **Table E.96**.

Reflective of the relative importance of small mesh multispecies, the states of New York and Rhode Island are projected to have the highest proportion of dealers affected by more than a five percent reduction in purchases of seafood products under both the Year 1 – 3 measures and the Year 4 default measure. More than half of the small mesh multispecies dealers in New York (26) are projected to experience reduced seafood purchases from federally permitted vessels in excess of five percent, and nine are projected to experience declines in purchases of greater than 20% for the Year 1 – 3 measures. The Year 4 default measure yields similar results, but the number of New York dealers affected by more than a 20% reduction gross seafood purchases from federally permitted vessels is projected to increase from nine to seventeen.

Table E.95 Impacts on Dealers: Range of Projected Reductions in Total Purchases of Seafood Products From Federally Permitted Vessels

PROJECTED REDUCTION RANGE	YEARS 1 – 3 (# OF DEALERS)	YEAR 4 (# OF DEALERS)
< 5 Percent	134	118
>= 5 Percent and < 10 Percent	24	19
>= 10 Percent and < 20 Percent	16	19
>= 20 Percent and < 30 Percent	10	13
>= 30 Percent and < 40 Percent	3	9
>= 40 Percent and < 50 Percent	1	5
>= 50 Percent	3	8

Table E.96 Impacts on Dealers: Range of Projected Reductions in Total Purchases of Seafood Products From Federally Permitted Vessels (By State)

	REDUCTIONS IN SEAFOOD PURCHASES YEAR 1 – 3 MEASURES		
STATE	**< 5 Percent**	**>= 5 and < 20 Percent**	**>= 20 Percent**
Massachusetts	48	4	0
Maryland	3	0	0
Maine	7	3	1
North Carolina	5	0	2
New Jersey	20	1	3
New York	16	17	9
Rhode Island	22	14	0
Other[a]	13	1	2
TOTAL	**134**	**40**	**17**
	REDUCTIONS IN SEAFOOD PURCHASES YEAR 4 DEFAULT		
STATE	**< 5 Percent**	**>= 5 and < 20 Percent**	**>= 20 Percent**
Massachusetts	45	4	3
Maryland	3	0	0
Maine	7	0	4
North Carolina	5	0	2
New Jersey	17	4	3
New York	14	11	17
Rhode Island	15	17	4
Other[a]	12	2	2
TOTAL	**118**	**38**	**35**

a Includes combined states of New Hampshire, Connecticut, Virginia and Unknown

E.7.3.3 Impacts on Important Commercial Small Mesh Multispecies Ports

The estimated impacts of the Year 1 – 3 and the Year 4 default measures on the principal whiting ports described in Section E.6.5.5 are reported in this section. The trip limit model described in Section E.7.2.2.1 (used to estimate exploitation rate reductions, fishery impacts, and impacts on small entities) is also used to estimate landings of small mesh multispecies and other species by port under the Year 1 – 3 and the Year 4 default management measures. As is the case for the estimated fishery impacts, the baseline for this port analysis is the 1995 – 1997 time period.

Cumulative kept pounds and estimated value for participating vessels (based on logbook data) between 1995 and 1997 are reported in **Table E.97** and **Table E.98** respectively. Based on cumulative pounds of all species landed by participating vessels, Point Judith (RI) landed the most of all significant whiting ports, followed in order by Cape May (NJ), Gloucester (MA), Portland (ME), Shinnecock (NY), Belford (NJ), Montauk (NY), Point Pleasant (NJ), Greenport (NY), and Provincetown (MA). Together, these ports account for 94% of all logbook pounds of combined small mesh multispecies for the 1995 – 1997 baseline years. Point Judith also led all ports in landings of small mesh multispecies, followed in order by Shinnecock, Greenport, Gloucester, Montauk, Portland, Point Pleasant, Belford, Provincetown, and Cape May. Note in **Table E.97** and **Table E.98** that "large mesh species" and "small mesh species" refer to the same groups of species as defined in **Table E.60**.

The estimated cumulative value of kept pounds (logbook) for the participating vessels in the baseline years is reported in **Table E.98**. Point Judith led all significant whiting ports in the cumulative value of all species landed, followed in order by Portland, Gloucester, Cape May, Shinnecock, Montauk, Point Pleasant, Greenport, Belford, and Provincetown. Point Judith also led these ports in terms of the combined value of all three small mesh multispecies, followed in order by Shinnecock, Greenport, Montauk, Gloucester, Portland, Point Pleasant, Belford, Provincetown, and Cape May.

Table E.97 Cumulative Kept Pounds by Port (from Logbook Data) for Vessels Participating in Small Mesh Multispecies Fisheries from 1995 - 1997

PORT	All Species (Pounds)	Large Mesh Species (Pounds)	Offshore Hake (Pounds)	Silver Hake (Pounds)	Red Hake (Pounds)	Squid (Pounds)	Shrimp (Pounds)	Small Mesh Species (Pounds)
Belford, NJ	21,145,822	18,682,837	25	1,260,969	197,933	436,681	3,524	563,853
Cape May/ Wildwood, NJ	120,337,618	53,716,729	72,883	419,022	16,494	44,287,536	2,810	21,822,144
Gloucester, MA	52,887,436	37,887,097	249,628	6,183,100	1,832,660	50,351	1,830,449	4,854,151
Greenport, NY	15,513,783	2,202,107	28,950	10,650,880	258,694	1,360,542	55	1,012,555
Montauk, NY	20,675,937	7,502,013	434,604	6,625,341	543,132	4,003,555	495	1,566,797
Other Northern New England	163,759,294	132,512,399	148,516	2,328,104	644,818	1,218,206	18,946,266	7,960,985
Other Southern New England	106,098,373	52,567,297	439,309	14,791,371	2,267,436	15,867,339	436,071	19,729,550
Portland, ME	49,206,537	29,212,920	286,972	4,794,620	117,656	10,080	10,385,313	4,398,976
Point Judith, RI	120,653,273	42,669,383	1,868,509	21,189,115	1,985,495	23,861,557	34,756	29,044,458
Point Pleasant, NJ	16,324,735	9,405,812	51,156	2,523,014	469,453	3,164,490	15	710,795
Provincetown, MA	5,976,715	4,491,566	257,371	848,503	222,922	5,682	0	150,671
Shinnecock/ Hampton Bays, NY	28,836,367	8,868,605	262,511	10,165,022	521,672	7,600,063	198	1,418,296

Table E.98 Cumulative Value ($) by Port (from Logbook Data) for Vessels Participating in Small Mesh Multispecies Fisheries from 1995 - 1997

PORT	All Species Value ($)	Large Mesh Species Value ($)	Offshore Hake Value ($)	Silver Hake Value ($)	Red Hake Value ($)	Squid Value ($)	Shrimp Value ($)	Small Mesh Species Value ($)
Belford, NJ	6,675,149	5,366,807	12	614,829	96,461	305,737	2,925	288,378
Cape May/ Wildwood, NJ	35,543,614	16,664,569	34,255	148,805	4,140	13,923,711	2,302	4,765,831
Gloucester, MA	38,155,642	32,975,728	117,325	2,283,557	467,458	35,054	1,288,393	988,127
Greenport, NY	8,736,280	2,190,312	13,607	4,420,937	96,005	947,465	46	1,067,909
Montauk, NY	19,374,328	10,311,617	201,254	3,891,924	225,715	3,190,525	391	1,552,902
Other Northern New England	145,891,296	127,262,642	69,803	926,625	219,364	818,681	15,003,843	1,590,338
Other Southern New England	70,999,224	49,202,480	206,475	6,452,982	799,954	8,019,078	345,317	5,972,939
Portland, ME	41,635,237	29,944,563	134,877	1,630,247	42,664	5,962	8,744,135	1,132,789
Point Judith, RI	67,420,788	30,830,441	875,896	8,069,845	455,264	13,570,400	47,056	13,571,885
Point Pleasant, NJ	10,268,283	6,754,043	26,711	1,029,585	139,332	1,806,332	12	512,269
Provincetown, MA	4,500,113	3,953,397	120,964	332,972	29,836	3,008	0	59,936
Shinnecock/ Hampton Bays, NY	22,292,855	9,675,707	123,380	4,948,144	195,923	5,683,934	158	1,665,608

The projected landings and value by vessels participating in small mesh multispecies fisheries by port for the Year 1 – 3 management measures are reported in **Table E.99**. In terms of pounds of all species combined, the port of Greenport (NY) is projected to experience the largest reduction (27.2%) during Years 1 – 3, followed by Shinnecock (16.3%), Montauk (10.8%), Point Judith (7.9%), Provincetown (2.7%), Gloucester (2.7%), Portland (1.7%), Point Pleasant (1.6%), Belford (0.6%), and Cape May (0.2%). The ports projected to experience the greatest loss in cumulative landings also exhibit a relatively higher degree of dependence on small mesh multispecies. This dependence is reflected in the projected reduction in combined pounds of small mesh multispecies during Years 1 – 3. Shinnecock is projected to experience the largest reduction (39.4%) in landings of small mesh multispecies during Years 1 – 3, followed by Greenport (36.7%), Point Judith (32.8%), Montauk (25.9%), Gloucester (16.4%), Portland (14.8%), Provincetown (11.5%), Cape May (9.7%), Point Pleasant (8.0%), and Belford (7.3%).

The projected landings and value by vessels participating in small mesh multispecies fisheries by port for the Year 4 default measure are reported in **Table E.100**. In terms of pounds of all species combined, Shinnecock (NY) is projected to experience the largest reduction (39.4%) in Year 4, followed by Greenport (36.7%), Point Judith (32.8%), Montauk (25.9%), Gloucester (16.4%), Portland (14.8%), Provincetown (11.5%), Cape May (9.7%), Point Pleasant (8.0%), and Belford (7.2%). In terms of pounds of combined small mesh multispecies, Portland (ME) is projected to experience the greatest reduction (84.8%), followed by Greenport (61.9%), Shinnecock (56.0%), Point Judith (50.2%), Montauk (42.5%), Cape May (42.3%), Gloucester (42.2%), Provincetown (37.1%), Belford (31.1%), and Point Pleasant (30.0%). The relatively large magnitude of the projected decrease in small mesh multispecies landings in Portland is primarily due to the assumed elimination of the experimental grate fishery with the implementation of the Year 4 default measure.

The projected landings and value reported in **Table E.99** and **Table E.100** were estimated using logbook data and the trip limit model described in Section E.7.2.2.1. These results are only partial estimates of potential port-level impacts because landings and value from logbook data may not completely reflect activity at the dealer level. In addition, the results are only for the group of vessels that participated in small mesh multispecies fisheries from 1995 – 1997. In order to estimate total port-level impacts, the logbook data must be prorated to the dealer data for small mesh multispecies fishery participants. These data must then be prorated to dealer activity in each port for all vessels that landed in the respective port.

The data reported in **Table E.99** and **Table E.100** highlight some of the differences between logbook and dealer data. For example, vessels reported having kept at least some quantity of offshore hake in every port, but the dealer data indicate landings of offshore hake in only half of these ports. Further, dealer reports of sold pounds of both red hake and offshore hake are substantially below that of logbook records of kept pounds. The possible reasons for these discrepancies are discussed in Section E.7.2.2.1.2.

Table E.99 Estimated Cumulative Kept Pounds and Corresponding Value for the Year 1 – 3 Management Measures by Port for Vessels Participating in Small Mesh Multispecies Fisheries Between 1995 and 1997 (From Logbook Data)

PORT	All Species (Pounds)	Large Mesh Species (Pounds)	Offshore Hake (Pounds)	Silver Hake (Pounds)	Red Hake (Pounds)	Squid (Pounds)	Shrimp (Pounds)	Small Mesh Species (Pounds)
Belford, NJ	28250850	25753928	0	1196877	197640	616335	0	518742
Cape May/Wildwood, NJ	162823985	71074824	0	528174	23521	57398894	0	33794507
Gloucester, MA	83992669	48846948	0	5064609	1060346	5432	2145470	27765016
Greenport, NY	11418508	1553887	53	6827515	140871	1661468	0	1184741
Montauk, NY	17720468	8478365	10	4435994	403678	3150778	86	1454948
Other Northern New England	201190411	170273216	0	1091566	110655	1947980	22400784	5653752
Other Southern New England	81654503	44054392	20	2783528	237060	18443211	278	19256183
Portland, ME	66001431	42328466	0	4812027	1353	16148	12454243	6591289
Point Judith, RI	141910982	44738181	107335	18914672	2093575	35268223	9933	40602551
Point Pleasant, NJ	20395770	10995554	138977	3322588	498047	4599674	0	799611
Provincetown, MA	6180630	4342957	0	1396437	378985	15953	2555	29912
Shinnecock/ Hampton Bays, NY	22971486	6637520	50	6636436	405909	7423688	8	1272665
	VALUE ($)	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**
Belford, NJ	7112726	5800566	0	597903	96714	431203	0	184161
Cape May/Wildwood, NJ	42526951	20345856	0	190423	5031	17330819	0	4649876
Gloucester, MA	47502208	42726859	0	1799917	262346	2637	1482657	1417803
Greenport, NY	6234590	1882619	13	2736011	48294	1134035	0	356394
Montauk, NY	19812281	14620254	2	2419464	159578	2407025	86	618466
Other Northern New England	195917907	176138714	0	402439	21734	1324398	17515353	655557
Other Southern New England	59463813	47489204	6	1095669	53772	8881264	278	3526913
Portland, ME	60562515	48036571	0	1611917	575	7556	10593300	415802
Point Judith, RI	72865996	35173414	42399	7536674	514177	21076732	26866	8105840
Point Pleasant, NJ	11749707	7399297	56340	1356353	150713	2608366	0	155248
Provincetown, MA	4569477	3954508	0	551827	51147	5276	1991	7223
Shinnecock/ Hampton Bays, NY	17088690	7029980	45	3426547	166713	5314173	8	511576

Table E.100 Estimated Cumulative Kept Pounds and Corresponding Value for the Year 4 Default Measure by Port for Vessels Participating in Small Mesh Multispecies Fisheries Between 1995 and 1997(From Logbook Data)

PORT	All Species (Pounds)	Large Mesh Species (Pounds)	Offshore Hake (Pounds)	Silver Hake (Pounds)	Red Hake (Pounds)	Squid (Pounds)	Shrimp (Pounds)	Small Mesh Species (Pounds)
Belford, NJ	27496660	25747463	0	887228	148564	481718	0	410864
Cape May/Wildwood, NJ	160728702	71044220	0	352751	16237	56384099	0	32900524
Gloucester, MA	80338041	48847031	0	3383616	800910	4100	2145454	27233242
Greenport, NY	8225276	1542289	42	4088001	96800	1297583	0	1043156
Montauk, NY	15717002	8424018	8	3429949	319971	2663382	86	1276422
Other Northern New England	198783646	170150230	0	623872	64182	1880479	22400225	5223000
Other Southern New England	76126680	43997658	15	1562195	130711	17014664	276	18833105
Portland, ME	60925913	42325768	0	906482	233	7909	12454234	6480072
Point Judith, RI	127208893	45019167	90693	13634006	1709122	30887787	9779	34217868
Point Pleasant, NJ	18940203	10990841	106521	2539259	367607	4073437	0	675514
Provincetown, MA	5754652	4315315	0	1012320	268877	12821	2555	23808
Shinnecock/ Hampton Bays, NY	20323737	6650104	34	4822064	310112	6632876	7	1075945
	VALUE ($)	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**
Belford, NJ	6776905	5798236	0	434209	72331	336947	0	142746
Cape May/Wildwood, NJ	41728588	20323833	0	123266	3329	16791660	0	4501734
Gloucester, MA	46462087	42728710	0	1166924	194955	2031	1482646	1368147
Greenport, NY	4925777	1876630	11	1657206	32993	888666	0	311297
Montauk, NY	18262964	14593757	2	1865531	127026	2034331	86	535345
Other Northern New England	194986727	176075070	0	229217	12538	1279889	17514894	597085
Other Southern New England	56492604	47453795	4	611529	29307	7998969	276	3269734
Portland, ME	58675778	48053857	0	294837	101	4299	10593294	407734
Point Judith, RI	66476962	35432650	35793	5532398	415194	18316931	26611	6614253
Point Pleasant, NJ	11081465	7393957	43170	1028411	111980	2316040	0	124081
Provincetown, MA	4414548	3938229	0	405356	36761	4433	1991	5692
Shinnecock/ Hampton Bays, NY	15657460	7055369	30	2445781	126319	4747853	7	440634

The reported landings and value of all species for small mesh multispecies fishery participants from dealer records are reported in **Table E.101**. As previously discussed, reported logbook data indicate pounds that were retained on a given trip. These kept pounds are based on estimated weight and may not necessarily be the same amount that is sold. By contrast, dealer data provide records of both the weight and value of fish transacted between a vessel and a dealer. To estimate total port impacts, the logbook data was prorated to the dealer data by dividing reported logbook kept pounds by landings reported through dealer data. For example, the ratio of logbook to dealer data for silver hake in Belford (NJ) is 0.97. This means that for every pound of silver hake reported in the dealer data, there are 0.97 pounds of silver hake reported in the logbook data. Thus, expanding logbook data to dealer data in the port of Belford involves dividing the logbook data by 0.97. Expansion factors applied to other species and other ports are calculated in a similar manner. In cases where dealer records report nothing, the expansion factor is also set at zero because the intent of this exercise is to estimate potential impacts at the dealer level.

Cumulative (1995 – 1997) landings and value from *all* vessels landing in each identified whiting port are reported in **Table E.102**. These data report cumulative landings and value by all identifiable vessels (excluding vessels with no Federal fishing permits) in all fisheries and therefore represent the baseline against which the port-level impacts of the proposed measures are compared. Among the identified ports, Cape May (NJ) led all ports in terms of aggregate landings of all species between 1995 and 1997, followed in order by Point Judith, Gloucester, Portland, Point Pleasant, Shinnecock, Belford, Montauk, Greenport, and Provincetown. In terms of the cumulative value of all species landed, Pont Judith (RI) led all other identified whiting ports, followed in order by Cape May, Portland, Gloucester, Point Pleasant, Montauk, Shinnecock, Belford, Greenport, and Provincetown.

Table E.101 Cumulative Landings and Value by Port for Vessels Participating in Small Mesh Multispecies Fisheries Between 1995 and 1997 (From Dealer Data)

PORT	All Species (Pounds)	Large Mesh Species (Pounds)	Offshore Hake (Pounds)	Silver Hake (Pounds)	Red Hake (Pounds)	Squid (Pounds)	Shrimp (Pounds)	Small Mesh Species (Pounds)
Belford, NJ	28421315	25755391	0	1294798	208372	640637	0	522117
Cape May/Wildwood, NJ	163124436	71087282	0	596923	23638	57550695	0	33865898
Gloucester, MA	86284345	48865555	0	6043009	1288490	6641	2145470	27935180
Greenport, NY	15687354	1566168	60	10829201	200898	1811684	0	1279343
Montauk, NY	19864411	8494942	13	6047459	497800	3276541	86	1547570
Other Northern New England	201849839	170399091	0	1295011	115267	1968055	22400784	5671631
Other Southern New England	86862778	44103869	24	4230476	348977	18737199	279	19441954
Portland, ME	67164880	42437424	0	5653074	1567	17471	12454243	6601101
Point Judith, RI	154147030	45140298	145301	28899045	2615760	36188642	9950	41148034
Point Pleasant, NJ	20724885	11000463	151952	3635621	523230	4608915	0	804704
Provincetown, MA	6352167	4348509	0	1525951	428532	16039	2555	30581
Shinnecock/ Hampton Bays, NY	27449966	6686586	60	11221117	526839	7662842	8	1352514
	VALUE ($)	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**
Belford, NJ	7171535	5801114	0	633404	100886	450046	0	186085
Cape May/Wildwood, NJ	42650862	20355157	0	218633	5055	17409151	0	4662866
Gloucester, MA	48160321	42739715	0	2180962	318340	3175	1482657	1435472
Greenport, NY	7917631	1894243	15	4314550	68525	1241163	0	399135
Montauk, NY	21314902	14633681	3	3327969	196611	2504007	86	652545
Other Northern New England	196287407	176273801	0	475789	22634	1338927	17515353	660903
Other Southern New England	62004524	47553707	7	1666132	79222	9078806	279	3626371
Portland, ME	61071147	48150717	0	1901862	665	8085	10593300	416518
Point Judith, RI	77341911	35521977	57244	11138556	630305	21675547	26894	8291388
Point Pleasant, NJ	11863494	7402095	61590	1471567	159075	2613192	0	155975
Provincetown, MA	4632095	3956871	0	602749	57806	5301	1991	7377
Shinnecock/ Hampton Bays, NY	19245002	7079479	54	5917112	217287	5486006	8	545056

Table E.102 Cumulative Coast-Wide Landings and Value by Port for All Vessels Between 1995 and 1997

PORT	All Species (Pounds)	Large Mesh Species (Pounds)	Offshore Hake (Pounds)	Silver Hake (Pounds)	Red Hake (Pounds)	Squid (Pounds)	Shrimp (Pounds)	Small Mesh Species (Pounds)
Belford, NJ	34073902	31407848	0	1294801	208484	640652	0	522117
Cape May/Wildwood, NJ	225550575	122869429	0	616719	23672	65866890	0	36173865
Gloucester, MA	191514351	61218050	78	6163000	1311340	7076	2179520	120635287
Greenport, NY	16015044	1690218	60	10886758	205638	1845033	10	1387327
Montauk, NY	23399798	11913574	13	6051629	498946	3331028	86	1604522
Other Northern New England	431024965	309499789	0	1340059	115651	3549720	28251327	88268419
Other Southern New England	424503319	254926273	88	4255801	353563	66633067	491	98334036
Portland, ME	102314126	44331928	0	5666891	1567	17495	13549988	38746257
Point Judith, RI	195013072	53655650	145333	29064237	2635016	39701868	9950	69801018
Point Pleasant, NJ	69683471	59847704	151952	3635727	531601	4619760	0	896727
Provincetown, MA	6619903	4613521	0	1526786	430391	16039	2555	30611
Shinnecock/ Hampton Bays, NY	38306056	17422121	60	11233611	527649	7752261	8	1370346
	VALUE ($)	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**
Belford, NJ	9468232	8097724	0	633405	100953	450065	0	186085
Cape May/Wildwood, NJ	90427195	64465627	0	224901	5063	20805933	0	4925671
Gloucester, MA	63647926	53622195	40	2220906	323100	3305	1506556	5971824
Greenport, NY	8215278	2078857	15	4338544	70054	1262113	9	465686
Montauk, NY	29669790	22904413	3	3330419	197094	2544534	86	693241
Other Northern New England	459254356	428544964	0	492100	22773	2533294	22072474	5588751
Other Southern New England	299403821	253209564	71	1676120	80514	27644924	916	16791712
Portland, ME	67146115	51475115	0	1906032	665	8090	11494361	2261852
Point Judith, RI	105755621	58921891	57254	11196120	634245	23866367	26894	11052850
Point Pleasant, NJ	40615948	36121941	61590	1471637	163473	2617453	0	179854
Provincetown, MA	5931785	5255832	0	603250	58031	5301	1991	7380
Shinnecock/ Hampton Bays, NY	24640831	12383894	54	5925808	217766	5558942	8	554359

The estimated total reductions in both landings and value by port for all vessels under the Year 1 – 3 management measures are reported in **Table E.103**. Of the significant whiting ports identified in **Table E.103**, the New York ports of Greenport, Shinnecock, and Montauk are projected to experience the largest reductions in both landings and value of all species combined. Aside from Point Judith (RI), no other ports are projected to lose more than five percent of aggregate species landings or value (from 1995 – 1997 levels). The same four ports (Greenport, Shinnecock, Montauk, and Point Judith) are also projected to experience the most significant reduction in landings and value of all three small mesh multispecies (individually or combined). Across all identified ports, estimated reductions in landings and value of shrimp and aggregate "large mesh species" (see **Table E.60**) are less than one percent. Projected reductions in landings and value of aggregate "small mesh species" (see **Table E.60**) exceed five percent in the ports of Greenport, Montauk, and Shinnecock only. Projected reductions in squid landings in Gloucester and Portland are estimated to be among the highest at 17.1% and 7.6% respectively. However, cumulative landings of squid from 1995 – 1997 represent a very small percentage of total activity in these two northern New England ports. Among the remaining ports, squid landings are projected to decline by more than five percent only in Greenport (8.14%).

The estimated total reductions in both landings and value by port for all vessels under the Year 4 default measure are reported in **Table E.104**. These results are similar to the Year 1 – 3 results. The ports of Greenport, Montauk, Shinnecock, and Point Judith are also impacted most significantly in terms of landings and value for all species combined. In terms of aggregate landings and value, no other ports are projected to experience a decline in excess of five percent under the Year 4 default measure. Portland is projected to experience the greatest reduction in silver hake landings, followed in order by Greenport, Shinnecock, Point Judith, Montauk, Gloucester, Cape May, Provincetown, Belford, and Point Pleasant. As previously noted, Portland leads all identified ports in projected silver hake reductions due to the assumed elimination of the whiting experimental grate fishery under the Year 4 default measure.

Table E.103 Estimated Percent Reduction in Landings and Value by Port for All Vessels Under the Year 1 – 3 Measures
All numbers represent percent reductions from the 1995 – 1997 baseline.

PORT	All Species (Pounds)	Large Mesh Species (Pounds)	Offshore Hake (Pounds)	Silver Hake (Pounds)	Red Hake (Pounds)	Squid (Pounds)	Shrimp (Pounds)	Small Mesh Species (Pounds)
Belford, NJ	0.50%	0.00%	0.00%	7.56%	5.15%	3.79%	0.00%	0.65%
Cape May/Wildwood, NJ	0.13%	0.01%	0.00%	11.15%	0.50%	0.23%	0.00%	0.20%
Gloucester, MA	1.20%	0.03%	0.00%	15.88%	17.40%	17.09%	0.00%	0.14%
Greenport, NY	26.66%	0.73%	12.35%	36.76%	29.19%	8.14%	0.00%	6.82%
Montauk, NY	9.16%	0.14%	23.31%	26.63%	18.86%	3.78%	0.00%	5.77%
Other Northern New England	0.15%	0.04%	0.00%	15.18%	3.99%	0.57%	0.00%	0.02%
Other Southern New England	1.23%	0.02%	4.77%	34.00%	31.65%	0.44%	0.26%	0.19%
Portland, ME	1.14%	0.25%	0.00%	14.84%	13.65%	7.56%	0.00%	0.03%
Point Judith, RI	6.27%	0.75%	26.12%	34.35%	19.82%	2.32%	0.17%	0.78%
Point Pleasant, NJ	0.47%	0.01%	8.54%	8.61%	4.74%	0.20%	0.00%	0.57%
Provincetown, MA	2.59%	0.12%	0.00%	8.48%	11.51%	0.53%	0.00%	2.19%
Shinnecock/ Hampton Bays, NY	11.69%	0.28%	17.42%	40.81%	22.92%	3.08%	0.00%	5.83%
	VALUE ($)	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**	**VALUE ($)**
Belford, NJ	0.62%	0.01%	0.00%	5.60%	4.13%	4.19%	0.00%	1.03%
Cape May/Wildwood, NJ	0.14%	0.01%	0.00%	12.54%	0.48%	0.38%	0.00%	0.26%
Gloucester, MA	1.03%	0.02%	0.00%	17.16%	17.33%	16.27%	0.00%	0.30%
Greenport, NY	20.49%	0.56%	12.35%	36.38%	28.88%	8.49%	0.00%	9.18%
Montauk, NY	5.06%	0.06%	23.21%	27.28%	18.79%	3.81%	0.00%	4.92%
Other Northern New England	0.08%	0.03%	0.00%	14.91%	3.95%	0.57%	0.00%	0.10%
Other Southern New England	0.85%	0.03%	1.73%	34.03%	31.61%	0.71%	0.15%	0.59%
Portland, ME	0.76%	0.22%	0.00%	15.21%	13.55%	6.54%	0.00%	0.03%
Point Judith, RI	4.23%	0.59%	25.93%	32.17%	18.31%	2.51%	0.11%	1.68%
Point Pleasant, NJ	0.28%	0.01%	8.52%	7.83%	5.12%	0.18%	0.00%	0.40%
Provincetown, MA	1.06%	0.04%	0.00%	8.44%	11.47%	0.48%	0.00%	2.09%
Shinnecock/ Hampton Bays, NY	8.75%	0.40%	17.42%	42.03%	23.22%	3.09%	0.00%	6.04%

Table E.104 Estimated Percent Reduction in Landings and Value by Port for All Vessels Under the Year 4 Default Measure
All numbers represent percent reductions from the 1995 – 1997 baseline.

PORT	All Species (Pounds)	Large Mesh Species (Pounds)	Offshore Hake (Pounds)	Silver Hake (Pounds)	Red Hake (Pounds)	Squid (Pounds)	Shrimp (Pounds)	Small Mesh Species (Pounds)
Belford, NJ	2.71%	0.03%	0.00%	31.48%	28.69%	24.81%	0.00%	21.31%
Cape May/Wildwood, NJ	1.06%	0.04%	0.00%	39.59%	31.27%	1.77%	0.00%	2.67%
Gloucester, MA	3.10%	0.03%	0.00%	43.15%	37.18%	35.91%	0.00%	0.58%
Greenport, NY	46.59%	1.41%	30.00%	61.92%	50.62%	27.86%	0.00%	17.02%
Montauk, NY	17.72%	0.60%	38.85%	43.25%	35.64%	18.41%	0.00%	16.90%
Other Northern New England	0.71%	0.08%	0.00%	50.08%	44.17%	2.47%	0.00%	0.51%
Other Southern New England	2.53%	0.04%	9.80%	62.70%	61.73%	2.59%	0.66%	0.62%
Portland, ME	6.10%	0.25%	0.00%	83.76%	85.15%	54.66%	0.00%	0.31%
Point Judith, RI	13.81%	0.23%	37.57%	52.52%	34.41%	13.35%	1.72%	9.93%
Point Pleasant, NJ	2.56%	0.02%	29.90%	30.16%	29.27%	11.59%	0.00%	14.41%
Provincetown, MA	9.03%	0.72%	0.00%	33.64%	37.10%	20.06%	0.00%	22.13%
Shinnecock/ Hampton Bays, NY	18.60%	0.21%	0.00%	56.96%	41.07%	13.29%	7.58%	20.18%
	VALUE ($)	VALUE ($)	VALUE ($)	VALUE ($)	VALUE ($)	VALUE ($)	VALUE ($)	VALUE ($)
Belford, NJ	4.17%	0.04%	0.00%	31.45%	28.29%	25.13%	0.00%	23.29%
Cape May/Wildwood, NJ	1.02%	0.05%	0.00%	42.40%	34.09%	2.97%	0.00%	3.27%
Gloucester, MA	2.67%	0.02%	0.00%	45.66%	38.19%	34.60%	0.00%	1.13%
Greenport, NY	36.42%	0.85%	30.00%	61.25%	50.72%	27.93%	0.00%	18.86%
Montauk, NY	10.29%	0.17%	38.98%	43.91%	35.31%	18.46%	0.00%	16.91%
Other Northern New England	0.28%	0.05%	0.00%	50.11%	44.33%	2.33%	0.00%	1.14%
Other Southern New England	1.84%	0.04%	3.54%	62.92%	62.00%	3.91%	0.37%	2.12%
Portland, ME	3.57%	0.19%	0.00%	84.31%	84.76%	46.80%	0.00%	0.39%
Point Judith, RI	10.27%	0.15%	37.47%	50.07%	33.92%	14.07%	1.05%	15.17%
Point Pleasant, NJ	1.93%	0.02%	29.91%	30.11%	28.81%	11.35%	0.00%	17.73%
Provincetown, MA	3.67%	0.35%	0.00%	32.72%	36.27%	16.38%	0.00%	22.84%
Shinnecock/ Hampton Bays, NY	14.56%	0.19%	0.00%	58.58%	41.77%	13.28%	7.86%	18.84%

E.7.4 SOCIAL IMPACTS OF THE PROPOSED MANAGEMENT ACTION

The primary objective of this section is to analyze and discuss the potential social impacts of the proposed management alternatives to rebuild stocks of whiting and red hake. However, there are some limitations to this analysis. First, data from quantitative social impact analyses in the New England and Mid-Atlantic regions are lacking. A few community studies have been conducted throughout the region (see Aguirre International (1996) and McCay et. al (1993)), but the information contained in those studies is mostly qualitative (descriptive port information), and studies in the New England region tend to focus on communities involved in groundfish fisheries. Several port communities involved in whiting fisheries do not contain a substantial groundfish fleet, and therefore, there is even less information available for those communities. Additionally, assessment of the potential social impacts of management alternatives is hampered by a lack of consistent, long-term data collection on the small-scale fleet. Mid-range and small vessels, especially those that fish day trips and are opportunistic (switching gear and species as the season, availability, and inclination dictate), are particularly underrepresented in the collection of statistics on catch rates and earnings. Unfortunately, these vessels represent a large portion of vessels that target whiting and other small mesh species during some part of the year.

Two proposals for funding under the Northeast Marine Fisheries Initiative (MARFIN) have recently been approved; they are: "*Development of an input-output model for social economic impact assessment of fisheries regulations in New England*" (Hoagland and Kite-Powell, WHOI) and "*Development of fishing community profiles on the coastal New England states*" (Chryssostomidis and Hall-Arber, MIT). These two studies are complementary, and when taken together, they should provide the synergy needed to advance the Council's capabilities to address the socioeconomic requirements of the Magnuson-Stevens Act for fisheries in New England. As the results of these studies become available, the Council may reconsider the Social Impact Assessments provided in current management plans.

Second, since the actual social impacts of fisheries regulations depend on how individuals and organizations react to new requirements and tasks, they never can be fully determined before regulations are implemented. In some cases, general predictions cane be made, and the distribution of impacts can be estimated. This impact analysis can provide an estimation of the likely outcomes of proposed actions, and it is therefore an informed prediction and should be viewed within that context.

This analysis builds on information provided in Section E.6.5, the Affected Human Environment. Social factors specific to fishing communities are described throughout Sections E.6.5.5.1, E.6.5.5.2, E.6.5.5.3, and E.6.5.5.4. This assessment also contains information collected through interviews with industry participants, notes from public meetings, and NMFS databases: permit files, the commercial fisheries "weigh-out" data, logbook data, and sea sampling data.

Negative social consequences of management actions usually result from the following:

1. Decreases in income
2. Changes in the structure of the fishery
3. Displacement from the fishery
4. Negative impacts on job satisfaction levels resulting from 1, 2, and 3 above
5. Perceptions of the rules as "bad" or "unfair" in terms of their potential impacts (Pollnac and Littlefield, 1983).

These issues will be addressed in the context of the proposed management action (versus the status quo).

E.7.4.1 Social Impacts of Status Quo/No Action

Current management measures for small mesh multispecies fisheries have been identified as incapable of ending overfishing and rebuilding whiting and red hake stocks. As the resource continues to decline (see Section E.7.2.1.2 for landings, yield, and revenues projections from the status quo), the social impacts of maintaining the status quo will worsen. Industry revenues will continue to decline as catch rates and stock biomass falls to lower levels.

Almost all small mesh multispecies fishermen agree that whiting stocks (in particular) are in bad shape and that management action should be taken. Fishermen talk about historical fishing areas that no longer hold the abundance of fish that once supported small mesh multispecies fisheries. They also note the disappearance of inshore stocks and consequently, the inshore small mesh fisheries. Some recount times when whiting were so abundant that people could easily catch numbers of them right from the shore. Industry participants also recall times when whiting and red hake were processed for industrial and other uses at many plants throughout New England and the Mid-Atlantic. However, the decrease in whiting, red hake, and other stocks has already caused almost all of the plants that once processed small mesh multispecies to close.

Many fishermen have expressed disappointment with the Council for not implementing a management plan to protect whiting years ago. They said that they have been asking the Council for years to manage effort in whiting fisheries, particularly as whiting evolved as an "underutilized" species and an "alternative" fishery for groundfish vessels to pursue during times of depleted groundfish stocks. Ironically, the groundfish situation itself was the primary diversion of the Council's attention away from whiting and other small mesh multispecies.

Many fishermen have blamed the emergence of the juvenile whiting export market (and the juvenile whiting fishery) for the recent decline in whiting abundance. While vessels in all areas target small whiting to some degree, vessels in the Gulf of Maine have taken most of the blame because they use a 40 mm grate that selects for small whiting. Opponents of the grate fishery suggest that a targeted juvenile whiting fishery which has developed and expanded since 1990 caused a tremendous decrease in the abundance of spawning fish available every year. However, this claim has not been proven; juvenile whiting discards have historically been high, and the emergence of a juvenile fishery may simply provide the opportunity for those vessels that traditionally discarded small whiting to profit from what was once considered bycatch.

Some fishermen believe that there are factors other than fishing which are affecting the health of small mesh multispecies resources, the impacts of which have not been fully acknowledged or considered. These include (but are not limited to): inshore pollution, acid rain, toxic ocean dumping, habitat degradation, and disruption of nearshore nursery grounds. Others suggest that whiting and red hake stocks are fluctuating due to natural variability and that the current downtrend will naturally turn itself around. Still others maintain that these stocks, particularly red hake stocks, migrate extensively due to their dependence on temperature, depth, and food availability. They feel that the stocks have not decreased in abundance, but they have moved to other areas perhaps not considered in abundance surveys.

Regardless of who or what is responsible for the stocks' condition, without regulations (an enforcement of the regulations), pressure on the stocks would continue with resulting decreases in yield that could lead to more business failures and bankruptcies.

E.7.4.2 Social Impacts of the Proposed Management Action

The 63% reduction in exploitation required to end overfishing and rebuild whiting and red hake stocks dispirits many fishermen, partly because they do not believe that stock increases and market responses will occur fast enough for them to profit from small mesh multispecies fisheries. Another reason for their doubt is that many feel that enforcement of some of the management proposals will not be strict enough to ensure compliance and therefore, recovery. Some fishermen mention other impediments to stock recovery such as the impacts of pollution, habitat destruction, and climatic changes that have lead to slow changes in water temperature. These factors may contribute to the stock conditions, but scientists generally concur that overfishing is currently the greatest problem.

Perhaps the most negative social impacts resulting from this management program will stem from the lack of available scientific information about these stocks. Fishermen lack confidence not only in the assessment of overfishing on these stocks, but also in the requirement for a 63% reduction in exploitation. They feel that this estimate of necessary reduction is based on data that is both incomplete and inconclusive. This should not be surprising, given the quality of data that are currently available to make these types of assessments for silver hake and red hake. This general lack of confidence in the process used to determine that silver hake and red hake are overfished and that a 63% reduction in exploitation is necessary could ultimately lead to a negative perception of small mesh multispecies management despite general agreement that management of these species is necessary.

To offset negative perceptions of management stemming from the lack of updated stock assessment information, the Council chose to implement a management program that reduces fishing mortality (and therefore whiting exploitation) 63% over a four-year period. The measures proposed for Years 1 – 3 are projected to reduce whiting exploitation by at least 30%, half the amount required to end overfishing and begin stock rebuilding. The Year 4 default measure is projected to reduce whiting exploitation to target levels. The intent of this phase-in reduction is to allow adequate time for the collection of necessary information to re-assess current whiting stock status. When this information becomes available, the Whiting Monitoring Committee will recommend adjustments to either the target reductions in exploitation, the Year 1 – 3 management measures, the Year 4 default measure, or all of the above. The phase-in program allows the Council to minimize the socio-economic impacts of the management program during Years 1 – 3, allows time for the development of updated stock status information, and grants the industry adequate time to prepare for potentially severe reductions if information suggests that the default measure should be implemented for either stock of silver hake.

In general, if whiting stocks rebound very quickly (which they are capable of doing), then the negative social consequences of the management actions will naturally be cushioned. However, both the long-term and short-term effects of effort reduction may be largely determined by economics. If ex-vessel prices for whiting (and red hake) increase because of the possession limit, more vessels will be able to make more money from catching less whiting. The less economic disruption there is, the less likely it is that there will be negative social effects on communities.

E.7.4.2.1 Moratorium on Commercial Permits

The most significant social impacts of this plan may result from limiting access to the small mesh multispecies fisheries. In the past, Northeast and Mid-Atlantic fishermen have expressed concern and dislike about the impacts of limiting entry to fisheries (see Section E.7.3 for Amendments 5 and 7), but limited access has evolved into an established tool in the repertoire of northeast fishery management. Access has already been limited to not only the multispecies fishery, but also the monkfish and scallop fisheries.

In general, two opinions exist about limiting access to small mesh multispecies fisheries. First, many fishermen have expressed support for a small mesh multispecies permit moratorium because it will protect those fishermen with an established commercial interest in small mesh multispecies fisheries. The markets for whiting and red hake are very limited and can only support a limited amount of product. Increased participation in small mesh multispecies fisheries has occurred in response to increased restrictions in other multispecies fisheries. Fishermen have entered small mesh multispecies fisheries seeking alternatives to fishing for cod, haddock, yellowtail flounder, and other depleted groundfish stocks. As a result, historical small mesh fishermen are finding it more difficult to profit from species like whiting, a species whose ex-vessel price responds dramatically to market supply. These fishermen have expressed to the Council on numerous occasions that open access to small mesh multispecies fisheries is no longer a viable option for the industry.

Another side, however, opposes a permit moratorium for a variety of reasons. Many people in the fishing communities feel strongly that a viable fishery depends on the availability of permits to young fishermen. Without a perceived opportunity for advancement, some fishermen fear that it will be more difficult to hire reliable and skilled crew. (The perception may be unfounded, however, since individuals are not prevented from entering or leaving the fishery.) This may be a philosophical problem rather than an actual one, however, since the displacement of fishing effort resulting from the regulations may release some experienced crew to the marketplace and may make some permitted vessels available for new owners. In all ports, moratoria are perceived as limiting opportunity for those who do not already own a vessel. For the recent immigrants in Gloucester and other ports, this may be perceived as the loss of a part of the American dream and the fishing “way of life.” Others opponents simply feel that public resources like fisheries resources should remain in the public domain, and specific individuals should not be granted the ability to derive profits from these resources if others cannot.

The proliferation of moratoria in various fisheries could limit fishermen's flexibility, a serious economic and psychological impediment to those who traditionally shift gear and species depending on season, weather, market conditions and personal circumstances. Communities in New York, New Jersey, and southern New England may be impacted most severely by the proposed moratorium, since it is these areas that harbor the majority of "opportunistic" (mixed trawl) fishermen.

Some fishermen also feel that limited access deprives them of the freedom to choose how, where, and when to fish. Emerging social and political issues can certainly affect the success of limited access management. If fishermen perceive the rules as "unfair" or "bad," then non-compliance, a negative social consequence in itself, can produce additional negative social consequences. Also, under limited access management, conflicts are more likely to evolve between those obeying the rules and those breaking the rules. The result can be an atmosphere of lawlessness and the development of a system perceived as "unfair." In the most extreme cases, a mass alienation from the system can produce more negative feedback, an increase in negative attitudes about management, and increased non-compliance (Pollnac and Littlefield, 1983). However, these perceptions are not evident in Northeast and Mid-Atlantic small mesh multispecies fisheries. A majority of the industry supports the implementation of a moratorium in this case.

It should be noted that, in general, moratoria are not intended to be permanent measures. They are usually "emergency" management measures implemented to address rapid declines in fish populations and are perceived as temporary fixes. Historically, moratoria have provided the backbone for implementation of permanent limited access systems in fisheries. The motivation to restrict entry via a moratorium is often based on the desire to not worsen an already bad situation. Such is the case with the moratorium proposed in this document.

E.7.4.2.1.1 Analysis of Qualifiers

The moratorium qualification criteria consist of both poundage (combined total landings of silver hake, red hake, offshore hake, and ocean pout) and permit components. The numbers of qualifiers were determined in the following manner:

STEP 1. Construct a data set containing total documented landings by any vessel for the time period January 1, 1980 to December 31, 1997. Dealer weighout data were used for calculating landings through December 31, 1993. For the calendar years 1994 to 1997, a combination of dealer and vessel trip report (VTR) data were used. Specifically, landings in the dealer and VTR data were independently summed, and the greater of the dealer or VTR data were used for purposes of estimating landings for 1994 – 1997. Based on the poundage criterion alone, a total of 2,708 vessels are identified as having combined landings of at least one pound of small mesh multispecies (and/or ocean pout) from 1980 to 1997. Of those vessels, 611 have documented landings in excess of 50,000 pounds over the same time period. The number of vessels by cumulative landings intervals are reported in **Table E.105**.

Table E.105 Number of Vessels by Cumulative Landings Intervals from 1/1/80 to 12/31/97

LANDINGS INTERVAL 1/1/80 – 12/31/97 (POUNDS)	NUMBER OF VESSELS
< 20,000	1879
20,000 to 34,999	138
35,000 to 49,999	80
50,000 to 74,999	79
75,000 to 99,999	51
100,000 to 249,999	144
250,000 to 499,999	91
500,000 to 999,999	71
1,000,000 +	175

STEP 2. Construct a data set of vessels that currently hold a valid multispecies permit. The NMFS permit files were queried on December 17, 1998 to estimate the number of current multispecies permit holders. As of this date, there were 3,423 vessels that held a valid open access or limited access multispecies permit. A breakdown of permits by category is provided in **Table E.106**. Note that the data shown in **Table E.106** include vessels that held a valid multispecies permit on the date that the permit records were queried. Vessels may apply for permits at any time, and permits may be temporarily suspended due to permit sanction or other action. This means that, as defined in the moratorium language, the number of "current" permit holders will differ from that reported in **Table E.106** upon implementation of this amendment.

Table E.106 Number of Vessels Possessing a Valid Multispecies Permit as of December 17, 1998

MULTISPECIES PERMIT CATEGORY	NUMBER OF VESSELS
Limited Access Category A (Individual DAS)	137
Limited Access Category B (Fleet DAS)	1,236
Limited Access Category C (Less than 30 feet)	12
Limited Access Category D (Hook - Only)	196
Limited Access Category E (Combination)	44
Limited Access Category G (Large Mesh Fleet DAS)	18
Open Access Category H (Hand Gear)	1,233
Open Access Category I (Charter/Party)	244
Open Access Category J (Scallop Possession Limit)	190
Open Access Category K (Non-regulated Multispecies)	113

STEP 3. Construct a data set of vessels that held a valid multispecies permit on or before the control date (September 9, 1996). The NMFS permit files were queried on December 17, 1998 to identify all unique vessels that had been issued a multispecies permit of any kind up until and including the 9/9/96 control date. Based on this query, a total of 13,168 multispecies permits were issued to unique vessels in the Northeast region between February 1979 and September 9, 1996. This number includes vessels that were issued groundfish permits between February 1979 and October 1986. After October 1986, groundfish permits were converted to multispecies permits.

STEP 4. Construct a data set for all vessels that participated in either the whiting raised footrope trawl or the whiting separator trawl (grate) experimental fishery. The list of vessels and their participation period were matched against VTR data to estimate cumulative reported poundage of small mesh multispecies during each vessel's participation period. There were a total of 111 vessels that participated in the whiting experimental grate fishery, 61 of which landed at least 1,000 pounds of combined small mesh multispecies (and/or ocean pout) during their participation period. There were a total of 38 unique vessels that participated in the raised footrope trawl experimental fishery, administered principally through the Massachusetts Division of Marine Fisheries (DMF). Of these vessels, all 38 landed in excess of 1,000 pounds of combined small mesh multispecies during their participation period. Landings by vessel in this experimental fishery were provided by Massachusetts DMF staff.

STEP 5. Merge the data created in Steps 1 – 4 (above) to estimate the numbers of qualifiers and non-qualifiers. The merged data sets result in a total of 13,976 unique vessels that at least held a permit prior to the 9/9/96 control date or hold a current multispecies permit, or had documented landings of small mesh multispecies (and/or ocean pout) in NMFS dealer or VTR data files. These data are summarized in **Table E.107**.

In order to qualify for a limited access small mesh multispecies moratorium permit of either kind (small mesh multispecies or possession limit permit), a vessel must meet three conditions: landings history, possession of a current multispecies permit, and possession of a multispecies permit on or before the 9/9/96 control date. The various possible permit and landings combinations form the row and column headings respectively in **Table E.107**. Of the 13,976 vessels included in the analysis, 1,406 meet all three conditions to qualify for a moratorium permit. Four hundred fourteen qualify for a limited access small mesh multispecies permit, and 992 qualify for a limited access small mesh multispecies possession limit permit. This estimate must be considered preliminary since permit status could change at any time prior to implementation of the Amendment and numbers of qualifiers could change through an appeal based upon permit status or provision of acceptable landings documentation. For example, any one of the 986 vessels that have sufficient documented landings and held a permit prior to the control date could qualify for a limited access moratorium permit (202 vessels) or a possession limit permit (784 vessels) as long as they obtain a multispecies permit prior to the implementation date. The number of qualifiers based on landings history is most likely to change among under tonnage (less than 5 GRT) vessels. Landings by these vessels could not be uniquely identified until 1994. Thus, the period over which history could be established for under tonnage vessels was 1994 to 1997 instead of the full 17 year period used for all other vessels. For example, of the 1,507 vessels have both a current permit and held a permit prior to the control date 530 vessels were less than 5 GRT and could end up qualifying for either a possession limit or a limited access permit upon appeal.

Table E.107 Number of Vessels By Landings Criterion and Permit Criterion: 1/1/80 – 12/31/97

Landings Criterion	Current Permit and Control Date Permit	Current Permit but No Control Date Permit	Control Date Permit but no Current Permit	No Control Date Permit and No Current Permit
No Landings History	1,507 (530)[a]	492 (298)	9,269 (5,857)	0
Possession Limit Permit	**992 (117)**	18 (11)	784 (43)	274 (1)
Small Mesh Multispecies Permit	**414 (11)**	0	202 (3)	24

a Numbers in parentheses denote number of under tonnage vessels.

Table E.108 and **Table E.109** report qualifiers and non-qualifiers by vessel length category and home port state respectively. Of the 414 qualifiers for a limited access small mesh multispecies permit, the majority (4%) are vessels 50 to 70 feet in length. One hundred thirty two (32%) are vessels over 71 feet in length overall, and 103 (25%) are vessels 49 feet or less. By contrast, of the 992 limited access small mesh multispecies possession limit permit qualifiers, the majority (58%) are vessels less than 49 feet in length overall. Medium-sized vessels (50 to 70 feet) comprise the smallest portion of possession limit permit qualifiers (less than 19%), and large vessels (more than 71 feet in length overall) comprise 22% of the total qualifiers.

Table E.109 reports qualifiers and non-qualifiers by home port state. Home port state is a self-reported category, usually chosen by the vessel owner as the state where the vessel is most often docked when not fishing. Of the 414 qualifiers for a limited access small mesh multispecies permit, over one fourth are home-ported in the state of Massachusetts (110). Maine and Rhode Island tie for second among limited access small mesh multispecies permit qualifiers with 81 home port vessels, followed by New York (59), New Jersey (52), and New Hampshire (13). Of the 992 qualifiers for a limited access small mesh multispecies possession limit permit, the most come from Massachusetts (388). Maine ranks second in this category as well with 166 home port vessels that qualify for this permit. New Jersey ranks third with 101 home port vessels, followed by New York (91) and Rhode Island (58). Although the state of Rhode Island ranks second in limited access small mesh multispecies permit holders, it does not contain a proportionate number of limited access small mesh multispecies possession limit permit qualifiers. This suggests that vessels home ported in Rhode Island have generally participated in higher volume small mesh multispecies fisheries, landing enough to qualify most vessels for the "directed" small mesh multispecies permit. Interestingly, North Carolina ranks sixth with 56 home port vessels qualifying for a limited access small mesh multispecies possession limit permit. These results illustrate that the proposed moratorium does indeed capture historical small mesh multispecies activity; North Carolina has not documented significant landings of small mesh multispecies since the mid-1980s. However, fishermen in North Carolina have expressed interest in continued access to fishing opportunities for small mesh multispecies.

Table E.108 Summary of Qualifiers and Non-Qualifiers by History and Permit Requirements and by Vessel Length Category

	No Small Mesh Multispecies History				Small Mesh Multispecies History (< 50,000 Pounds)				Small Mesh Multispecies History (>= 50,000 Pounds)			
VESSEL LENGTH	**Current & Control Date**	**Current Only**	**Control Date Only**	**No Permits**	**Possession Limit Qualifiers**	**Current Only**	**Control Date Only**	**No Permits**	**Limited Access Qualifiers**	**Current Only**	**Control Date Only**	**No Permits**
49 Feet and Under	1224	473	8345	0	579	16	378	236	103	0	44	18
50 to 70 feet	121	12	497	0	187	2	210	24	175	0	104	3
71 Feet or Greater	158	4	414	0	218	0	193	13	132	0	53	3
Unknown	4	3	13	0	8	0	3	1	4	0	1	0
TOTAL	1507	492	9269	0	**992**	18	784	274	**414**	0	202	24

Table E.109 Summary of Qualifiers and Non-Qualifiers by History and Permit Requirements and by Home Port State

	No Small Mesh Multispecies History				Small Mesh Multispecies History (< 50,000 Pounds)				Small Mesh Multispecies History (>= 50,000 Pounds)			
STATE	**Current & Control Date**	**Current Only**	**Control Date Only**	**No Permits**	**Possession Limit Qualifiers**	**Current Only**	**Control Date Only**	**No Permits**	**Limited Access Qualifiers**	**Current Only**	**Control Date Only**	**No Permits**
Connecticut	36	9	246	0	**17**	0	6	1	**10**	0	2	0
Delaware	7	7	49	0	**2**	0	2	1	**0**	0	0	0
Massachusetts	716	230	4045	0	**388**	1	256	16	**110**	0	89	2
Maryland	0	6	31	0	**11**	1	8	5	**3**	0	1	0
Maine	206	74	1553	0	**166**	0	159	5	**81**	0	35	0
North Carolina	16	4	108	0	**56**	0	48	1	**1**	0	2	0
New Hampshire	57	21	507	0	**55**	3	28	3	**13**	0	1	1
New Jersey	148	35	808	0	**101**	5	84	28	**52**	0	21	1
New York	170	40	935	0	**91**	7	62	17	**59**	0	10	0
Rhode Island	118	31	591	0	**58**	0	51	4	**81**	0	32	1
Virginia	27	31	111	0	**42**	0	63	5	**2**	0	6	1
Other or Unknown	6	4	285	0	**5**	1	17	188	**2**	0	3	18

Table E.110 provides information about non-qualifiers, specifically the most recent year that non-qualifiers who possessed a valid multispecies permit as of the 9/9/96 control date held a multispecies permit. Of the 202 non-qualifiers who have enough landings history for the limited access small mesh multispecies permit (50,000 pounds), only 50 have possessed a valid multispecies permit since 1995. These 50 vessels are the most likely to still qualify for a limited access small mesh multispecies permit by obtaining a multispecies permit before the implementation of this amendment. Ninety two of these non-qualifiers have not possessed a multispecies permit since 1989 or earlier; these vessels have most likely moved to other areas, switched fisheries, or exited the fishing industry altogether. They are the least likely vessels to obtain a current multispecies permit in order to qualify for a limited access small mesh multispecies permit. Of the 784 non-qualifiers who have enough landings history for a limited access small mesh multispecies possession limit permit (1 pound), only 190 possessed a valid multispecies permit since 1995. These vessels are the most likely to still qualify for a limited access small mesh multispecies possession limit permit by obtaining a valid multispecies permit before this amendment is implemented. Three hundred twenty eight of these vessels have not possessed a valid multispecies permit since 1989, indicating that these vessels have probably exited the fishery (or the industry) and are unlikely to try to obtain a limited access small mesh multispecies possession limit permit.

Table E.110 Most Recent Year That Non-Qualifier With a Control Date Permit Held a Valid Multispecies Permit

YEAR	No Small Mesh Multispecies History	Small Mesh Multispecies History < 50,000 Pounds	Small Mesh Multispecies History >= 50,000 Pounds
Pre- 1987	2948	241	60
1987	322	24	8
1988	549	46	13
1989	288	17	11
1990	277	23	8
1991	500	32	13
1992	752	45	6
1993	1034	87	15
1994	452	18	5
1995	823	61	13
1996	878	117	20
1997	446	73	30
TOTAL	**9269**	**784**	**202**

E.7.4.2.1.2 Moratorium Conclusions

It appears that the qualification criteria associated with the proposed moratorium minimizes the negative social consequences of limiting access to fisheries. In general, most people favor limiting access to small mesh multispecies fisheries. When combined with the "sunset provision," the proposed moratorium qualifies vessels in every significant whiting port and maintains some level of access for almost every vessel that landed one pound of small mesh multispecies between 1995 and 1997. It also allows for non-qualifying multispecies permit holders to obtain access to the fishery once the objectives of the plan are met. In addition, a significant proportion of non-qualifiers can still obtain an open access multispecies permit before this amendment is implemented in order to qualify for a limited access small mesh multispecies permit.

E.7.4.2.2 Mesh Requirements and Possession Limits

Fishermen's views on mesh increases are generally based on what they perceive the change will do to their income, not that the measure itself holds some socially or culturally undesirable characteristic. Gear changes often do require capital outlays which may be difficult for fishermen to afford, especially if their revenues have already been decreased by cutbacks in other fisheries as well as the decrease in small mesh species resources.

In general, possession limits can affect the structure of a fishery. If they are set very low, the inshore portion of the fleet can usually manage to fish economically, while the offshore portion of the fleet cannot cover trip expenses. This changes the structure of financial rewards generated in the fishery and can ultimately change the short and long-term structure of the fishery itself.

The anticipated problem with possession limits is that because whiting is such a high volume fishery, large tows (especially as the stocks recover) will result in more fish than the possession limit; fishermen will be forced to discard. The impacts of this could diffuse through the entire fleet by slowing (or perhaps even reversing) the recovery of the stocks. However, the general industry reaction to a whiting/offshore hake possession limit has been positive. Many fishermen feel that a possession limit is necessary to provide market stability and increase profits from fishing for small mesh multispecies. Vessels participating in the Cultivator Shoal Whiting Fishery support a possession limit for whiting, and their trips usually land the highest volumes.

The mesh size/possession limit categories proposed for Years 1 – 3 maximize fishermen's flexibility and allow for most fishermen to maintain their current fishing practices in other fisheries. This should minimize the adverse social impacts of the Year 1 – 3 measures. Fishermen will not be forced to purchase mesh they do not currently use unless they choose to fish in a new mesh size category. Allowing fishermen to choose how they want to fish may lessen the negative perception of whiting management measures and should not lead to an increase in negative perceptions of job satisfaction.

E.7.4.2.3 The Year 4 Default Measure

The Year 4 default measure, if implemented, is projected to have more severe negative social consequences than the measures proposed for Years 1 – 3. Section E.7.3 illustrates that the economic impacts of the Year 4 default measure are expected to be more significant not only for vessels participating in small mesh multispecies fisheries, but also for vessels participating in other fisheries. It is the economic impacts of the Year 4 default measure on other fisheries that are likely to generate increased social impacts. Fishermen in other fisheries, particularly other small mesh fisheries, will probably experience decreased income from the implementation of the default measure. As a result, management measures for small mesh multispecies may be perceived as "bad" or "unfair." From this, negative perceptions of job satisfaction could arise. In addition, the default measure is likely to exacerbate problems with displaced effort in other fisheries.

E.7.4.2.4 Conclusions

The social impacts of the proposed management action will fall the hardest on the communities that depend most heavily on small mesh multispecies fisheries in the Exclusive Economic Zone (EEZ). Most of these communities are located in southern New England and the Mid-Atlantic, in the states of Rhode Island, New York, and New Jersey. Some communities likely to experience the most severe impacts include, but are not limited to, Montauk (NY), Point Judith (RI), Greenport (NY), Hampton Bays (NY), and Point Pleasant (NJ).

In addition to the types of fishing vessels which populate important small mesh multispecies ports, the level of social impacts is determined by the dependence of communities on fishing in terms of its social and cultural values. For example, in communities where self-employment through fishing is highly regarded as a traditional "way of life," the loss of opportunities to fish can be expected to have a greater impact.

In general, small mesh multispecies are part of a larger complex of mixed trawl fisheries and are not always the primary focus of fishing vessels. Most vessels that fish for small mesh multispecies are flexible and switch target species and fisheries on a seasonal basis. To the extent that fleets can maintain their flexibility, switch fisheries, and adapt to the regulations, the social impacts of the proposed management action will be lessened in the short term. In the long term, the recovery of small mesh multispecies has the potential to create greater economic opportunities in small mesh multispecies fisheries than any of the affected vessels have experienced. Negative social impacts resulting from the proposed management action are likely to be replaced with positive impacts resulting from rebuilt stocks and healthy, thriving small mesh multispecies fisheries.

6.2 E.O. 12866: REGULATORY IMPACT REVIEW

6.2.1 Introduction and Background

The Regulatory Impact Review (RIR) provides an assessment of the costs and benefits of proposed action and other alternatives in accordance with the guidelines established by Executive Order 12866. The regulatory philosophy of Executive Order 12866 stresses that, in deciding whether and how to regulate, agencies should assess all costs and benefits of all regulatory alternatives and choose those approaches that maximize net benefits to the society.

The RIR also serves as a basis for determining whether any proposed regulations are a "significant regulatory action" under the criteria provided in Executive Order 12866 and whether the proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act of 1980 (RFA), as amended in 1996. This RIR summarizes the effects of the proposed management plan and other alternatives considered in this amendment to end overfishing on whiting and rebuild the resource. This amendment document and accompanying EIS contain all of the elements of the RIR/RFA, and the relevant sections are referenced.

6.2.2 Statement of the Problem

The statement of the problem is presented in Section 3.2 of this combined document.

6.2.3 Management Objectives

The management objectives of this amendment are identified and discussed in Section 3.2.3 of this combined document.

6.2.4 Management Alternatives

The proposed management action is described in Section 4.0 of this combined document. Alternatives to the proposed action are described in Section E.5.2 of this combined document.

6.2.5 Impacts of Management Alternatives

The economic analysis of the proposed management action relative to the status quo is contained in Section E.7.3 of this combined document. Subsections of the economic analysis are as follows:

Section E.7.3.1	Bioeconomic Analysis of the Proposed Management Action (Cost-Benefit Analysis)
Section E.7.3.2	Impacts on Small Business
Section E.7.3.3	Impacts on Important Commercial Small Mesh Multispecies Ports

The economic impacts of the non-selected alternatives are discussed in **Appendix III,** *A Bioeconomic Analysis of Whiting Amendment Fishery Management Options (Report to the New England Fishery Management Council).*

6.2.6 Enforcement Costs

The management measures for small mesh multispecies, including the combined possession limits and mesh restrictions, will increase the enforcement burden. From a budgetary or accounting perspective, the cost of enforcing the small mesh multispecies regulations is equal to the cost in terms of personnel and ship time allocated to monitoring and enforcing the small mesh multispecies trip limits and mesh regulations. However, from an economic perspective, given a fixed enforcement budget, these costs are transfer payments and are not measures of the economic value of enforcement services.

Enforcement services have value, and adding new enforcement responsibilities necessarily takes away from enforcement services that are devoted to other fisheries. Enforcement benefits are measured by the contribution that the deterrent effect has on individual compliance behavior which, in turn, affects the effectiveness of fishery management objectives. The economic cost of any added enforcement burden is measured by the benefits that are foregone by diverting enforcement services away from any existing enforcement activities to the newly added enforcement requirements. Unfortunately, no empirical studies have been conducted to measure the deterrent effect of marine fisheries enforcement activity in the Northeast region, so a quantitative estimate of the enforcement cost of the small mesh multispecies regulations is not possible at this time.

6.2.7 Determination of Significant Regulatory Action

Executive Order 12866 defines a “significant regulatory action” as one that is likely to result in:

(1) an annual effect on the economy of $100 million or more or one which adversely affects in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or state, local, or tribal governments or communities;

(2) a serious inconsistency or interference with an action taken or planned by another agency; or

(3) novel legal or policy issues arising out of legal mandates, the President’s priorities, or the principles set forth in the Executive Order.

The economic benefits and costs of the proposed management measures are discussed in detail in Sections E.7.2.3, E.7.3.1, E.7.3.2, and E.7.3.3. The net benefits of the proposed measures are summarized below.

In general, fishery revenues from the northern stock of silver hake are projected to decline from base year levels, while revenues from the southern stock are projected to increase. Percent differences from the base year in median nominal gross revenues by market category are shown in **Figure E.49** and **Figure E.50** for the northern and southern areas respectively. Revenues from the juvenile and round market categories are projected to stabilize at about 65% of base year levels by Year 4 in the northern stock. In contrast, juvenile and round revenues from the southern stock are predicted to increase (after an initial decline) to about 200 and 150% respectively. In both stocks, revenues from the king market category are projected to increase substantially.

The percent difference in median discounted returns net of operating costs is presented in **Figure E.51**. In the northern area, the proposed management action results in a consistent upward trend in discounted net returns to Year 4, when they are projected to stabilize at approximately 60% higher than the base year. The stable trajectory for discounted net returns (in Year 4 and beyond) indicates that, in nominal terms, returns for the northern area are increasing at approximately the same rate as the discount rate (7%). In the southern area, on the other hand, discounted net returns under the proposed action are projected to increase throughout the simulation period relative to the base year. This means that net returns in the southern area are increasing at a much faster rate than the discount rate. The proposed management action is projected to result in a less than one percent chance of net returns less than zero, and a 99% chance of net returns greater than or equal to zero **Figure E.52**.

The economic performance of the proposed management action relative to the status quo is illustrated in **Figure E.53**. At the simulation medians, the present value of the proposed management action exceeds that of the status quo by approximately $137 million.

The bioeconomic model indicates that there would be short run losses in net returns to vessels that participate in small mesh multispecies fisheries under the proposed management action. The fishery impact assessment indicates that the cumulative losses in gross revenues for the first three years of plan implementation would be approximately $13.3 million, an annual average of $4.4 million on a coast-wide basis. Similarly, if the Year 4 default measure is implemented, the estimated cumulative revenue losses would be $30.2 million, or an annual average of $10.1 million on a coast-wide basis.

The estimated reductions in gross revenues would not have an annual effect on the economy that exceeds $100 million. Further, the proposed management measures do not create serious inconsistencies with actions taken or planned by another agency, nor do the proposed measures create any novel legal or policy issues. Therefore, the proposed management measures would not be considered a significant regulatory action for purposes of E. O. 12866.

6.3 INITIAL REGULATORY FLEXIBILITY ANALYSIS (IRFA)

6.3.1 Introduction and Background

The purpose of the RFA is to reduce the impacts of burdensome regulations and recordkeeping requirements on small businesses. To achieve this goal, the RFA requires government agencies to describe and analyze the effects of regulations and possible alternatives on small business entities. On the basis of this information, the Initial Regulatory Flexibility Analysis (IRFA) determines whether the proposed action would have a "significant economic impact on a substantial number of small entities."

The main elements of the RFA are discussed in several sections of this combined document, and the relevant sections are reference throughout the RFA. The following discussion summarizes the consequences for small businesses of the proposed action in small mesh multispecies fisheries.

6.3.2 Statement of the Problem

The statement of the problem is presented in Section 3.2 of this combined document.

6.3.3 Management Objectives

The management objectives of this amendment are identified and discussed in Section 3.2.3 of this combined document.

6.3.4 Management Alternatives

The proposed management action is described in Section 4.0 of this combined document. Alternatives to the proposed action are described in Section E.5.2 of this combined document.

6.3.5 Determination of Significant Economic Impact on a Substantial Number of Small Entities

NMFS considers a "substantial number" of small entities to be more than 20% of those entities in the class. If the effects of the management action fall primarily on a distinct segment of the industry or portion thereof (user group, gear type, geographical area, for example), that segment is considered the class for the purposes of this criterion.

NMFS has determined that economic impacts are significant for the purposes of the RFA if any of the following criteria are met:

- (a) the regulations are likely to result in more than a five percent decrease in annual gross revenues,
- (b) annual compliance costs (i.e. annualized capital, operating, reporting) increase total costs of production by more than five percent,
- (c) compliance costs as a percent of sales are ten or more percent higher for small entities than compliance costs for large entities,
- (d) capital costs of compliance represent a significant portion of capital available to small entities, considering internal cash flow and external financing capabilities, or
- (e) the requirements of the regulations are likely to result in two or more percent of the small entities affected being forced to cease business operations.

The economic impact analysis presented in Section E.7.3 serves as the basis for determining whether one or more of these criteria would be exceeded. Based on these analyses and the assumptions embedded therein, criterion (a) was found to be exceeded for small commercial fishing entities under the Year 4 default measure. Also, criterion (e) was found to be exceeded under both the Year 1 – 3 measures and the Year 4 default measure. Therefore, the proposed regulations are found to have a significant economic impact on a substantial number of small entities. The principal bases for this determination are summarized below.

6.3.6 Threshold Analysis

To determine whether any one or more of the criteria cited above are met for a determination of significance under the RFA, an analysis was conducted of the economic impacts on small entities. The data and methods used to conduct this analysis are detailed in Section E.7.3.2 (*Impacts on Small Businesses*) for small entities engaged in the harvest (SIC 0912) of small mesh multispecies and small entities engaged in the seafood wholesale trade sector (SIC 5146). The economic impacts on wholesale seafood dealers are detailed in Section E.7.3.2.2.3. Although seafood dealers are demonstrated to be indirectly impacted as a consequence of the proposed management measures, there are no new proposed regulations that will create a new compliance burden on seafood dealers. Therefore, the above threshold criteria were applied only to commercial fishing vessels. The estimated economic impacts on small mesh multispecies vessels are detailed in Section E.7.3.2.2. The results of the commercial vessel impact analysis, as they pertain to the threshold criteria, are summarized below.

The estimated impacts on gross revenues are reported in **Table 111** for the Year 1 – 3 measures and the Year 4 default measure. The Year 1 – 3 management measures are estimated to reduce gross revenues from all species by more than five percent for 81 vessels (7% of small mesh multispecies fishery participants). Based on these estimates, the Year 1 – 3 management measures would not exceed the revenue threshold. Under the default measure, 222 vessels (approximately 20% of small mesh multispecies fishery participants) are estimated to experience a reduction in gross revenues of five percent or more. Therefore, if the default measure is implemented, it would have a significant economic impact on a substantial number of small entities.

Table 111 Summary of Economic Impacts of Proposed Measures on Small Mesh Multispecies Commercial Fishing Vessels

Reduction in Gross Revenues	Impacted Vessels (Year 1 – 3 Measures)	Impacted Vessels (Default Measure)
Less than 5%	1075	934
5% to less than 10%	28	81
10% to less than 20%	24	75
20% to less than 30%	11	25
30% to less than 40%	7	12
40% to less than 50%	4	9
More than 50%	7	20

Short run and long run profitability are assessed for small mesh multispecies commercial fishing vessels in Section E.7.3.2.2.1 and Section E.7.3.2.2.2 respectively. Based on these analyses, the management measures are estimated to have relatively little impact on short-run break-even. Specifically, of the 1,156 participating vessels, 941 are projected to be able to cover all operating costs under either the Year 1 – 3 measures or the Year 4 default measure. Of the remaining vessels, the majority (213) are estimated to be operating below break-even under the status quo and the Year 1 – 3 measures. Only one vessel is found to be above break-even under the status quo and below break-even under the Year 1 – 3 measures. By contrast, one vessel is estimated to be operating below break-even under the status quo and is estimated to operate above break-even under the Year 1 – 3 measures. The projected results for short run break-even under the Year 4 default measure are similar.

In the short run, vessels may be assumed to be able to maintain business operations provided operating costs can be paid. In the long run, vessels may be able to maintain business operations only if all costs (fixed plus operating) can be paid from gross receipts. Estimated profitability for the Year 1 – 3 and Year 4 default management measures indicate that two percent or more vessels may not be able to operate at positive long run profit upon plan implementation. Specifically, a total of 573 vessels are estimated to operate at positive profit under both the Year 1 – 3 measures and the Year 4 default measure. For the Year 1 – 3 and Year 4 default measures, 518 vessels are estimated to be operating at negative profit under the status quo and either of the management measures. Although the proposed measures will exacerbate the problem, it is not known how many of these 518 vessels might cease business operations whether the proposed measures are implemented or not. Under the Year 1 – 3 measures, a total of 25 vessels (2.2 percent of all small mesh multispecies fishery participants) would be operating at negative profit that are estimated to be earning positive profit under the status quo. Similarly, a total of 61 vessels (5.3 percent of all small mesh multispecies fishery participants) are estimated to operate at negative profit under the Year 4 default measure, compared to positive earnings under the status quo. Therefore, the threshold criterion for business failure is found to be exceeded.

6.3.7 Mitigating Factors

Given available data, the economic impact analysis was conducted as though the management measures were implemented with no corresponding changes in fishing patterns and no improvements in resource conditions. Both of these assumptions are likely to result in estimated economic impacts that may be more severe than when the management measures are actually implemented. Vessel owners do respond to regulations by altering their fishing strategies to make up for at least some portion of revenue losses. By restricting the analysis to observed behavior, the economic analysis does not take these potential effort changes into account.

An additional consideration is the fact that silver hake is a fast-growing species that is expected to respond well to reductions in fishing mortality. Assuming that the management measures accomplish their conservation objectives, the exploitable biomass will increase, and the improved size structure of the population will result in improved productivity (hence lower revenue losses) than that assumed in the economic analysis.

Last, the estimates of affected entities assume that the Year 4 default measure would be implemented as described in the proposed management action. If the Year 1 – 3 measures are more effective than they are projected to be, or if management adjustments are made during Years 1 – 3 to accommodate new information, the Year 4 default measure may not be necessary for one or more of the small mesh multispecies stocks. If this is the case, then the economic impacts may not be as significant as projected.

6.4 ENDANGERED SPECIES ACT (ESA)

Section 7 of the Endangered Species Act requires federal agencies conducting, authorizing, or funding activities that may affect threatened or endangered marine species to ensure that those effects do not jeopardize the continued existence of listed species. The Council has concluded that small mesh multispecies fisheries, as described in Amendment 12 to the Northeast Multispecies FMP, may affect several listed species, but are not likely to jeopardize their continued existence. See Section E.7.2.4 of this combined document for a discussion of the impacts on ESA-listed species.

6.5 MARINE MAMMAL PROTECTION ACT (MMPA)

See Section E.7.2.4 of this combined document for a discussion of the impacts of the proposed management action on marine mammal populations.

6.6 COASTAL ZONE MANAGEMENT ACT (CZMA)

The Council has reviewed the coastal zone management programs for states whose coastal waters are within the range of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina. The Council has determined that the proposed action is consistent with the CZM programs of those states and has sent a notification of this determination, along with a copy of this amendment document, for their concurrence.

No state letters of concurrence with the Council's determination have been received at the time of the submittal of this amendment. Copies of such correspondence will be on file at the Council office.

6.7 PAPERWORK REDUCTION ACT (PRA)

Analyses required by the Paperwork Reduction Act will be submitted under separate cover. Copies are available at the Council office.

7.0 PUBLIC COMMENTS AND RESPONSES

Volume III of this document contains public hearing summaries, written comments submitted during public hearings, and written comments submitted during the 45-day NEPA comment period. Most public comments addressed the moratorium alternatives as well as the alternatives for separate management of the northern and southern management areas. The following paragraphs summarize the nature of comments received at public hearings and during the 45-day comment period. These comments are addressed in their corresponding sections throughout this combined document.

<u>Moratorium on Commercial Permits</u>

Most people favored a moratorium on commercial permits to fish for small mesh multispecies, but comments on the appropriate qualification criteria varied widely. Some favored extremely liberal criteria, and some favored very restrictive criteria. Fishermen currently participating in small mesh multispecies fisheries tended to favor stricter criteria in order to protect the stocks from increased fishing pressure as well as themselves from increased competition in the fishery. Fishermen who historically participated in small mesh multispecies fisheries favored more liberal criteria spanning a longer qualifying time period in order to accommodate vessels that no longer fish for whiting due to the unavailability of the product in inshore areas. Many people testified that the decline in whiting stocks led to an exodus from the fishery in the 1980s and felt that the vessels who lost their opportunity to fish in the 1990s should have the opportunity to fish for small mesh multispecies in the future, as the whiting stocks recover. North Carolina fishermen emphasized that they want to retain access to the small mesh multispecies fisheries in their area, which appear to be extremely variable. Representatives from North Carolina presented state whiting landings which indicated that significant amounts of whiting had not been landed in the state since the early 1980s. In addition, most multispecies fishermen felt that all multispecies permit holders should be granted a limited access small mesh multispecies permit, similar to the criteria established for the multispecies permit moratorium in Amendment 5. They claimed that vessels were able to qualify for a limited access multispecies permit with one pound of whiting landings, and therefore, the same criteria should be applied to the whiting fishery.

Industry representatives from the Gulf of Maine testified that their opportunities to fish for whiting are very limited due to groundfish mesh regulations and the seasonality of the two Small Mesh Areas. In addition, the emergence of two experimental whiting fisheries in the Gulf of Maine (the raised footrope trawl and grate fisheries) has allowed for increased small mesh multispecies fishery participation in the Gulf of Maine only recently. People feared that limiting the qualification criteria to a time before the 9/9/96 control date would exclude vessels that have recently made a significant economic investment in small mesh multispecies fishing through their participation in the experimental whiting fisheries. Due to the emergence of the experimental fisheries since 1995, many thought that these vessels would not be able to qualify for a limited access permit under the proposed landings criteria and suggested that the proposed landings requirements be lowered to accommodate their concerns.

Management of the Cultivator Shoal Whiting Fishery

Most comments about the management proposals for the Cultivator Shoal Whiting Fishery were received during the public hearings. The majority of comments from the industry as well as the Whiting Advisory Panel indicated that June 15 – 30 is an extremely important time for whiting fishing on the Cultivator. Fishermen claimed that whiting market conditions, combined with the unavailability of whiting in other areas during the month of June, usually generate the best prices for whiting, and participants in the Cultivator Shoal Whiting Fishery can make their most profitable trips during the last two weeks of June. Some fishermen suggested that Cultivator Shoal participants take blocks of time out of the fishery instead of shortening the season and removing the month of June. Most additional comments were in support of a whiting/offshore hake possession limit for vessels participating in the Cultivator Shoal Whiting Fishery, and everyone favored the proposed adjustments to the Cultivator Shoal participation requirements, which the Council adopted with this amendment.

Separate Management of the Northern and Southern Whiting Management Areas

In general, there was little support for managing the northern and southern whiting areas separately. Most people felt that the proposed alternatives were complicated and confusing. In addition, most people did not favor the proposal for dividing the southern management area into an eastern zone and a western zone. The state of New York as well as the Mid-Atlantic Fishery Management Council submitted a separate proposal for identifying two management areas. Several comments suggested that separate management measures for the two areas created inequities by allowing fishermen to fish for the same species under different regulations depending on where their vessel was located. In general, there was very little support for the Preferred Alternative in the southern management area.

Other public comments include, but are not limited to, the following:

- Open access incidental catch allowance permit: Many felt that the proposed incidental catch allowances (open access multispecies permit) were too low. Some said that they would support the proposed incidental catch allowances as long as the Council ensured that the appropriate vessels will qualify for the limited access permit by implementing moratorium criteria that qualifies active as well as historical participants. One fisherman said that he thought that the proposed open access incidental catch allowances were too low even for multispecies vessels fishing under a DAS, and he feared that the measure would create a discard problem in non-targeted fisheries that have never had a whiting discard problem. Additional discussion is included in Section E.5.2.2.1.3.

- Transfer of small mesh multispecies at sea: Some people did not support a restriction on the transfer of small mesh multispecies at sea. They felt that transferring small mesh multispecies at sea would have inconsequential effects on the rebuilding plan and that the ability to transfer (or receive) small amounts of small mesh multispecies at sea is critical for some vessels, particularly those in the tuna and lobster fisheries. Other commenters favored a complete prohibition on the transfer of small mesh multispecies at sea. Additional discussion is included in Section E.5.2.2.1.6.
- Additional Framework Language: In general, most people favored the framework adjustment process as a means of managing fisheries on a real-time basis. One commenter did not support framework adjustments at all because he felt that the process allows the Council to make changes to regulations too quickly and without adequate public input. In terms of the proposed measures to be added to the framework adjustment list, several people commented that a Whiting Days at Sea (DAS) program would be too controversial to implement through a framework adjustment and suggested that such a program be accompanied by a full set of public hearings. Additional discussion is included in Section 4.12.
- Additional Issues: In general, there was very little support expressed for a Whiting DAS program. Some commenters emphasized that they would not support a minimum fish size for whiting because of the high volume nature of the fishery and the potential to lessen the quality of the product with additional sort time. Several commenters identified the lack of up-to-date scientific information about whiting and red hake stock status and urged the Council to develop better information on which to base such drastic reductions in fishing. Others mentioned various reasons for the decline of the whiting stocks, including, but not limited to, pollution, loss of nursery grounds, high levels of fishing pressure on the Cultivator Shoal Whiting Fishery, and the development of the juvenile whiting fishery.

8.0 GLOSSARY

Amendment – a formal change to a fishery management plan (FMP). The Council prepares amendments and submits them to the Secretary of Commerce for review and approval. The Council may also change FMPs through a "framework adjustment procedure" (see below).

B_{MSY} – the stock biomass that would produce maximum sustainable yield (MSY) when fished at a level equal to F_{MSY}. For most stocks, B_{MSY} is about ½ of the carrying capacity.

Bycatch (Incidental Catch) – fish that are harvested in a fishery, but which are not sold or kept for personal use. This includes economic discards and regulatory discards. The fish that are being targeted may be bycatch if they are not retained.

Codend – the terminal, closed end of a trawl net. IN this amendment, for a vessel less than or equal to 60 feet in length overall, the codend must be a minimum of the first 50 meshes (100 bars in the case of square mesh) from the terminus of the net. For a vessel greater than 60 feet in length overall, the codend must be a minimum of the first 100 meshes (200 bars in the case of square mesh) from the terminus of the net. This specification does not apply to vessels that fish with mesh smaller than 2.5-inches and are subject to other codend specifications for other small mesh fisheries (loligo squid, for example).

Council – New England Fishery Management Council (NEFMC).

Days-At-Sea (DAS) – the total days, including steaming time that a boat spends at sea on a trip intended to catch fish.

Environmental Impact Statement (EIS) – an analysis of the expected impacts of a fishery management plan (or some other proposed federal action) on the environment and on people, initially prepared as a "Draft" (DEIS) for public comment. After an initial EIS is prepared for a plan, subsequent analyses are called "Supplemental." The Final EIS is referred to as the Final Supplemental Environmental Impact Statement (FSEIS).

Exclusive Economic Zone (EEZ) – for the purposes of the Magnuson-Stevens Fishery Conservation and Management Act, the area from the seaward boundary of each of the coastal states to 200 nautical miles from the baseline.

Exempted Fisheries – Currently, any fishery determined by the Regional Director to have less than a 5% regulated species bycatch, by weight, of total catch according to 50 CFR §648.80 (a)(7). The default measure for this amendment includes a similar system for small mesh multispecies exempted fisheries based on 10% small mesh multispecies bycatch.

Exploitation Rate – the percentage of catchable fish killed by fishing every year. If a fish stock has 1,000,000 fish large enough to be caught by fishing gear and 550,000 are killed by fishing during the year, the annual exploitation rate is 55%.

Fishing Effort – the amount of time and fishing power used to harvest fish. Fishing power includes gear size, boat size, and horsepower.

Fishing Mortality (see Mortality)

FMP (Fishery Management Plan) – document that describes a fishery and establishes measures to manage it. This document forms the basis for federal regulations for fisheries managed under the regional Fishery Management Councils. The New England Fishery Management Council prepares FMPs and submits them to the Secretary of Commerce for approval and implementation.

Framework Adjustments – adjustments within a range of measures previously specified in a fishery management plan. A change can usually be made more quickly and easily by a framework adjustment than through an amendment. For plans developed by the New England Council, the procedure requires at least two Council meetings at which the proposed measures are discussed, and analyses of the biological and economic impacts associated with the action. An evaluation of environmental impacts not already analyzed as part of the FMP is also completed.

Limited Access – a management system that limits the number of participants in a fishery. Usually, qualification for this system is based on historic participation, and the participants remain constant over time (with the exception of attrition).

Mortality:

Fishing Mortality (F) – (see also exploitation rate) a measurement of the rate of removal of fish from a population by fishing. F is that rate at which fish are harvested at any given point in time. ("Exploitation rate" is an annual rate of removal, "F" is an instantaneous rate.)

$F_{0.1}$ – F at which the increase in yield-per-recruit in weight for an increase in a unit-of effort is only 10% of that produced in an unexploited stock; usually considered a conservative target fishing mortality rate.

F_{MSY} – a fishing mortality rate that would produce the maximum sustainable yield from a stock when the stock biomass is at a level capable of producing MSY on a continuing basis.

F_{target} – the fishing mortality that management measures are designed to achieve.

Natural Mortality (M) – a measurement of the rate of fish deaths from all causes other than fishing such as predation, cannibalism, disease, starvation, and pollution; the rate of natural mortality may vary from species to species

Total Mortality (Z) – Fishing Mortality + Natural Mortality.

Minimum Biomass Level – the minimum stock size (or biomass) below which there is a significantly lower chance that the stock will produce enough new fish to sustain itself over the long-term. If a stock is at this level, fishing mortality must be reduced to as near zero as possible until the stock rebuilds.

Open Access – describes a fishery or permit for which there is no qualification criteria to participate or obtain. Open access permits may be issued along with restrictions on fishing activities (for example, minimum mesh requirements or possession limits).

Optimum Yield (OY) – the amount of fish which–

(a) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;

(b) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and

(c) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Overfished – a measure of stock biomass that is below a threshold level that would provide adequate spawning activity, i.e. the stock's productive capacity.

Overfishing – a level or rate of fishing mortality that jeopardizes the long-term capacity of a stock or stock complex to produce MSY on a continuing basis.

PDT (Plan Development Team) – a group of technical experts responsible for developing and analyzing management measures under the direction of the Council; the Council has a Whiting PDT that meets to discuss the development of this amendment.

Proposed Rule – a federal regulation is usually published in the Federal Register as a proposed rule with a time period for public comment. After the comment period closes, the proposed regulation may be changed or withdrawn before it is published as a final rule, along with its date of implementation and response to comments.

Recruitment – the amount of fish added to the fishery each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to fishing gear in one year would be the recruitment into the fishery.

Small Mesh Multispecies – for the purposes of this amendment to the Northeast Multispecies FMP, small mesh species refers to silver hake, offshore hake, and red hake.

Spawning Stock Biomass (SSB) – the total weight of fish in a stock that are old enough to reproduce.

Stock – a grouping of fish usually based on genetic relationship, geographic distribution and movement patterns; a region may have more than one stock of a species.

Whiting Monitoring Committee – a team appointed by the NEFMC to review, analyze, and recommend adjustments to the management measures addressing small mesh multispecies. The team consists of staff from the NEFMC and MAFMC, NMFS Northeast Regional Office, the NEFSC, the U.S. Coast Guard, at least one industry representative from each geographical area (northern New England, southern New England, and the Mid-Atlantic), and no more than two representatives, appointed by the Commission, from affected states.

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Additional references are contained in the Appendices to this document.