FRAMEWORK ADJUSTMENT 4

TO THE

ATLANTIC MACKEREL, SQUID, AND BUTTERFISH FISHERY MANAGEMENT PLAN

(Includes Final Environmental Impact Statement, Regulatory Impact Review and Essential Fish Habitat Assessment)

January 2004

Mid-Atlantic Fishery Management Council

in cooperation with

the National Marine Fisheries Service,

the New England Fishery Management Council,

and

the South Atlantic Fishery Management Council

First Framework Meeting: August 5, 2003
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COVER SHEET

RESPONSIBLE AGENCIES:

Assistant Administrator for Fisheries
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
Washington, D.C. 20235

Mid-Atlantic Fishery Management Council
Room 2115, Federal Building, 300 South New Street
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PROPOSED ACTIONS:

Adoption, approval, and implementation of Framework Adjustment 4 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan.

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ABSTRACT:

The Mid-Atlantic Fishery Management Council and the NOAA Assistant Administrator for Fisheries propose to adopt, approve, and implement Framework Adjustment 4 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (FMP) pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (the Act). The FSEIS presents the details of a management program designed to ensure compliance with the Act. It proposes measures to extend the limited entry program for the Illex squid fishery for an additional five years.

DATE BY WHICH COMMENTS MUST BE RECEIVED: ____________________

January 2004

EXECUTIVE SUMMARY

Prior to the 1980's, the fishery for *Illex* squid in the US EEZ was prosecuted primarily by the foreign distant water fleets. With the implementation of the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan and it's subsequent Amendments, the fishery has become fully Americanized. At the same time that the domestic fishery was undergoing development, new biological data became available which indicated that *Illex* is an annual species. This resulted in downwardly revised estimates of the sustainable yield from this fishery.

The simultaneous growth of the domestic fishery and reduction in the estimate of sustainable yield resulted in the *Illex* fishery moving towards a fully capitalized and exploited state. As a result, a limited entry program became necessary and was implemented in Amendment 5. However, due to concerns that capacity might be insufficient to fully exploit the annual quota, a five year sunset provision was placed on the *Illex* moratorium when it was implemented in Amendment 5. The sunset provision for the moratorium on entry into the *Illex* fishery, implemented in 1997, was set to expire in July 2002, but was extended for one year under Framework 2. The *Illex* moratorium was subsequently set to expire in July 2003 until remedial action was taken by the Council under Framework 3, which extended the moratorium until July 2004 . The sole purpose of Framework 4 is to extend the moratorium on entry to the *Illex* fishery while the Council addresses this issue in Amendment 9 to the FMP.

The Council is considering the following alternatives for this framework action 1) extend the moratorium on entry to the *Illex* fishery for an additional five years (preferred and most restrictive alternative), 2) extend the moratorium on entry to the *Illex* fishery for an additional two years, and 3) no action (least restrictive alternative). A fourth alternative, extending the moratorium on entry to the *Illex* fishery without sunset provision, was considered by the Council but rejected because it was considered to be beyond the scope of a framework action.

A description and discussion of the expected impacts on the environment of the alternatives considered in this framework action are given in Section 6.0. A qualitative summary of the expected impacts of each alternative relative to the status quo is given below (Table ES-1). Overall, the first two alternatives are not expected to have any significant impacts since both maintain the status quo (although for different time periods). They are intended to extend the *Illex* moratorium until the Council addresses this issue in Amendment 9. The third alternative, no action, could have a number of negative impacts which are discussed in section 6.0. Analyses of harvest capacity clearly indicate that overcapacity for the *Illex* fishery currently exists (i.e., the maximum harvest capacity of current moratorium permit holders far exceeds the long term sustainable yield for the species). As a result, in the future the Council may be required to implement measures to reduce harvest capacity in this fishery in accordance with the Build Sustainable Fisheries element of the NOAA Fisheries Strategic Plan, which specifies that a 20 percent reduction in the number of overcapitalized fisheries must be achieved by the year 2005.

Table ES-1. Qualitative summary of the expected impacts of various alternatives considered in Framework 4 compared to the status quo. A minus sign (-) signifies an expected negative impact and a zero (0) is used for null impact.

	Environmental Dimension				
	Biological	Economic	Social	Protected Resources	Essential Fish Habitat
Alternative 1 (extend moratorium for 5 years)	0	0	0	0	Slightly Positive
Alternative 2 (extend moratorium for 2 years)	0	0	0	0	0
Alternative 3 (moratorium expires in 2004)	-	-	-	-	-

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Appendices

1.0 INTRODUCTION

Framework 4 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management (FMP), prepared by the Mid-Atlantic Fishery Management Council, is intended to manage the Atlantic mackerel, squid, and butterfish fisheries pursuant to the Magnuson-Stevens Fishery Conservation Act (MSFCMA) of 1976, as amended by the Sustainable Fisheries Act (SFA). The purpose of this action is to address the issue of limited access to the *Illex* squid fishery. Specifically, Framework 4 would extend the moratorium on entry to the *Illex* fishery until the Council addresses the problem of the expiration of the *Illex* fishery moratorium in Amendment 9 to the FMP. The history of the development of the *Illex* fishery moratorium is described in detail below in section 2.2.1.

2.0 PURPOSE AND NEED FOR ACTION

The sole purpose of this action is to extend the moratorium on entry to the *Illex* fishery while the Council addresses this issue in Amendment 9 to the FMP. This extension is needed because the *Illex* moratorium program is set to expire in July of 2004. The Council concluded that delays in development of Amendment 9 could result in a hiatus in the *Illex* limited access program if the moratorium for the *Illex* fishery expired before a permanent resolution to the issue is addressed in Amendment 9. Therefore, the Council decided to develop Framework 4, the sole purpose of which is to extend the moratorium on entry to the *Illex* fishery while the Council addresses this issue in Amendment 9 to the FMP. The Council is currently developing an environmental impact statement through the development of Amendment 9 to the FMP. In addition to the limited access issue in the *Illex* fishery, Amendment 9 is addressing a number of complex issues including those related to gear impacts on Essential Fish Habitat, bycatch reduction, permitting of NAFO vessels to transit the US EEZ, multi-year quota specifications, and the definition of overfishing for *Loligo* squid. In the case of the *Illex* fishery, a five year sunset provision was placed on the *Illex* moratorium when it was implemented in Amendment 5 due to concerns that capacity might be insufficient to fully exploit the annual quota for the fishery. The sunset provision for the moratorium on entry into the *Illex* fishery, implemented in 1997, was set to expire in July 2002, but was extended for one year under Framework 2. An additional one year extension of the moratorium was implemented under Framework 3.

2.1 History of FMP Development

In March 1977, the Council initiated development of the Mackerel and Squid FMPs. The Council adopted the Mackerel FMP for hearings in September 1977 and the Squid FMP for hearings in October 1977. Hearings on Mackerel and Squid FMPs were held in December, 1977. The Mackerel and Squid FMPs were adopted by the Council in March 1978. The Mackerel FMP was submitted for NMFS approval in May 1978. The Squid FMP was submitted for NMFS approval in June 1978. However, based on NMFS comments, the Council requested that the Mackerel and Squid FMPs be returned.

The FMPs were revised, the revisions being identified as Mackerel FMP Supplement 1 and

Squid FMP Supplement 1. These two Supplements, along with the original Butterfish FMP, were adopted for public hearings by the Council in July of 1978. Hearings on all three documents were held during September and October 1978 and all three FMPs were adopted in final form by the Council in November 1978. The Butterfish FMP was submitted for NMFS approval in December 1978. Mackerel FMP Supplement 1 and Squid FMP Supplement 1 were submitted for NMFS approval in January 1979. NMFS approved Squid FMP Supplement 1 in June 1979 and Mackerel FMP Supplement 1 in July 1979. Both FMPs were for fishing year (1 April - 31 March) 1979-80.

The Butterfish FMP was disapproved by NMFS in April 1979 because of a need for additional justification of the reasons for reducing OY below MSY. The Butterfish FMP was revised, adopted by the Council, and resubmitted for NMFS approval in June 1979. It was approved by NMFS in November 1979 for fishing year 1979-80.

The Council adopted Amendments 1 to both the Mackerel and Squid FMPs for hearings in August 1979. Hearings were held during October 1979. The Amendments were adopted by the Council and submitted for NMFS approval in November 1979. Both Amendments were approved by NMFS in March 1980. This extended the Squid FMP for an indefinite time beyond the end of fishing year 1979-80 and extended the Mackerel FMP through fishing year 1980-81. Butterfish FMP Amendment 1, extending the FMP through fishing year 1980-81, was adopted by the Council for hearings in December 1979 with hearings held during January 1980. During January 1980 the Amendment was adopted in final form by the Council and submitted for NMFS approval and was approved in March 1980.

The Council began work on an amendment to merge the Mackerel, Squid, and Butterfish FMPs in March 1980 the document being identified as Amendment 2 to the Mackerel, Squid, and Butterfish FMP. The Amendment was adopted by the Council for public hearings in August 1980. However, NMFS commented that there were significant problems with the Amendment that could not be resolved prior to the end of the fishing year (31 March 1981). The Council then prepared separate Amendments 2 to both the Mackerel and Butterfish FMPs to extend those FMPs through fishing year 1981-82. Since Amendment 1 to the Squid FMP extended that FMP indefinitely, there was no need to take this action for the Squid FMP. Those drafts were adopted for public hearing by the Council in October 1980 with hearings held in November. The Amendments were adopted in final form by the Council and submitted for NMFS approval in November 1980. Amendment 2 to the Mackerel FMP was approved by NMFS in January 1981 and Amendment 2 to the Butterfish FMP was approved by NMFS in February 1981.

In October 1980 the merger amendment, previously designated as Amendment 2, was redesignated Amendment 3. The Council adopted draft Amendment 3 to the Squid, Mackerel, and Butterfish FMP in July 1981 and hearings were held during September. The Council adopted Amendment 3 in October 1981 and submitted it for NMFS approval. NMFS review identified the need for additional explanation of certain provisions of the Amendment. The revisions were made and the revised Amendment 3 was submitted for NMFS approval in February 1982.

The Amendment was approved by NMFS in October 1982. However, problems developed with the implementation regulations, particularly with the Office of Management and Budget through that agency's review under Executive Order 12291. In an effort to have the FMP in place by the beginning of the fishing year (1 April 1983), the FMP, without the squid OY adjustment mechanism, or a revised Atlantic mackerel mortality rate, and retitled as the Atlantic Mackerel, Squid, and Butterfish FMP, was implemented by emergency interim regulations on 1 April 1983. By agreement of the Secretary of Commerce (Secretary) and the Council, the effective date of those emergency regulations was extended through 27 September 1983. The differences between the FMP and the implementing regulations resulted in a hearing before the House Subcommittee on Fisheries and Wildlife Conservation and the Environment on 10 May 1983.

Amendment 1 to the Atlantic Mackerel, Squid, and Butterfish FMP was prepared to implement the squid OY adjustment mechanism and the revised mackerel mortality rate. That Amendment was adopted by the Council on 15 September 1983, approved by NMFS on 19 December 1983, and implemented by regulations published in the *Federal Register* on 1 April 1984.

Amendment 2 was adopted by the Council on 19 September 1985 and approved by NOAA 6 March 1986. Amendment 2 changed the fishing year to the calendar year, revised the squid bycatch TALFF allowances, put all four species on a framework basis, and changed the fishing vessel permits from permanent to annual.

Amendment 3 was adopted by the Council in two actions. The Atlantic mackerel overfishing definition was adopted by the Council at its October 1990 meeting. The *Loligo*, *Illex*, and butterfish overfishing definitions were adopted at the December 1990 meeting. This was done because the Northeast Fisheries Center proposed changes to the overfishing definitions proposed in the hearing draft for the squids and butterfish. The Center's concerns were incorporated in the version adopted at the December 1990 meeting.

Amendment 4, approved by NMFS 8 November 1991, authorized the Regional Director, Northeast Region, NMFS (Regional Director) to limit the areas where directed foreign fishing and joint venture transfers from US to foreign vessels may take place. Directed foreign fishing must be conducted seaward of at least 20 miles from the shore. Operations of foreign vessels in support of US vessels (that is, joint ventures) may operate anywhere in the Exclusive Economic Zone (EEZ) throughout the management unit unless specific areas are closed to them. The catch limitations were changed by requiring that, if the preliminary initial or final amounts differ from those recommended by the Council, the *Federal Register* notice must clearly state the reason(s) for the difference(s) and specify how the revised specifications satisfy the 9 criteria set forth for the species affected. Additionally, for Atlantic mackerel, the specification of OYs and other values may be specified for three years at one time. These annual values may be adjusted within any year and prior to the second and third years as set forth above. However, projecting specifications over several years should allow more orderly development of the fishery since the revisions to the specifications for the second and third years would be done by notice, rather than by regulatory measures. The joint ventures section was changed to allow the Regional Director may impose special conditions on joint ventures and directed foreign fishing activities.

Such special conditions may include a ratio between the tonnage that may be caught in a directed foreign fishery relative to the tonnage that may be purchased over-the-side from US vessels and relative to the tonnage of US processed fish that must be purchased by the venture.

Amendment 5 was approved by NMFS 9 February 1996. It lowered the *Loligo* squid MSY, eliminated the possibility of directed foreign fisheries for *Loligo*, *Illex*, and butterfish, instituted a dealer and vessel reporting system, instituted an operator permitting system, implemented a limited access system for *Loligo*, *Illex* and butterfish, and expanded the management unit to include all Atlantic mackerel, *Loligo*, *Illex*, and butterfish under US jurisdiction. Amendment 6 revised the definitions of overfishing for *Loligo*, *Illex,* and butterfish and allowed for seasonal management of the *Illex* fishery.

Amendment 7 was developed to achieve consistency among FMP's in the NE region of the US relative vessel permitting, replacement and upgrade criteria. Amendment 8 was developed to bring the FMP into compliance with new and revised National Standards and other required provisions of the Sustainable Fisheries Act, which was passed by Congress in 1996. Specifically, Amendment 8 revised the overfishing definitions for Atlantic mackerel, *Loligo* and *Illex* squid, and butterfish and addressed the new and revised National Standards relative to the existing management measures. In addition, Amendment 8 added a framework adjustment procedure that allows the Council to add or modify management measures through a streamlined public review process.

Framework Adjustment 1 to the Atlantic Mackerel, Squid and Butterfish FMP established a program in which data collection projects can be funded in part through a percentage research set-aside from total annual quota for each species. The purpose of this program is to support research and the collection of additional data that would otherwise be unavailable. Framework Adjustment 2 extended the moratorium on entry to the *Illex* fishery until July 2, 2003, added a provision to the FMP that, in the event the annual specifications for Atlantic mackerel, squid and butterfish are not published by the NMFS prior to the start of the fishing year, that the previous year's specifications will apply (excluding TALFF specifications), and allows for the specification of management measures for *Loligo* for a period of up to three years. Framework Adjustment 3 extended the moratorium on entry to the *Illex* fishery until July 2, 2004.

2.2 Problem for Resolution

2.2.1 Moratorium on entry to *Illex* fishery expires in 2004

Prior to the 1980's, the fishery for *Illex* in the US EEZ was prosecuted primarily by the foreign distant water fleets. With the implementation of the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan and it's subsequent Amendments, the fishery has become fully Americanized. At the same time that the domestic fishery was undergoing development, new biological data became available which indicated that *Illex* is an annual species. This resulted in downwardly revised estimates of the sustainable yield from this fishery.

The simultaneous growth of the domestic fishery and reduction in the estimate of sustainable yield resulted in the *Illex* fishery moving towards a fully capitalized and exploited state. As a result, a limited entry program became necessary and was implemented in Amendment 5 to the FMP (62 FR 28638, May 27, 1997). However, due to concerns that capacity might be insufficient to fully exploit the annual quota for this fishery, a five-year sunset provision was placed on the *Illex* moratorium when it was implemented in Amendment 5. Due to this sunset provision, the moratorium on entry to the *Illex* fishery was set to expire in July 2002, but was extended for one year under Framework 2 to the FMP (67 FR 44392, July 2, 2002). An additional one year extension of the moratorium was implemented under Framework 3 (68 FR 31988, May 29, 2003). The Council is currently developing a Draft Environmental Impact Statement (DEIS) through the development of Amendment 9 to the FMP. In addition to the limited access issue in the *Illex* fishery, the Council is also addressing a number of complex issues in Amendment 9 including those related to gear impacts on essential fish habitat, bycatch reduction, permitting of NAFO vessels to transit the US EEZ, and the definition of overfishing for *Loligo* squid. The original NOI to develop a DEIS for Amendment 9 was published in 66 FR 56574, November 29, 2001 and the Council held the initial scoping meeting on December 12, 2001 in Atlantic City, NJ. The Council continued the development of Amendment 9 in 2002-2003 and submitted the DEIS for NMFS approval for public hearings in April 2003. NMFS identified a number of deficiencies in the DEIS for Amendment 9 at the March 19, 2003, Council meeting held in New York City, NY. As a result of those deficiencies, the Council was unable to adopt the DEIS for Amendment 9. At it's June 25, 2003, meeting in Philadelphia, PA, the Council concluded that delays in development of the DEIS for Amendment 9 could result in a hiatus in the *Illex* limited access program if the moratorium for the *Illex* fishery expired before the final rule for Amendment 9 is implemented. Therefore, the Council decided to develop Framework 4, the sole purpose of which is to extend the moratorium on entry to the *Illex* fishery while the Council addresses this issue in Amendment 9 to the FMP. The Council concluded that new public scoping meetings are not necessary for this DEIS because this issue was considered during the original December 12, 2001 Scoping meeting based on the original NOI. Applicable comments from that meeting were be considered along with the written comments received on this notice in the preparation of the DEIS for Framework 4. The NOA for the DEIS for Framework 4 was published on September 26, 2003 and the 45-day commernt period ended on November 10, 2003. The sole purpose of this framework action is to extend the moratorium on entry to the *Illex* fishery while the Council addresses this issue in Amendment 9 to the FMP.

2.3 Management Objectives

The objectives of the FMP are:

1. Enhance the probability of successful (i.e., the historical average) recruitment to the fisheries.
2. Promote the growth of the US commercial fishery, including the fishery for export.
3. Provide the greatest degree of freedom and flexibility to all harvesters of these resources consistent with the attainment of the other objectives of this FMP.
4. Provide marine recreational fishing opportunities, recognizing the contribution of recreational fishing to the national economy.

5. Increase understanding of the conditions of the stocks and fisheries.
6. Minimize harvesting conflicts among US commercial, US recreational, and foreign fishermen.

2.4 Management Unit

The management unit is all northwest Atlantic mackerel (*Scomber scombrus*), *Loligo pealei, Illex illecebrosus*, and butterfish (*Peprilus triacanthus*) under US jurisdiction.

2.5 Management Strategy

Effective federal fishery management of Atlantic mackerel, *Loligo* and *Illex* squid, and butterfish has occurred for the past two decades. The management strategy during the first phase of the Atlantic Mackerel, Squid, and Butterfish FMP was to provide for the orderly development of the domestic fisheries for these resources under the purview of the Magnuson Act. This process involved the sequential phasing out of foreign fishing for these species in US waters and the gradual transfer of offshore fishing methods and technology to the domestic fishing fleet. For both squid species, the domestic fisheries have been fully developed.

All four species in the management unit are managed primarily via annual quotas to control fishing mortality. In addition, to the annual review and modifications to management measures specified in the FMP, the Council added a framework adjustment procedure in Amendment 8 which allows the Council to add or modify management measures through a streamlined public review process. As such, management measures that have been identified in the plan can be implemented or adjusted at any time during the year. This is the third framework action taken under the Atlantic Mackerel, Squid and Butterfish FMP since the framework procedure was implemented under Amendment 8. This framework action addresses the problems and issues described in section 2.2.

3.0 MANAGEMENT MEASURE ALTERNATIVES

3.1 Alternatives Considered for Analysis

ALTERNATIVES ANALYZED FOR *ILLEX* MORATORIUM EXTENSION			
ALTERNATIVE	**DESCRIPTION**	**SECTION DESCRIBED**	**SECTION EVALUATED**
1 (preferred and most restrictive)	**Extend moratorium with five year sunset**	**3.1.1**	**6.1**
2	**Extend moratorium with two year sunset**	**3.1.2**	**6.1**
3 (least restrictive)	**No action**	**3.1.3**	**6.1**

3.1.1 Extend the moratorium on entry to the *Illex* fishery for an additional five years (Alternative 1 - preferred and most restrictive alternative)

Amendment 5 established a moratorium on new entry into the commercial fishery for *Illex* squid. The Council placed a five year sunset provision on the moratorium which was set to expire in July 2002, but was extended until July 2004 under Framework 3. This measure would extend the *Illex* moratorium for an additional five years. Under this alternative, the moratorium on entry to the *Illex* fishery would expire in 2009 unless superceded by actions taken by the Council in a future amendment. This alternative was considered as the preferred by the Council and also was the most restrictive alternative considered by the Council. This alternative also maintains the status quo for five years.

3.1.2 Extend the moratorium on entry to the *Illex* fishery for an additional two years (Alternative 2)

Amendment 5 established a moratorium on new entry into the commercial fishery for *Illex* squid. The Council placed a five year sunset provision on the moratorium which was set to expire in July 2002, but was extended until July 2004 under Framework 3. This measure would extend the *Illex* moratorium for an additional two years. Under this alternative, the moratorium on entry to the *Illex* fishery would expire in 2006 unless superceded by actions taken by the Council in a future amendment. This alternative also maintains the status quo for two years.

3.1.3 No Action (Alternative 3 - least restrictive alternative)

Under this option, the *Illex* moratorium would expire in July of 2004 and the fishery would revert to open access conditions.

3.2 Alternatives considered but rejected for consideration

3.2.1 Extend the moratorium on entry to the *Illex* fishery without sunset provision.

Amendment 5 established a moratorium on new entry into the commercial fishery for *Illex* squid. The Council placed a five year sunset provision on the moratorium which was set to expire in July 2002, but was extended until July 2004 under Framework 3. This measure would extend the *Illex* moratorium without a sunset provision. This option was rejected from further analysis because the Council considered the measure to be beyond the scope of a framework action. This action is currently being considered in Amendment 9 to the FMP.

The framework adjustment process set forth at 50 C.F.R. §648.24 is a mechanism to add management measures to or adjust management measures in the Fishery Management Plan for the Squid, Mackerel and Butterfish Fisheries (FMP). As a consequence, the *Illex* squid moratorium limitation in the FMP is subject to an adjustment through this framework adjustment process. As reflected in the administrative record underlying the adoption and implementation of this process, this process was developed to make revisions to the measures in the FMP that did not represent major changes to the cornerstone provisions of the FMP. One of the cornerstone provisions in the FMP is the moratorium on entry into the *Illex* squid fishery, which, by virtue of Amendment 5 to the FMP, is of limited duration. Alternative 4 of Framework Action 4 would eliminate the sunset provision on the moratorium and extend the moratorium indefinitely. This would ostensibly close the door on new entry into the fishery. Such a change goes beyond an adjustment to the *Illex* squid moratorium provision of the FMP that can be effected through the framework adjustment. This is the basis for the conclusion that Alternative 4 should be rejected. Such a major shift in the direction of the FMP will be controversial, particularly as access to other overfished fisheries in the Northwest Atlantic has been severely curtailed. The framework process involves a somewhat truncated administrative process that incorporated the opportunity for public participation at two Council meeting, which are currently held some six weeks apart. Extending the *Illex* moratorium indefinitely demands a more deliberative and widespread public process. Under the Magnuson-Stevens Fishery Conservation and Management Act, the process of amending the FMP is the appropriate mechanism to extend the moratorium indefinitely.

4.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1 Description of the Stock *(Illex illecebrosus)*

4.1.1 Species Description and Distribution

Illex is distributed on the western north Atlantic from the Labrador Sea to Florida Straits (Roper *et al.* 1998). Until recently, *Illex illecebrosus* was believed to be distributed on both sides of the North Atlantic, as was once thought (Roper et al. 1998). This confusion seems to have been a result of misidentifications of the closely related species *I. coindetii* (which does seem to be distributed on both sides of the Atlantic), as *I. illecebrosus*. The *Illex* population is assumed to constitute a unit throughout it's range of commercial exploitation from Cape Hatteras to Newfoundland (Dawe and Hendrickson 1998). A jig fishery occurs in the inshore waters of Newfoundland during August through late autumn and bottom trawl fisheries occur on the U.S. continental shelf, primarily in the Mid-Atlantic Bight, and on the Scotian Shelf off Canada during June through late autumn. There is overlap in the geographic distributions of *Illex* species in the northwest Atlantic Ocean *I. illecebrosus* and *I. oxygonius* (Roper and Mangold 1998; Roper *et al.* 1998). The species are morphologically similar and difficult to distinguish and identify. Museum records indicate that *Illex coindetii* is also sympatric with *Illex illecebrosus* in the vicinity of Norfolk Canyon and further south (Roper *et al.* 1998).

Data from the NOAA/Canada DFO East Coast of North America Strategic Assessment Project indicate that during 1975-1994 *Illex* in the northwest Atlantic were distributed from Labrador to Cape Hatteras. The areas of highest abundance of the species are the southern edge of the Grand Bank, the Scotian Shelf, Georges Bank, and the Middle Atlantic Bight.

Illex are highly migratory, capable of long distance migrations of more than 1,000 miles (Dawe *et al.* 1981). They undergo seasonal inshore-offshore migrations which may be related to temperature, food, or both (MAFMC 1995). They spend winters (January to March) in dense aggregations along the outer continental shelf and upper slope where water temperatures are relatively warm, 46-57 ºF (8-14 ºC). In the spring (April-May), when shelf waters begin warming, they migrate shoreward, and during summer and autumn are widespread throughout the entire New England and Middle Atlantic continental shelf (Wigley 1982). In late autumn they begin their return migration to the warmer, offshore waters at the edge of and beyond the continental shelf (MAFMC 1995), where spawning is believed to occur. The hypothetical migration path of *Illex* is summarized in Black *et al.* 1987.

4.1.2 Status of the Stock

Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management (FMP) was developed to bring the FMP into compliance with the Sustainable Fisheries Act (SFA). The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act, that caused the Guidelines to be significantly revised. The most significant changes were made to National Standard 1, which imposed new requirements concerning definitions of overfishing in fishery management plans. The overfishing definition for *Illex* was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Illex* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{MSY} is exceeded. Annual quotas will be specified which correspond to a target fishing mortality rate of 75% of F_{MSY}. Maximum OY will be specified as the catch associated with a fishing mortality rate of F_{MSY}. In adition, the biomass target is specified to equal B_{MSY}. The minimum biomass threshold is specified as ½ B_{MSY}.

The most recent stock assessment occurred in 2003 at SAW 37. At that time, it was not possible to evaluate current stock status because there were no reliable estimates of absolute stock biomass or fishing mortality to compare with existing reference points. However, based on a number of qualitative analyses, overfishing was not likely to have occurred during 1999-2002. Relative exploitation indices for the domestic U.S. fishery have declined since reaching a peak in 1999 and were below the 1982-2002 mean during 2000-2002. Squid body weights and indices from U.S. and Canadian surveys have been low for an extended period of time and suggest that the fraction of the stock available on the U.S. shelf is currently in a low productivity regime.

4.1.3 Ecological relationships and stock characteristics

The age and growth of *Illex* has been well studied relative to other squid species, being one of the few for which the statolith ageing method has been validated (Dawe *et al.* 1985). Research on the age and growth of *Illex* based on counts of daily statolith growth increments indicates an annual life span (Dawe *et al.* 1985). Age data collected in 2000 during an *Illex* survey in U.S. waters indicated a lifespan of about 215 days or seven months (Hendrickson, In Press).

Based on observations of captive females, *I. illecebrosus* is a semelparous, terminal spawner whereby spawning occurs shortly after mating and is followed by death within days thereafter. The largest number of mated females on record were caught during the 2000 *Illex* survey and provided the first evidence of a spawning area during May; the Mid-Atlantic Bight at depths of 113-377 m (Hendrickson, In Press). The survey data suggest that spawning occurs in midwater and that water temperatures at these depths, on the Scotian Shelf and further north , are too low for normal embryonic development (O'Dor et al. 1982). Back-calculations of hatch dates from statolith increment counts indicate that spawning occurs during October through June; (Hendrickson In Press).

4.2 Description of EFH

The area affected by the proposed action has been identified as EFH for species managed under the NE Multispecies; Atlantic Sea Scallop; Atlantic Monkfish; Summer Flounder; Scup and Black Sea Bass; Squid, Atlantic Mackerel and Butterfish; Atlantic Surf Clam and Ocean Quahog; Atlantic Bluefish; Atlantic Billfish; and Atlantic Tuna, Swordfish and Shark Fishery Management Plans. In general, EFH for these species includes pelagic and demersal waters, saltmarsh creeks, seagrass beds, mudflats and open bay areas, as well as mud, sand, gravel and shell sediments over the continental shelf, and structured habitat containing sponges and other biogenic organisms.

The following description of EFH for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish fisheries are excerpted from Amendment 8 to the FMP. A complete description of essential Fish Habitat for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish is given in Amendment 8 to the FMP. The Council is also currently updating this information in Amendment 9.

4.2.1 *Loligo pealei*

Pre-recruits: EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina in areas that comprise the highest 75% of the catch where pre-recruit *Loligo* were collected in the NEFSC trawl surveys (Figure 54a). Generally, pre-recruit *Loligo* are collected from shore to 700 ft and temperatures between 4 /F and 27 /F.

Recruits: EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina in areas that comprise the highest 75% of the catch where recruited *Loligo* were collected in the NEFSC trawl surveys (Figure 54b). Generally, recruited *Loligo* are collected from shore to 1000 ft and temperatures between 39/F and 81 /F.

Pre-recruits and recruits are stock assessment terms used by NEFSC and correspond roughly to the life history stages juveniles and adults, respectively. *Loligo* pre-recruits are less than or equal to 8 cm and recruits are greater than 8 cm.

4.2.2 Atlantic mackerel

Eggs: Offshore, EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from Maine through Cape Hatteras, North Carolina in areas that comprise the highest 75% of the catch where Atlantic mackerel eggs were collected in MARMAP ichthyoplankton surveys (Figure 53a). Inshore, EFH is the “mixing” and/or “seawater” portions of all the estuaries where Atlantic mackerel eggs are “common,” “abundant,” or “highly abundant” on the Atlantic coast, from Passamaquaddy Bay, Maine to James River, Virginia (Table 13; Figures 13a, 44). Generally, Atlantic mackerel eggs are collected from shore to 50 ft and temperatures between 41 /F and 73 /F.

Larvae: Offshore, EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina that comprise the highest 75% of the catch where Atlantic mackerel larvae were collected in the MARMAP ichthyoplankton survey (Figure 53b). Inshore, EFH is also the “mixing” and/or “seawater” portions of all the estuaries where Atlantic mackerel larvae are “common,” “abundant,” or “highly abundant” on the Atlantic coast, from Passamaquaddy Bay, Maine to James River, Virginia (Table 13; Figures 13b, 44). Generally, Atlantic mackerel larvae are collected in depths between 33 ft and 425 ft and temperatures between 43 /F and 72 /F.

Juveniles: Offshore, EFH is the pelagic water found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina in areas that comprise the highest 75% of the catch where juvenile Atlantic mackerel were collected in the NEFSC trawl surveys (Figure 53c). Inshore, EFH is the “mixing” and/or “seawater” portions of all the estuaries where juvenile Atlantic mackerel are “common,” “abundant,” or “highly abundant” on the Atlantic coast, from Passamaquaddy Bay, Maine to James River, Virginia (Table 13; Figures 13c, 44). Generally, juveniles Atlantic mackerel are collected from shore to 1050 ft and temperatures between 39 /F and 72 /F.

Adults: Offshore, EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina, in areas that comprise the highest 75% of the catch where adult Atlantic mackerel were collected in the NEFSC trawl surveys (Figure 53d). Inshore, EFH is the "mixing" and/or "seawater" portions of all the estuaries where adult Atlantic mackerel are "common," "abundant," or "highly abundant" on the Atlantic coast, from Passamaquaddy Bay, Maine to James River, Virginia (Table 13; Figures 13d, 44). Generally, adult Atlantic mackerel are collected from shore to 1250 ft and temperatures between 39 /F and 61 /F.

4.2.3 *Illex illecebrosus*

Pre-recruits: EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina in areas that comprise the highest 75% of the catch where pre-recruit *Illex* were collected in the NEFSC trawl surveys (Figure 55a). Generally, pre-recruit *Illex* are collected from shore to 600 ft and temperatures between 36 /F and 73 /F.

Recruits: EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina in areas that comprise the highest 75% of the catch where recruited *Illex* were collected in the NEFSC trawl surveys (Figure 55b). Generally, recruited *Illex* are collected from shore to 600 ft and temperatures between 39 /F and 66 /F.

Pre-recruits and recruits are stock assessment terms used by NEFSC and correspond roughly to the life history stages juveniles and adults, respectively. *Illex* pre-recruits are less than or equal to 10 cm and recruits are greater than 10 cm.

4.2.4 Atlantic butterfish

Eggs: Offshore, EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina in areas that comprise the highest 75% of the catch where butterfish eggs were collected in MARMAP ichthyoplankton surveys (Figure 56a). Inshore, EFH is the "mixing" and/or "seawater" portions of all the estuaries where butterfish eggs are "common," "abundant," or "highly abundant" on the Atlantic coast, from Passamaquaddy Bay, Maine to James River, Virginia (Table 14; Figures 43a, 44). Generally, butterfish eggs are collected from shore to 6000 ft and temperatures between 52 /F and 63 /F.

Larvae: Offshore, EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina areas that comprise the highest 75% of the catch where butterfish larvae were collected in the

NEFSC trawl surveys (Figure 56). Inshore, EFH is the "mixing" and/or "seawater" portions of all the estuaries where butterfish larvae are "common," "abundant," or "highly abundant" on the Atlantic coast, from Passamaquaddy Bay, Maine to James River, Virginia (Table 14; Figures 43b, 44). Generally, butterfish larvae are collected in depths between 33 ft and 6000 ft and temperatures between 48 /F and 66 /F.

Juveniles: Offshore, EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina in areas that comprise the highest 75% of the catch where juvenile butterfish were collected in the NEFSC trawl surveys (Figure 56c). Inshore, EFH is the "mixing" and/or "seawater" portions of all the estuaries where juvenile butterfish are "common," "abundant," or "highly abundant" on the Atlantic coast, from Passamaquaddy Bay, Maine to James River, Virginia, (Table 14; Figures 43c, 44). Generally, juvenile butterfish are collected in depths between 33 ft and 1200 ft and temperatures between 37 /F and 82 /F.

Adults: Offshore, EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina in areas that comprise the highest 75% of the catch where adult butterfish were collected in the NEFSC trawl surveys (Figure 56d). Inshore, EFH is the "mixing" and/or "seawater" portions of all the estuaries where adult butterfish are "common," "abundant," or "highly abundant" on the Atlantic coast, from Passamaquaddy Bay, Maine to James River, Virginia (Table 14; Figures 43d, 44). Generally, adult butterfish are collected in depths between 33 ft and 1200 ft and temperatures between 37 /F and 82 /F.

4.3 Description of Protected Resources

There are numerous species which inhabit the environment within the management unit of this FMP that are afforded protection under the Endangered Species Act (ESA) of 1973 (i.e., for those designated as threatened or endangered) and/or the Marine Mammal Protection Act of 1972 (MMPA). Eleven are classified as endangered or threatened under the ESA, while the remainder are protected by the provisions of the MMPA. The Council has determined that the following list of species protected either by the Endangered Species Act of 1973 (ESA), the Marine Mammal Protection Act of 1972 (MMPA), or the Migratory Bird Act of 1918 may be found in the environment utilized by Atlantic mackerel, squid and butterfish fisheries:

Cetaceans

<u>Species</u>	<u>Status</u>
Northern right whale (*Eubalaena glacialis*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Blue whale (*Balaenoptera musculus*)	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Sperm whale (*Physeter macrocephalus*	Endangered

Minke whale (*Balaenoptera acutorostrata*)	Protected
Beaked whales (*Ziphius and Mesoplodon spp.*)	Protected
Risso's dolphin (*Grampus griseus*)	Protected
Pilot whale (*Globicephala spp.*)	Protected
White-sided dolphin (*Lagenorhynchus acutus*)	Protected
Common dolphin (*Delphinus delphis*)	Protected
Spotted and striped dolphins (*Stenella spp.*)	Protected
Bottlenose dolphin (*Tursiops truncatus*)	Protected

Sea Turtles

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

Fish

Species	Status
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered
Atlantic salmon (*Salmo salar*)	Endangered

Birds

Species	Status
Roseate tern (*Sterna dougallii dougallii*)	Endangered
Piping plover (*Charadrius melodus*)	Endangered

Critical Habitat Designations

Species	Area
Right whale	Cape Cod Bay

Description of Species Listed as Endangered which inhabit the management unit of the FMP

North Atlantic Right Whale

Right whales have occurred historically in all the world's oceans from temperate to subarctic latitudes. NMFS recognizes three major subdivisions of right whales: North Pacific, North Atlantic, and Southern Hemisphere. NMFS further recognizes two extant subunits in the North Atlantic: eastern and western. A third subunit may have existed in the central Atlantic (migrating from east of Greenland to the Azores or Bermuda), but this stock appears to be extinct (Waring *et al.* 2002).

The north Atlantic right whale has the highest risk of extinction among all of the large whales in the worlds oceans. The scarcity of right whales is the result of an 800-year history of whaling that continued into the 1960s (Klumov 1962). Historical records indicate that right whales were subject to commercial whaling in the North Atlantic as early as 1059. Between the 11th and 17th centuries, an estimated 25,000-40,000 right whales may have been harvested. The size of the western north Atlantic right whale population at the termination of whaling is unknown, but the stock was recognized as seriously depleted as early as 1750. However, right whales continued to be taken in shore-based operations or opportunistically by whalers in search of other species as late as the 1920's. By the time the species was internationally protected in 1935, there may have been fewer than 100 western north Atlantic right whales in the western Atlantic (Hain 1975; Reeves *et al.* 1992; Kenney *et al.* 1995 in Waring *et al.* 2002).

Right whales appear to prefer shallow coastal waters, but their distribution is also strongly correlated to the distribution of their prey (zooplankton). In both northern and southern hemispheres, right whales are observed in the lower latitudes and more coastal waters during winter, where calving takes place, and then tend to migrate to higher latitudes during the summer. The distribution of right whales in summer and fall in both hemispheres appears linked to the distribution of their principal zooplankton prey (Winn *et al.* 1986). They generally occur in Northwest Atlantic waters west of the Gulf Stream and are most commonly associated with cooler waters (21º C). They are not found in the Caribbean and have been recorded only rarely in the Gulf of Mexico.

Right whales feed on zooplankton through the water column, and in shallow waters may feed near the bottom. In the Gulf of Maine they have been observed feeding on zooplankton, primarily copepods, by skimming at or below the water's surface with open mouths (NMFS 1991b; Kenney *et al.* 1986; Murison and Gaskin 1989; and Mayo and Marx 1990). Research suggests that right whales must locate and exploit extremely dense patches of zooplankton to feed efficiently (Waring *et al.* 2000). New England waters include important foraging habitat for right whales and at least some portion of the North Atlantic right whale population is present in these waters throughout most months of the year. They are most abundant in Cape Cod Bay between February and April (Hamilton and Mayo 1990; Schevill *et al.* 1986; Watkins and Schevill 1982) and in the Great South Channel in May and June (Payne *et al.* 1990) where they have been observed feeding predominantly on copepods, largely of the genera *Calanus* and *Pseudocalanus* (Waring *et al.* 2002). Right whales also frequent Stellwagen Bank and Jeffrey's Ledge, as well as Canadian waters including the Bay of Fundy and Browns and Baccaro Banks, in the spring and summer months. Mid-Atlantic waters are used as a migratory pathway from the spring and summer feeding/nursery areas to the winter calving grounds off the coast of Georgia and Florida.

NMFS designated right whale critical habitat on June 3, 1994 (59 FR 28793) to help protect important right whale foraging and calving areas within the U.S. These include the waters of

Cape Cod Bay and the Great South Channel off the coast of Massachusetts, and waters off the coasts of southern Georgia and northern Florida. In 1993, Canada's Department of Fisheries declared two conservation areas for right whales; one in the Grand Manan Basin in the lower Bay of Fundy, and a second in Roseway Basin between Browns and Baccaro Banks (Canadian Recovery Plan for the North Atlantic Right Whale 2000).

The northern right whale was listed as endangered throughout it's range on June 2, 1970 under the ESA. The current population is considered to be at a low level and the species remains designated as endangered (Waring *et al.* 2002). A Recovery plan has been published and currently is in effect (NMFS 1991). This is a strategic stock because the average annual fishery-related mortality and serious injury from all fisheries exceeds the Potential Biological Removal (PBR).

The western North Atlantic population of right whales was estimated to be 291 individuals in 1998 (Waring *et al.* 2002). The current population growth rate of 2.5% as reported by Knowlton *et al.* (1994) suggests the stock may be showing signs of slow recovery. The best available information makes it reasonable to conclude that the current death rate exceeds the birth rate in the western North Atlantic right whale population. The nearly complete reproductive failure in this population from 1993 to 1995 and again in 1998 and 1999 suggests that this pattern has continued for almost a decade, though the 2000/2001 season appears the most promising in the past 5 years, in terms of calves born. Because no population can sustain a high death rate and low birth rate indefinitely, this combination places the North Atlantic right whale population at high risk of extinction. Coupled with an increasing calving interval, the relatively large number of young right whales (0-4 years) and adults that are killed, by human-related factors, the likelihood of extinction is high. The recent increase in births gives rise to optimism, however these young animals must be provided with protection so that they can mature and contribute to future generations in order to be a factor in stabilizing of the population.

Right whales may be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources due to trophic effects resulting from a variety of activities including the operation of commercial fisheries. However, the major known sources of anthropogenic mortality and injury of right whales clearly are ship strikes and entanglement in commercial fishing gear. Waring *et al. (* 2002) give a detailed description of the annual human related mortalities of right whales.

Humpback Whale

The humpback whale was listed as endangered throughout it's range on June 2, 1970. This species is the fourth most numerically depleted large cetacean worldwide. Humpback whales calve and mate in the West Indies and migrate to feeding areas in the northwestern Atlantic during the summer months. Six separate feeding areas are utilized in northern waters after their return (Waring *et al.* 2002). Only one of these feeding areas, the GOM, lies within U.S. waters and is within the action area of this consultation. Most of the humpbacks that forage in the GOM visit Stellwagen Bank and the waters of Massachusetts and Cape Cod Bays. Sightings are most frequent from mid-March through November between 41° N and 43° N, from the Great South Channel north along the outside of Cape Cod to Stellwagen Bank and Jeffreys Ledge (CeTAP 1982), and peak in May and August. Small numbers of individuals may be present in this area year-round. They feed on a number of species of small schooling fishes, particularly sand lance and Atlantic herring, by targeting fish schools and filtering large amounts of water for their associated prey. Humpback whales have also been observed feeding on krill (Wynne and Schwartz 1999).

Various papers (Barlow & Clapham 1997; Clapham *et al.* 1999) summarized information gathered from a catalogue of photographs of 643 individuals from the western North Atlantic population of humpback whales. These photographs identified reproductively mature western North Atlantic humpbacks wintering in tropical breeding grounds in the Antilles, primarily on Silver and Navidad Banks, north of the Dominican Republic. The primary winter range also includes the Virgin Islands and Puerto Rico (Waring *et al.* 2002). In general, it is believed that calving and copulation take place on the winter range. Calves are born from December through March and are about 4 meters at birth. Sexually mature females give birth approximately every 2 to 3 years. Sexual maturity is reached between 4 and 6 years of age for females and between 7 and 15 years for males. Size at maturity is about 12 meters.

Humpback whales use the mid-Atlantic as a migratory pathway, but it may also be an important feeding area for juveniles. Since 1989, observations of juvenile humpbacks in the mid-Atlantic have been increasing during the winter months, peaking January through March (Swingle *et al.* 1993). Biologists speculate that non-reproductive animals may be establishing a winter feeding range in the mid-Atlantic since they are not participating in reproductive behavior in the Caribbean. Swingle *et al.* (1993) identified a shift in distribution of juvenile humpback whales in the nearshore waters of Virginia, primarily in winter months. Those whales using this mid-Atlantic area that have been identified were found to be residents of the GOM and Atlantic Canada (Gulf of St. Lawrence and Newfoundland) feeding groups, suggesting a mixing of different feeding stocks in the mid-Atlantic region. A shift in distribution may be related to winter prey availability. Studies conducted by the Virginia Marine Science Museum indicate that these whales are feeding on, among other things, bay anchovies and menhaden. In concert with the increase in mid-Atlantic whale sightings, strandings of humpback whales have increased between New Jersey and Florida since 1985. Strandings were most frequent during September through April in North Carolina and Virginia waters, and were composed primarily of juvenile humpback whales of no more than 11 meters in length (Wiley *et al.* 1995). Six of 18 humpbacks for which the cause of mortality was determined were killed by vessel strikes. An additional humpback had scars and bone fractures indicative of a previous vessel strike that may have contributed to the whale's mortality. Sixty percent of those mortalities that were closely investigated showed signs of entanglement or vessel collision.

New information has recently become available on the status and trends of the humpback whale population in the North Atlantic. Although current and maximum net productivity rates are unknown at this time, the population is apparently increasing. It has not yet been determined whether this increase is uniform across all six feeding stocks (Waring *et al.* 2002). For example, the overall rate of increase has been estimated at 9.0% (CV=0.25) by Katona and Beard (1990), while a 6.5% rate was reported for the Gulf of Maine by Barlow and Clapham (1997) using data through 1991. The rate reported by Barlow and Clapham (1997) may roughly approximate the rate of increase for the portion of the population within the action area.

Estimating abundance for the Gulf of Maine stock has proved problematic. Three approaches have been investigated: mark-recapture estimates, minimum population size, and line-transect estimates. Most of the markrecapture estimates were affected by heterogeneity of sampling, which was heavily focused on the southwestern Gulf of Maine. However, an estimate of 652 (CV=0.29) derived from the more extensive and representative YONAH sampling in 1992 and 1993 was probably less subject to this bias. The second approach uses photo-identification data to establish the minimum number of humpback whales known to be alive in a particular year, 1997. By determining the number of identified individuals seen either in that year, or in both a previous and subsequent year, it is possible to determine that at least 497 humpbacks were alive in 1997. This figure is also likely to be negatively biased, again because of heterogeneity of sampling. A similar calculation for 1992 (which would correspond to the YONAH estimate for the Gulf of Maine) yields a figure of 501 whales (Waring *et al.* 2002).

In the third approach, data were used from a 28 July to 31 August 1999 line-transect sighting survey conducted by a ship and airplane covering waters from Georges Bank to the mouth of the Gulf of St. Lawrence. Total track line length was 8,212 km. However, in light of the information on stock identity of Scotian Shelf humpback whales noted above, only the portions of the survey covering the Gulf of Maine were used; surveys blocks along the eastern coast of Nova Scotia were excluded. Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and g(0), the probability of detecting a group on the track line. Aerial data were not corrected for g(0) (Palka 2000). These surveys yielded an estimate of 816 humpbacks (CV = 0.45). However, given that the rate of exchange between the Gulf of Maine and both the Scotian Shelf and mid-Atlantic region is not zero, this estimate is likely to be somewhat conservative. Accordingly, inclusion of data from 25% of the Scotian Shelf survey area (to reflect the match rate of 25% between the Scotian Shelf and the Gulf of Maine) gives an estimate of 902 whales (CV=0.41). Since the mark-recapture figures for abundance and minimum population size given above falls above the lower bound of the CV of the line transect estimate, and given the known exchange between the Gulf of Maine and the Scotian Shelf, we have chosen to use the latter as the best estimate of abundance for Gulf of Maine humpback whales (Waring *et al.* 2002).

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the lognormally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for Gulf of Maine humpback whales is 902 (CV=0.41). The minimum population estimate for this stock is 647 (Waring *et al.* 2002).

As detailed below, current data suggest that the Gulf of Maine humpback whale stock is steadily increasing in size. This is consistent with an estimated average trend of 3.2% (SE=0.005) in the

North Atlantic population overall for the period 1979–1993 (Stevick *et al.* 2001), although there are no other feeding-area-specific estimates. Barlow and Clapham (1997) applied an interbirth interval model to photographic mark-recapture data and estimated the population growth rate of the Gulf of Maine humpback whale stock at 6.5% (CV=0.012). Maximum net productivity is unknown for this population, although a theoretical maximum for any humpback population can be calculated using known values for biological parameters (Brandão *et al.* 2000, Clapham *et al.* 2001b). For the Gulf of Maine, data supplied by Barlow and Clapham (1997) and Clapham *et al.* (1995) gives values of 0.96 for survival rate, 6y as mean age at first parturition, 0.5 as the proportion of females, and 0.42 for annual pregnancy rate. From this, a maximum population growth rate of 0.072 is obtained according to the method described by Brandão et al. (2000). This suggests that the observed rate of 6.5% (Barlow and Clapham 1997) was close to the maximum for this stock. Clapham *et al.* (2001a) updated the Barlow and Clapham (1997) analysis using data from the period 1992 to 2000. The estimate was either 0% (for a calf survival rate of 0.51) or 4.0% (for a calf survival rate of 0.875). Although confidence limits are not available (because maturation parameters could not be estimated), both estimates of population growth rate are outside the 95% confidence intervals of the previous estimate of 6.5% for the period 1979 to 1991 (Barlow and Clapham 1997). It is unclear whether this apparent decline is an artifact resulting from a shift in distribution; indeed, such a shift occurred during exactly the period (1992-95) in which survival rates declined. It is possible that this shift resulted in calves born in those years imprinting on (and thus subsequently returning to) areas other than those in which intensive sampling occurs. If the decline is a real phenomenon it may be related to known high mortality among young-of-the-year whales in the waters of the U.S. mid-Atlantic states. However, calf survival appears to have increased since 1996, presumably accompanied by an increase in population growth. In light of the uncertainty accompanying the more recent estimate of population growth rate for the Gulf of Maine, for purposes of this assessment the maximum net productivity rate was assumed to be the default value for cetaceans of 0.04 (Barlow et al. 1995). Current and maximum net productivity rates are unknown for the North Atlantic population overall (Waring *et al.* 2002). As noted above, Stevick et al. (2001) calculated an average population growth rate of 3.2% (SE=0.005) for the period 1979–1993.

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 647 . The maximum productivity rate is the default value of 0.04. The “recovery” factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.10 because this stock is listed as an endangered species under the Endangered Species Act (ESA). PBR for the Gulf of Maine humpback whale stock is 1.3 whales (Waring *et al.* 2002).

The major known sources of anthropogenic mortality and injury of humpback whales include entanglement in commercial fishing gear and ship strikes. Based on photographs of the caudal peduncle of humpback whales, Robbins and Mattila (1999) estimated that at least 48% --- and possibly as many as 78% --- of animals in the Gulf of Maine exhibit scarring caused by entanglement. Several whales have apparently been entangled on more than one occasion. These estimates are based on sightings of free-swimming animals that initially survive the encounter. Because some whales may drown immediately, the actual number of interactions may be higher. In addition, the actual number of species-gear interactions is contingent on the intensity of observations from aerial and ship surveys.

For the period 1996 through 2000, the total estimated human-caused mortality and serious injury to the Gulf of Maine humpback whale stock is estimated as 3.0 per year (USA waters, 2.4; Canadian waters, 0.6). This average is derived from two components: 1) incidental fishery interaction records, 2.8 (USA waters, 2.2; Canadian waters, 0.6); and 2) records of vessel collisions, 0.2 (USA waters, 0.2; Canadian waters, 0). There were additional humpback mortalities and serious injuries that occurred in the southeastern and mid-Atlantic states that could not be confirmed as involving members of the Gulf of Maine stock (Waring *et al.* 2002). These records represent an additional minimum annual average of 1.6 human-caused mortalities and serious injuries to humpbacks over the time period, of which 1.0 per year are attributable to incidental fishery interactions and 0.6 per year are attributable to vessel collisions (Waring *et al.* 2002).

As with right whales, human impacts (vessel collisions and entanglements) are factors which may be slowing recovery of the humpback whale population. There is an average of four to six entanglements of humpback whales a year in waters of the southern Gulf of Maine and additional reports of vessel-collision scars (unpublished data, Center for Coastal Studies). Of 20 dead humpback whales (principally in the mid-Atlantic, where decomposition did not preclude examination for human impacts), Wiley et al. (1995) reported that 6 (30%) had major injuries possibly attributable to ship strikes, and 5 (25%) had injuries consistent with possible entanglement in fishing gear. One whale displayed scars that may have been caused by both ship strike and entanglement. Thus, 60% of the whale carcasses which were suitable for examination showed signs that anthropogenic factors may have contributed to, or been responsible for, their death. Wiley et al. (1995) further reported that all stranded animals were sexually immature, suggesting a winter or migratory segregation and/or that juvenile animals are more susceptible to human impacts.

An updated analysis of humpback whale mortalities from the mid-Atlantic states region has recently been produced by Barco *et al.* (2001). Between 1990 and 2000, there were 52 known humpback whale mortalities in the waters of the U.S. mid-Atlantic states (summarized by Barco *et al.* 2001). Length data from 48 of these whales (18 females, 22 males and 8 of unknown sex) suggested that 39 (81.2%) were first-year animals, 7 (14.6%) were immature and 2 (4.2%) were adults. However, sighting histories of 5 of the dead whales indicate that some were small for their age, and histories of live whales further indicate that the population contains a greater percentage of mature animals than is suggested by the stranded sample. In their study of entanglement rates estimated from caudal peduncle scars, Robbins and Mattila (2001) found that males were more likely to be entangled than females. The scarring data also suggested that yearlings were more likely than other age classes to be involved in entanglements. Finally, female humpbacks showing evidence of prior entanglements produced significantly fewer calves, suggesting that entanglement may significantly impact reproductive success. Humpback whale entanglements also occur in relatively high numbers in Canadian waters. Reports of collisions with fixed fishing gear set for groundfish around Newfoundland averaged 365 annually from 1979 to 1987 (range 174-813). An average of 50 humpback whale entanglements (range 26-66) were reported annually between 1979 and 1988, and 12 of 66 humpback whales that were entangled in 1988 died (Lien et al. 1988). Volgenau et al. (1995) also summarized existing data and concluded that in Newfoundland and Labrador, cod traps caused the most entanglements and entanglement mortalities (21%) of humpbacks between 1979 and 1992. They also reported that gillnets are the gear that has been the primary cause of entanglements and entanglement mortalities (20%) of humpbacks in the Gulf of Maine between 1975 and 1990.

Humpback whales may also be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources due to trophic effects resulting from a variety of activities including the operation of commercial fisheries.

Fin Whale

Fin whales inhabit a wide range of latitudes between 20-75/ N and 20-75/ S (Perry *et al.* 1999). Fin whales spend the summer feeding in the relatively high latitudes of both hemispheres, particularly along the cold eastern boundary currents in the North Atlantic and North Pacific Oceans and in Antarctic waters (IWC 1992). Most migrate seasonally from relatively high-latitude Arctic and Antarctic feeding areas in the summer to relatively low-latitude breeding and calving areas in the winter (Perry *et al.* 1999).

As in the case of right and humpback whales, fin whale populations were heavily affected by commercial whaling. However, commercial exploitation of fin whales occurred much later than for right and humpback whales. Although some fin whales were taken as early as the 17th century by the Japanese using a fairly primitive open-water netting technique (Perry *et al.* 1999) and were hunted occasionally by sailing vessel whalers in the 19th century (Mitchell and Reeves 1983), wide-scale commercial exploitation of fin whales did not occur until the 20th century when the use of steam power and harpoon- gun technology made exploitation of this faster, more offshore species feasible. In the southern hemisphere, over 700,000 fin whales were landed in the 20th century. More than 48,000 fin whales were taken in the North Atlantic between 1860 and 1970 (Perry *et al.* 1999). Fisheries existed off of Newfoundland, Nova Scotia, Norway, Iceland, the Faroe Islands, Svalbard (Spitsbergen), the islands of the British coasts, Spain and Portugal. Fin whales were rarely taken in U.S. waters, except when they ventured near the shores of Provincetown, MA, during the late 1800's (Perry *et al.* 1999).

Various estimates have been provided to describe the current status of fin whales in western North Atlantic waters. Based on the catch history and trends in Catch Per Unit Effort, an estimate of 3,590 to 6,300 fin whales was obtained for the entire western North Atlantic (Perry *et al.* 1999). Hain *et al.* (1992) estimated that about 5,000 fin whales inhabit the Northeastern United States continental shelf waters. The latest (Waring *et al.* 2002) SAR gives a best estimate of abundance for fin whales of 2,814 (CV = 0.21). The minimum population estimate for the western North Atlantic fin whale is 2,362. This is currently an underestimate, as too little is known about population structure, and the estimate is derived from surveys over a limited portion of the western North Atlantic. There is also not enough information to estimate population trends.

In the North Atlantic today, fin whales are widespread and occur from the Gulf of Mexico and Mediterranean Sea northward to the edges of the arctic pack ice (Waring *et al.* 2002). A number of researchers have suggested the existence of fin whale subpopulations in the North Atlantic. Mizroch *et al.* (1984) suggested that local depletions resulting from commercial overharvesting supported the existence of North Atlantic fin whale subpopulations. Others have used genetics information to provide support for the belief that there are several subpopulations of fin whales in the North Atlantic and Mediterranean (Bérubé *et al.* 1998). In 1976, the IWC's Scientific Committee proposed seven stocks for North Atlantic fin whales. These are: (1) North Norway; (2) West Norway-Faroe Islands; (3) British Isles-Spain and Portugal; (4) East Greenland-Iceland; (5) West Greenland; (6) Newfoundland-Labrador; and (7) Nova Scotia (Perry *et al.* 1999). However, it is uncertain whether these stock boundaries define biologically isolated units (Waring *et al.* 2002). The NMFS has designated one stock of fin whale for U.S. waters of the North Atlantic where the species is commonly found from Cape Hatteras northward.

During 1978-1982 aerial surveys, fin whales accounted for 24% of all cetaceans and 46% of all large cetaceans sighted over the continental shelf between Cape Hatteras and Nova Scotia (Waring *et al.* 1998). Underwater listening systems have also demonstrated that the fin whale is the most acoustically common whale species heard in the North Atlantic (Clark 1995). The single most important area for this species appeared to be from the Great South Channel, along the 50 meter isobath past Cape Cod, over Stellwagen Bank, and past Cape Ann to Jeffrey's Ledge (Hain *et al.* 1992).

Despite our broad knowledge of fin whales, less is known about their life history as compared to right and humpback whales. Age at sexual maturity for both sexes ranges from 5-15 years. Physical maturity is reached at 20-30 years. Conception occurs during a 5 month winter period in either hemisphere. After a 12 month gestation, a single calf is born. The calf is weaned between 6 and 11 months after birth. The mean calving interval is 2.7 years, with a range of between 2 and 3 years (Agler *et al.* 1993). Like right and humpback whales, fin whales are believed to use northwestern North Atlantic waters primarily for feeding and migrate to more southern waters for calving. However, the overall pattern of fin whale movement consists of a less obvious north-south pattern of migration than that of right and humpback whales. Based on acoustic recordings from hydrophone arrays, Clark (1995) reported a general pattern of fin whale movements in the fall from the Labrador/Newfoundland region, south past Bermuda, and into the West Indies. However, evidence regarding where the majority of fin whales winter, calve, and mate is still scarce. Some populations seem to move with the seasons (e.g., one moving south in winter to occupy the summer range of another), but there is much structuring in fin whale populations that what animals of different sex and age class do is not at all clear. Neonate strandings along the U.S. mid-Atlantic coast from October through January suggest the possibility of an offshore calving area.

The overall distribution of fin whales may be based on prey availability. This species preys opportunistically on both invertebrates and fish. The predominant prey of fin whales varies greatly in different geographical areas depending on what is locally available. In the western North Atlantic fin whales feed on a variety of small schooling fish (i.e., herring, capelin, sand lance) as well as squid and planktonic crustaceans. As with humpback whales, fin whales feed by filtering large volumes of water for their prey through their baleen plates. Photo identification studies in western North Atlantic feeding areas, particularly in Massachusetts Bay, have shown a high rate of annual return by fin whales, both within years and between years (Seipt *et al.* 1990).

As discussed above, fin whales were the focus of commercial whaling, primarily in the 20th century. The IWC did not begin to manage commercial whaling of fin whales in the North Atlantic until 1976. In 1987, fin whales were given total protection in the North Atlantic with the exception of a subsistence whaling hunt for Greenland. The IWC set a catch limit of 19 whales for the years 1995-1997 in West Greenland. All other fin whale stocks had a zero catch limit for these same years. However, Iceland reported a catch of 136 whales in the 1988/89 and 1989/90 seasons, and has since ceased reporting fin whale kills to the IWC (Perry *et al.* 1999). In total, there have been 239 reported kills of fin whales from the North Atlantic from 1988 to 1995.

The major known sources of anthropogenic mortality and injury of fin whales include ship strikes and entanglement in commercial fishing gear. However, many of the reports of mortality cannot be attributed to a particular source. Of 18 fin whale mortality records collected between 1991 and 1995, four were associated with vessel interactions, although the proximal cause of mortality was not known. The following injury/mortality events are those reported from 1996 to the present for which source was determined. These numbers should be viewed as absolute minimum numbers; the total number of mortalities and injuries cannot be estimated but is believed to be higher since it is unlikely that all carcasses will be observed. In general, known mortalities of fin whales are less than those recorded for right and humpback whales. This may be due in part to the more offshore distribution of fin whales where they are either less likely to encounter entangling gear, or are less likely to be noticed when gear entanglements or vessel strikes do occur. Fin whales may also be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources due to trophic effects resulting from a variety of activities including the operation of commercial fisheries. The fin whale was listed as endangered throughout it's range on June 2, 1970 under the ESA.
Hain *et al.* (1992) estimated that about 5,000 fin whales inhabit the northeastern United States continental shelf waters. Waring *et al.* 2002 present a more recent estimate of 2,814 (CV=0.21) fin whales based on aerial and shipboard surveys of the area from Georges Bank to the mouth of the Gulf of S. Lawrence in 1999.

Sei Whale

Sei whales are a widespread species in the world's temperate, subpolar and subtropical and even tropical marine waters. However, they appear to be more restricted to temperate waters than other balaenopterids (Perry *et al.* 1999). The IWC recognized three stocks in the North Atlantic based on past whaling operations as opposed to biological information: (1) Nova Scotia; (2) Iceland Denmark Strait; (3) Northeast Atlantic (Donovan 1991 *in* Perry *et al.* 1999). Mitchell and Chapman (1977) suggested that the sei whale population in the western North Atlantic consists of two stocks, a Nova Scotian Shelf stock and a Labrador Sea stock. The Nova Scotian Shelf stock includes the continental shelf waters of the northeastern United States, and extends northeastward to south of Newfoundland. The IWC boundaries for this stock are from the U.S. east coast to Cape Breton, Nova Scotia and east to longitude 42/ (Waring *et al.* 2002). This is the only sei whale stock within the action area.

Sei whales became the target of modern commercial whalers primarily in the late 19^{th} and early 20^{th} century after stocks of other whales, including right, humpback, fin and blues, had already been depleted. Sei whales were taken in large numbers by Norway and Scotland from the beginning of modern whaling. More than 700 sei whales were killed off of Norway in 1885, alone. Small numbers were also taken off of Spain, Portugal and in the Strait of Gibraltar beginning in the 1920's, and by Norwegian and Danish whalers off of West Greenland from the 1920's to 1950's (Perry *et al.* 1999). In the western North Atlantic, sei whales were originally hunted off of Norway and Iceland, but from 1967-1972, sei whales were also taken off of Nova Scotia (Perry *et al.* 1999). A total of 825 sei whales were taken on the Scotian Shelf between 1966-1972, and an additional 16 were taken from the same area during the same time by a shore based Newfoundland whaling station (Perry *et al.* 1999). The species continued to be exploited in Iceland until 1986 even though measures to stop whaling of sei whales in other areas had been put into place in the 1970's (Perry *et al.* 1999). There is no estimate for the abundance of sei whales prior to commercial whaling. Based on whaling records, approximately14,295 sei whales were taken in the entire North Atlantic from 1885 to 1984 (Perry *et al.* 1999).

Sei whales winter in warm temperate or subtropical waters and summer in more northern latitudes. In the northern Atlantic, most births occur in November and December when the whales are on the wintering grounds. Conception is believed to occur in December and January. Gestation lasts for 12 months and the calf is weaned at 6-9 months when the whales are on the summer feeding grounds. Sei whales reach sexual maturity at 5-15 years of age. The calving interval is believed to be 2-3 years (Perry *et al.* 1999).

Sei whales occur in deep water throughout their range, typically over the continental slope or in basins situated between banks. In the northwest Atlantic, the whales travel along the eastern Canadian coast in autumn, June and July on their way to and from the Gulf of Maine and Georges Bank where they occur in winter and spring. Within the action area, the sei whale is most common on Georges Bank and into the Gulf of Maine/Bay of Fundy region during spring and summer, primarily in deeper waters. Individuals may range as far south as North Carolina. It is important to note that sei whales are known for inhabiting an area for weeks at a time then disappearing for year or even decades; this has been observed all over the world, including in the southwestern GOM in 1986. The basis for this phenomenon is not clear.

Although sei whales may prey upon small schooling fish and squid in the action area, available information suggests that calanoid copepods and euphausiids are the primary prey of this species. There are occasional influxes of sei whales further into Gulf of Maine waters, presumably in conjunction with years of high copepod abundance inshore. Sei whales are occasionally seen feeding in association with right whales in the southern Gulf of Maine and in the Bay of Fundy. However, there is no evidence to demonstrate interspecific competition between these species for food resources. There is very little information on natural mortality factors for sei whales. Possible causes of natural mortality, particularly for young, old or otherwise compromised individuals are shark attacks, killer whale attacks, and endoparasitic helminths. Baleen loss has been observed in California sei whales, presumably as a result of an unknown disease (Perry *et al.* 1999).

There are insufficient data to determine trends of the sei whale population. Because there are no abundance estimates within the last 10 years, a minimum population estimate cannot be determined for NMFS management purposes (Waring *et al.* 2002). Abundance surveys are problematic not only because this species is difficult to distinguish from the fin whale but more significant is that too little is known of the sei whale's distribution, population structure and patterns of movement; thus survey design and data interpretation are very difficult.

Few instances of injury or mortality of sei whales due to entanglement or vessel strikes have been recorded in U.S. waters. Entanglement is not known to impact this species in the U.S. Atlantic, possibly because sei whales typically inhabit waters further offshore than most commercial fishing operations, or perhaps entanglements do occur but are less likely to be observed. A small number of ship strikes of this species have been recorded. The most recent documented incident occurred in 1994 when a carcass was brought in on the bow of a container ship in Charlestown, Massachusetts. Other impacts noted above for other baleen whales may also occur. Due to the deep-water distribution of this species, interactions that do occur are less likely to be observed or reported than those involving right, humpback, and fin whales that often frequent areas within the continental shelf (Waring *et al.* 2002).

Blue Whale

Like the fin whale, blue whales occur worldwide and are believed to follow a similar migration pattern from northern summering grounds to more southern wintering areas (Perry *et al.* 1999). Three subspecies have been identified: *Balaenoptera musculus musculus, B.m. intermedia*, and *B.m. brevicauda* (Waring *et al.* 2002). Only *B. musculus* occurs in the northern hemisphere. Blue whales range in the North Atlantic extends from the subtropics to Baffin Bay and the Greenland Sea . The IWC currently recognizes these whales as one stock (Perry *et al.* 1999).

Blue whales were intensively hunted in all of the world's oceans from the turn of the century to the mid-1960's. Blue whales were occasionally hunted by sailing vessel whalers in the 19th

century. However, development of steam-powered vessels and deck-mounted harpoon guns in the late 19th century made it possible to exploit them on an industrial scale. Blue whale populations declined worldwide as the new technology spread and began to receive widespread use (Perry *et al.* 1999). Subsequently, the whaling industry shifted effort away from declining blue whale stocks and targeted other large species, such as fin whales, and then resumed hunting for blue whales when the species appeared to be more abundant (Perry *et al.* 1999). The result was a cyclical rise and fall, leading to severe depletion of blue whale stocks worldwide (Perry *et al.* 1999). In the North Atlantic, Norway shifted operations to fin whales as early as 1882 due to the scarcity of blue whales (Perry *et al.* 1999). In all, at least 11,000 blue whales were taken in the North Atlantic from the late 19th century through the mid-20th century. Blue whales were given complete protection in the North Atlantic in 1955 under the International Convention for the Regulation of Whaling. However, Iceland continued to hunt blue whales until 1960. There are no good estimates of the pre-exploitation size of the western North Atlantic blue whale stock but it is widely believed that this stock was severely depleted by the time legal protection was introduced in 1955 (Perry *et al.* 1999). Mitchell (1974) suggested that the stock numbered in the very low hundreds during the late 1960's through early 1970's (Perry *et al.* 1999). Photo-identification studies of blue whales in the Gulf of St. Lawrence from 1979 to 1995 identified 320 individual whales. The NMFS recognizes a minimum population estimate of 308 blue whales for the western North Atlantic (Waring *et al.* 2002).

Blue whales are only occasional visitors to east coast U.S. waters. They are more commonly found in Canadian waters, particularly the Gulf of St. Lawrence where they are present for most of the year, and other areas of the North Atlantic. It is assumed that blue whale distribution is governed largely by food requirements. In the Gulf of St. Lawrence, blue whales appear to predominantly feed on *Thysanoessa raschii* and *Meganytiphanes norvegica*. In the eastern North Atlantic, *T. inermis* and *M. norvegica* appear to be the predominant prey.

Compared to the other species of large whales, relatively little is known about this species. Sexual maturity is believed to occur in both sexes at 5-15 years of age. Gestation lasts 10-12 months and calves nurse for 6-7 months. The average calving interval is estimated to be 2-3 years. Birth and mating both take place in the winter season, but the location of wintering areas is speculative (Perry *et al.* 1999). In 1992 the U.S. Navy and contractors conducted an extensive blue whale acoustic survey of the North Atlantic and found concentrations of blue whales on the Grand Banks and west of the British Isles. One whale was tracked for 43 days during which time it traveled 1,400 nautical miles around the general area of Bermuda (Perry *et al.* 1999).

There is limited information on the factors affecting natural mortality of blue whales in the North Atlantic. Ice entrapment is known to kill and seriously injure some blue whales, particularly along the southwest coast of Newfoundland, during late winter and early spring. Habitat degradation has been suggested as possibly affecting blue whales such as in the St. Lawrence River and the Gulf of St. Lawrence where habitat has been degraded by acoustic and chemical pollution. However, there is no data to confirm that blue whales have been affected by such habitat changes (Perry *et al.* 1999).

Entanglement in fishing gear and ship strikes are believed to be the major sources of anthropogenic mortality and injury of blue whales. However, confirmed deaths or serious injuries from either are few. In 1987, concurrent with an unusual influx of blue whales into the Gulf of Maine, one report was received from a whale watch boat that spotted a blue whale in the southern Gulf of Maine entangled in gear described as probable lobster pot gear. A second animal found in the Gulf of St. Lawrence apparently died from the effects of an entanglement. In March 1998, a juvenile male blue whale was carried into Rhode Island waters on the bow of a tanker. The cause of death was determined to be due to a ship strike, although not necessarily caused by the tanker on which it was observed, and the strike may have occurred outside the U.S. EEZ (Waring *et al.* 2002). No recent entanglements of blue whales have been reported from the U.S. Atlantic. Other impacts noted above for other baleen whales may occur.

Sperm Whale

Sperm whales inhabit all ocean basins, from equatorial waters to the polar regions (Perry *et al.* 1999). In the western North Atlantic they range from Greenland to the Gulf of Mexico and the Caribbean. The sperm whales that occur in the western North Atlantic are believed to represent only a portion of the total stock (Blaylock *et al.* 1995). Total numbers of sperm whales off the USA or Canadian Atlantic coast are unknown, although eight estimates from selected regions of the habitat do exist for select time periods. The best estimate of abundance for the North Atlantic stock of sperm whales is 4,702 (CV=0.36) (Waring *et al.* 2002). The minimum population estimate for the western North Atlantic sperm whale is 3,505 (CV=0.36). Sperm whales present in the Gulf of Mexico are considered by some researchers to be endemic, and represent a separate stock from whales in other portions of the North Atlantic. However, NMFS currently uses the IWC stock structure guidance which recognizes one stock for the entire North Atlantic (Waring *et al.* 2002).

The International Whaling Commission estimates that nearly a quarter-million sperm whales were killed worldwide in whaling activities between 1800 and 1900 (IWC 1971). However, estimates of the number of sperm whales taken during this time are difficult to quantify since sperm whale catches from the early 19^{th} century through the early 20^{th} century were calculated on barrels of oil produced per whale rather than the actual number of whales caught (Perry *et al.* 1999). With the advent of modern whaling the larger rorqual whales were targeted. However as their numbers decreased, greater attention was paid to smaller rorquals and sperm whales. From 1910 to 1982 there were nearly 700,000 sperm whales killed worldwide from whaling activities (Clarke 1954). Whale catches for the southern hemisphere is 394,000 (including revised Soviet figures). Sperm whales were hunted in America from the 17th century through the early 20^{th} century. In the North Atlantic, hunting occurred off of Iceland, Norway, the Faroe Islands, coastal Britain, West Greenland, Nova Scotia, Newfoundland/Labrador, New England, the Azores, Madeira, Spain, and Spanish Morocco (Waring *et al.* 1998). Some whales were also taken off the U.S. Mid-Atlantic coast (Reeves and Mitchell 1988; Perry *et al.* 1999), and in the northern Gulf of Mexico (Perry *et al.* 1999). There are no catch estimates available for the number of sperm whales caught during U.S. operations (Perry *et al.* 1999). Recorded North

Atlantic sperm whale catch numbers for Canada and Norway from 1904 to 1972 total 1,995. All killing of sperm whales was banned by the IWC in 1988. However, at the 2000 meetings of the IWC, Japan indicated it would include the take of sperm whales in its scientific research whaling operations. Although this action was disapproved of by the IWC, Japan has reported the take of 5 sperm whales from the North Pacific as a result of this research.

Sperm whales generally occur in waters greater than 180 meters in depth. While they may be encountered almost anywhere on the high seas, their distribution shows a preference for continental margins, sea mounts, and areas of upwelling, where food is abundant (Leatherwood and Reeves 1983). Sperm whales in both hemispheres migrate to higher latitudes in the summer for feeding and return to lower latitude waters in the winter where mating and calving occur. Mature males typically range to much higher latitudes than mature females and immature animals but return to the lower latitudes in the winter to breed (Perry *et al.* 1999). Waring *et al.* (2002) suggest sperm whale distribution is closely correlated with the Gulf Stream edge. Like swordfish, which feed on similar prey, sperm whales migrate to higher latitudes during summer months, when they are concentrated east and northeast of Cape Hatteras. In the U.S. EEZ, sperm whales occur on the continental shelf edge, over the continental slope, and into the mid-ocean regions , and are distributed in a distinct seasonal cycle; concentrated east-northeast of Cape Hatteras in winter and shifting northward in spring when whales are found throughout the mid-Atlantic Bight. Distribution extends further northward to areas north of Georges Bank and the Northeast Channel region in summer and then south of New England in fall, back to the mid-Atlantic Bight (Waring *et al.* 2002).

Sperm whale distribution may be linked to their social structure as well as distribution of their prey (Waring *et al.* 2002). Sperm whale populations are organized into two types of groupings: breeding schools and bachelor schools. Older males are often solitary (Best 1979). Breeding schools consist of females of all ages, calves and juvenile males. In the Northern Hemisphere, mature females ovulate April through August. During this season one or more large mature bulls temporarily join each breeding school. A single calf is born after a 15-month gestation. A mature female will produce a calf every 4-6 years. Females attain sexual maturity at a mean age of nine years, while males have a prolonged puberty and attain sexual maturity at about age 20 (Waring *et al.* 2002). Bachelor schools consist of maturing males who leave the breeding school and aggregate in loose groups of about 40 animals. As the males grow older they separate from the bachelor schools and remain solitary most of the year (Best 1979). Male sperm whales may not reach physical maturity until they are 45 years old (Waring *et al.* 2002). The sperm whales prey consists of larger mesopelagic squid (e.g., *Architeuthis* and *Moroteuthis*) and fish species (Perry *et al.* 1999). Sperm whales, especially mature males in higher latitude waters, have been observed to take significant quantities of large demersal and mesopelagic sharks, skates, and bony fishes (Clarke 1962, 1980).

Few instances of injury or mortality of sperm whales due to human impacts have been recorded in U.S. waters. Because of their generally more offshore distribution and their benthic feeding habits, sperm whales are less subject to entanglement than are right or humpback whales. Documented takes primarily involve offshore fisheries such as the offshore lobster pot fishery and pelagic driftnet and pelagic longline fisheries. The NMFS Sea Sampling program recorded three entanglements (in 1989, 1990, and 1995) of sperm whales in the swordfish drift gillnet fishery prior to permanent closure of the fishery in January 1999. All three animals were injured, found alive, and released. However, at least one was still carrying gear. Opportunistic reports of sperm whale entanglements for the years 1993-1997 include three records involving offshore lobster pot gear, heavy monofilament line, and fine mesh gillnet from an unknown source. Sperm whales may also interact opportunistically with fishing gear. Observers aboard Alaska sablefish and Pacific halibut longline vessels have documented sperm whales feeding on longline caught fish in the Gulf of Alaska (Perry *et al.* 1999). Behavior similar to that observed in the Alaskan longline fishery has also been documented during longline operations off South America where sperm whales have become entangled in longline gear, have been observed feeding on fish caught in the gear, and have been reported following longline vessels for days (Perry *et al.* 1999).

Sperm whales are also struck by ships. In May 1994 a ship struck sperm whale was observed south of Nova Scotia (Waring *et al.* 2002). A sperm whale was also seriously injured as a result of a ship strike in May 2000 in the western Atlantic. Due to the offshore distribution of this species, interactions that do occur are less likely to be reported than those involving right, humpback, and fin whales that more often occur in nearshore areas. Other impacts noted above for baleen whales may also occur.

Due to their offshore distribution, sperm whales tend to strand less often than, for example, right whales and humpbacks. Preliminary data for 2000 indicate that of ten sperm whales reported to the stranding network (nine dead and one injured) there was one possible fishery interaction, one ship strike (wounded with bleeding gash on side) and eight animals for which no signs of entanglement or injury were sighted or reported. No sperm whales have stranded or been reported to the stranding network as of February 2001.

Loggerhead Sea Turtle

The loggerhead turtle was listed as "threatened" under the ESA on July 28, 1978, but is considered endangered by the World Conservation Union (IUCN) and under the Convention on International Trade in Endangered Species of Flora and Fauna (CITES). Loggerhead sea turtles are found in a wide range of habitats throughout the temperate and tropical regions of the Atlantic. These include open ocean, continental shelves, bays, lagoons, and estuaries (NMFS& FWS 1995). In the management unit of this FMP they are most common on the open ocean in the northern Gulf of Maine, particularly where associated with warmer water fronts formed from the Gulf Stream. The species is also found in entrances to bays and sounds and within bays and estuaries, particularly in the Mid-Atlantic.

Since they are limited by water temperatures, sea turtles do not usually appear on the summer foraging grounds in the Gulf of Maine until June, but are found in Virginia as early as April. They remain in these areas until as late as November and December in some cases, but the large majority leave the Gulf of Maine by mid-September. Loggerheads are primarily benthic feeders, opportunistically foraging on crustaceans and mollusks (NMFS & FWS 1995). Under certain conditions they also feed on finfish, particularly if they are easy to catch *(e.g.,* caught in gillnets or inside pound nets where the fish are accessible to turtles).

A Turtle Expert Working Group (TEWG 2000), conducting an assessment of the status of the loggerhead sea turtle population in the Western North Atlantic (WNA), concluded that there are at least four loggerhead subpopulations separated at the nesting beach in the WNA (TEWG 1998). However, the group concluded that additional research is necessary to fully address the stock definition question. The four nesting subpopulations include the following areas: northern North Carolina to northeast Florida, south Florida, the Florida Panhandle, and the Yucatan Peninsula. Genetic evidence indicates that loggerheads from Chesapeake Bay southward to Georgia appear nearly equally divided in origin between South Florida and northern subpopulations. Additional research is needed to determine the origin of turtles found north of the Chesapeake Bay.

The TEWG (1998) analysis also indicated the northern subpopulation of loggerheads may be experiencing a significant decline (2.5% - 3.2% for various beaches). A recovery goal of 12,800 nests has been assumed for the Northern Subpopulation, but TEWG (1998) reported nest number at around 6,200 (TEWG 1998). More recently, the addition of nesting data from the years 1996, 1997 and 1998, did not change the assessment of the TEWG that the number of loggerhead nests in the Northern Subpopulation is stable or declining (TEWG 2000). Since the number of nests have declined in the 1980's, the TEWG concluded that it is unlikely that this subpopulation will reach this goal given this apparent decline and the lack of information on the subpopulation from which loggerheads in the WNA originate. Continued efforts to reduce the adverse effects of fishing and other human-induced mortality on this population are necessary.

The most recent 5-year ESA sea turtle status review (NMFS & USFWS 1995) highlights the difficulty of assessing sea turtle population sizes and trends. Most long-term data comes from nesting beaches, many of which occur extensively in areas outside U.S. waters. Because of this lack of information, the TEWG was unable to determine acceptable levels of mortality. This status review supports the conclusion of the TEWG that the northern subpopulation may be experiencing a decline and that inadequate information is available to assess whether its status has changed since the initial listing as threatened in 1978. NMFS & USFWS (1995) concluded that loggerhead turtles should remain designated threatened but noted that additional research will be necessary before the next status review can be conducted.

Leatherback Sea Turtle

Leatherback turtles are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic, Pacific, Caribbean, and the Gulf of Mexico (Ernst and Barbour 1972). The leatherback sea turtle is the largest living turtle and ranges farther than any other sea turtle species, exhibiting broad thermal tolerances (NMFS and USFWS, 1995). Evidence from tag returns and strandings in the western Atlantic suggests that adults engage in routine migrations between boreal, temperate and tropical waters (NMFS and USFWS, 1992). In the U.S., leatherback turtles are found throughout the action area of this consultation. Located in the northeastern waters during the warmer months, this species is found in coastal waters of the continental shelf and near the Gulf Stream edge, but rarely in the inshore areas. However, leatherbacks may migrate close to shore, as a leatherback was satellite tracked along the mid-Atlantic coast, thought to be foraging in these waters. A 1979 aerial survey of the outer Continental Shelf from Cape Hatteras, North Carolina to Cape Sable, Nova Scotia showed leatherbacks to be present throughout the area with the most numerous sightings made from the Gulf of Maine south to Long Island. Shoop and Kenney (1992) also observed concentrations of leatherbacks during the summer off the south shore of Long Island and off New Jersey. Leatherbacks in these waters are thought to be following their preferred jellyfish prey. This aerial survey estimated the leatherback population for the northeastern U.S. at approximately 300-600 animals (from near Nova Scotia, Canada to Cape Hatteras, North Carolina).

Compared to the current knowledge regarding loggerhead populations, the genetic distinctness of leatherback populations is less clear. However, genetic analyses of leatherbacks to date indicate female turtles nesting in St. Croix/Puerto Rico and those nesting in Trinidad differ from each other and from turtles nesting in Florida, French Guiana/Suriname and along the South African Indian Ocean coast. Much of the genetic diversity is contained in the relatively small insular subpopulations. Although populations or subpopulations of leatherback sea turtles have not been formally recognized, based on the most recent reviews of the analysis of population trends of leatherback sea turtles, and due to our limited understanding of the genetic structure of the entire species, the most conservative approach would be to treat leatherback nesting populations as distinct populations whose survival and recovery is critical to the survival and recovery of the species. Further, any action that appreciably reduced the likelihood for one or more of these nesting populations to survive and recover in the wild, would appreciably reduce the species' likelihood of survival and recovery in the wild.

Leatherbacks are predominantly a pelagic species and feed on jellyfish (i.e., *Stomolophus, Chryaora*, and *Aurelia* (Rebel 1974)), cnidarians (medusae, siphonophores) and tunicates (salps, pyrosomas). Time-Depth-Recorder data recorded by Eckert *et al.* (1998b) indicate that leatherbacks are night feeders and are deep divers, with recorded dives to depths in excess of 1000 meters. However, leatherbacks may come into shallow waters if there is an abundance of jellyfish nearshore. Leary (1957) reported a large group of up to 100 leatherbacks just offshore of Port Aransas, Texas associated with a dense aggregation of Stomolophus. Leatherbacks also occur annually in places such as Cape Cod and Narragansett Bays during certain times of the year, particularly the fall.

Although leatherbacks are a long lived species (> 30 years), they are somewhat faster to mature than loggerheads, with an estimated age at sexual maturity reported as about 13-14 years for females, and an estimated minimum age at sexual maturity of 5-6 years, with 9 years reported as a likely minimum (Zug and Parham 1996) and 19 years as a likely maximum (NMFS 2001). In the U.S. and Caribbean, female leatherbacks nest from March through July. They nest frequently (up to 7 nests per year) during a nesting season and nest about every 2-3 years. During each nesting, they produce 100 eggs or more in each clutch and thus, can produce 700 eggs or more per nesting season (Schultz 1975). The eggs will incubate for 55-75 days before hatching. The habitat requirements for post-hatchling leatherbacks are virtually unknown (NMFS and USFWS 1992).

Anthropogenic impacts to the leatherback population are similar to those discussed above for the loggerhead sea turtle, including fishery interactions as well as intense exploitation of the eggs (Ross 1979). Eckert (1996) and Spotila *et al.* (1996) record that adult mortality has also increased significantly, particularly as a result of driftnet and longline fisheries. Zug and Parham (1996) attribute the sharp decline in leatherback populations to the combination of the loss of long-lived adults in fishery related mortality, and the lack of recruitment stemming from elimination of annual influxes of hatchlings because of intense egg harvesting.

Poaching is not known to be a problem for U.S. nesting populations. However, numerous fisheries that occur in both U.S. state and Federal waters are known to negatively impact juvenile and adult leatherback sea turtles. These include incidental take in several commercial and recreational fisheries. Fisheries known or suspected to incidentally capture leatherbacks include those deploying bottom trawls, off-bottom trawls, purse seines, bottom longlines, hook and line, gill nets, drift nets, traps, haul seines, pound nets, beach seines, and surface longlines (NMFS and USFWS 1992). At a workshop held in the Northeast in 1998 to develop a management plan for leatherbacks, experts expressed the opinion that incidental takes in fisheries were likely higher than is being reported.

Leatherback interactions with the southeast shrimp fishery are also common. Turtle Excluder Devices (TEDs), typically used in the southeast shrimp fishery to minimize sea turtle/fishery interactions, are less effective for the large-sized leatherbacks. Therefore, the NMFS has used several alternative measures to protect leatherback sea turtles from lethal interactions with the shrimp fishery. These include establishment of a Leatherback Conservation Zone (60 FR 25260). NMFS established the zone to restrict, when necessary, shrimp trawl activities from off the coast of Cape Canaveral, Florida to the Virginia/North Carolina Border. It allows the NMFS to quickly close the area or portions of the area to the shrimp fleet on a short-term basis when high concentrations of normally pelagic leatherbacks are recorded in more coastal waters where the shrimp fleet operates. Other emergency measures may also be used to minimize the interactions between leatherbacks and the shrimp fishery. For example, in November 1999 parts of Florida experienced an unusually high number of leatherback strandings. In response, the NMFS required shrimp vessels operating in a specified area to use TEDs with a larger opening for a 30-day period beginning December 8, 1999 (64 FR 69416) so that leatherback sea turtles could escape if caught in the gear.

Leatherbacks are also susceptible to entanglement in lobster and crab pot gear, possibly as a result of attraction to gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface, attraction to the buoys which could appear as prey, or the gear configuration which may be more likely to wrap around flippers. The total number of leatherbacks reported entangled from New York through Maine from all sources for the years 1980 - 2000 is 119; out of this total, 92 of these records took place from 1990-2000. Entanglements are also common in

Canadian waters where Goff and Lien (1988) reported that 14 of 20 leatherbacks encountered off the coast of Newfoundland/Labrador were entangled in fishing gear including salmon net, herring net, gillnet, trawl line and crab pot line. It is unclear how leatherbacks become entangled in such gear. Prescott (1988) reviewed stranding data for Cape Cod Bay and concluded that for those turtles where cause of death could be determined (the minority), entanglement in fishing gear is the leading cause of death followed by capture by dragger, cold stunning, or collision with boats.

Spotila *et al.* (1996) describe a hypothetical life table model based on estimated ages of sexual maturity at both ends of the species' natural range (5 and 15 years). The model concluded that leatherbacks maturing in 5 years would exhibit much greater population fluctuations in response to external factors than would turtles that mature in 15 years. Furthermore, the simulations indicated that leatherbacks could maintain a stable population only if both juvenile and adult survivorship remained high, and that if other life history stages (i.e., egg, hatchling, and juvenile) remained static. Model simulations indicated that an increase in adult mortality of more than 1% above background levels in a stable population was unsustainable. As noted, there are many human-related sources of mortality to leatherbacks; a tally of all leatherback takes anticipated annually under current biological opinions completed for the NMFS June 30, 2000, biological opinion on the pelagic longline fishery projected a potential for up to 801 leatherback takes, although this sum includes many takes expected to be nonlethal. Leatherbacks have a number of pressures on their populations, including injury or mortality in fisheries, other Federal activities (e.g., military activities, oil and gas development, etc.), degradation of nesting habitats, direct harvest of eggs, juvenile and adult turtles, the effects of ocean pollutants and debris, lethal collisions, and natural disturbances such as hurricanes (which may wipe out nesting beaches).

Spotila *et al.* (1996) recommended not only reducing mortalities resulting from fishery interactions, but also advocated protection of eggs during the incubation period and of hatchlings during their first day, and indicated that such practices could potentially double the chance for survival and help counteract population effects resulting from adult mortality. They conclude, "stable leatherback populations could not withstand an increase in adult mortality above natural background levels without decreasing . . . the Atlantic population is the most robust, but it is being exploited at a rate that cannot be sustained and if this rate of mortality continues, these populations will also decline. "

Estimated to number approximately 115,000 adult females globally in 1980 (Pritchard 1982) and only 34,500 by 1995 (Spotila *et al.* 1996), leatherback populations have been decimated worldwide, not only by fishery related mortality but, at least historically, primarily due to intense exploitation of the eggs (Ross 1979). On some beaches nearly 100% of the eggs laid have been harvested (Eckert 1996). Eckert (1996) and Spotila *et al.* (1996) record that adult mortality has also increased significantly, particularly as a result of driftnet and longline fisheries. Spotila (2000) states that a conservative estimate of annual leatherback fishery-related mortality (from longlines, trawls and gillnets) in the Pacific during the 1990s is 1,500 animals. He estimates that this represented about a 23% mortality rate (or 33% if most mortality was focused on the East Pacific population).

Nest counts are currently the only reliable indicator of population status available for leatherback turtles. The status of the leatherback population in the Atlantic is difficult to assess since major nesting beaches occur over broad areas within tropical waters outside the United States. Recent information suggests that Western Atlantic populations declined from 18,800 nesting females in 1996 (Spotila *et al.* 1996) to 15,000 nesting females by 2000. Eastern Atlantic (i.e., off Africa, numbering ~ 4,700) and Caribbean (4,000) populations appear to be stable, but there is conflicting information for some sites and it is certain that some nesting populations (e.g., St. John and St. Thomas, U.S. Virgin Islands) have been extirpated (NMFS and USFWS 1995). It does appear, however, that the Western Atlantic portion of the population is being subjected to mortality beyond sustainable levels, resulting in a continued decline in numbers of nesting females.

Kemp's Ridley Sea Turtle

The Kemp's ridley is probably the most endangered of the world's sea turtle species. The only major nesting site for ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963). Estimates of the adult population reached a low of 1,050 in 1985, but increased to 3,000 individuals in 1997. First-time nesting adults have increased from 6% to 28% from 1981 to 1989, and from 23% to 41% from 1990 to 1994, indicating that the ridley population may be in the early stages of growth (TEWG 1998). More recently the TEWG (2000) concluded that the Kemp's Ridley population appears to be in the early stages of exponential expansion. While the number of females nesting annually is estimated to be orders of magnitude less than historical levels, the mean rate of increase in the annual number of nests has accelerated over the period 1987-1999. Preliminary analyses suggest that the intermediate recovery goal of

10,000 nesting females by 2020 may be achievable (TEWG 2000).

Juvenile Kemp's ridleys inhabit northeastern US coastal waters where they forage and grow in shallow coastal during the summer months. Juvenile ridleys migrate southward with autumnal cooling and are found predominantly in shallow coastal embayments along the Gulf Coast during the late fall and winter months.

Ridleys found in mid-Atlantic waters are primarily post-pelagic juveniles averaging 40 cm in carapace length, and weighing less than 20 kg. After loggerheads, they are the second most abundant sea turtle in Virginia and Maryland waters, arriving in there during May and June and then emigrating to more southerly waters from September to November. In the Chesapeake Bay, ridleys frequently forage in shallow embayments, particularly in areas supporting submerged aquatic vegetation (Lutcavage and Musick 1985). The juvenile population in Chesapeake Bay is estimated to be 211 to 1,083 turtles.

The model presented by Crouse *et al.* (1987) illustrates the importance of subadults to the stability of loggerhead populations and may have important implications for Kemp's ridleys. The vast majority of ridleys identified along the Atlantic Coast have been juveniles and subadults. Sources of mortality in this area include incidental takes in fishing gear, pollution and marine habitat degradation, and other man-induced and natural causes. Loss of individuals in the Atlantic, therefore, may impede recovery of the Kemp's ridley sea turtle population. Sea sampling data from the northeast otter trawl fishery and southeast shrimp and summer flounder bottom trawl fisheries has recorded takes of Kemp's ridley turtles.

Green Sea Turtle

Green sea turtles are more tropical in distribution than loggerheads, and are generally found in waters between the northern and southern 20°C isotherms. In the wester Atlantic region, the summer developmental habitat encompasses estuarine and coastal waters as far north as Long Island Sound, Chesapeake Bay, and the North Carolina sounds, and south throughout the tropics (NMFS 1998). Most of the individuals reported in U.S. waters are immature (NMFS 1998). Green sea turtles found north of Florida during the summer must return to southern waters in autumn or risk the adverse effects of cold temperatures.

There is evidence that green turtle nesting has been on the increase during the past decade. For example, increased nesting has been observed along the Atlantic coast of Florida on beaches where only loggerhead nesting was observed in the past (NMFS 1998). Recent population estimates for the western Atlantic area are not available. Green turtles are threatened by incidental captures in fisheries, pollution and marine habitat degradation, destruction/disturbance of nesting beaches, and other sources of man-induced and natural mortality.

Juvenile green sea turtles occupy pelagic habitats after leaving the nesting beach. At approximately 20 to 25 cm carapace length, juveniles leave pelagic habitats, and enter benthic foraging areas, shifting to a chiefly herbivorous diet (NMFS 1998). Post-pelagic green turtles feed primarily on sea grasses and benthic algae, but also consume jellyfish, salps, and sponges. Known feeding habitats along U.S. coasts of the western Atlantic include shallow lagoons and embayments in Florida, and similar shallow inshore areas elsewhere (NMFS 1998).

Sea sampling data from the scallop dredge fishery and southeast shrimp and summer flounder bottom trawl fisheries have recorded incidental takes of green turtles

Shortnose Sturgeon

Shortnose sturgeon occur in large rivers along the western Atlantic coast from the St. Johns River, Florida (possibly extirpated from this system), to the Saint John River in New Brunswick, Canada. The species is anadromous in the southern portion of its range *(i.e.,* south of Chesapeake Bay), while northern populations are amphidromous (NMFS 1998). Population sizes vary across the species' range with the smallest populations occurring in the Cape Fear and Merrimack Rivers and the largest populations in the Saint John and Hudson Rivers (Dadswell 1979; NMFS 1998).

Shortnose sturgeon are benthic and mainly inhabit the deep channel sections of large rivers. They feed on a variety of benthic and epibenthic invertebrates including molluscs, crustaceans (arnphipods, chironomids, isopods), and oligochaete worms (Vladykov and Greeley 1963; Dadswell 1979). Shortnose sturgeon are long-lived (30 years) and mature at relatively old ages. In northern areas, males reach maturity at 5-10 years, while females reach sexual maturity between 7 and 13 years.

In the northern part of their range, shortnose sturgeon exhibit three distinct movement patterns that are associated with spawning, feeding, and overwintering periods. In spring, as water temperatures rise above 8° C, pre-spawning shortnose sturgeon move from overwintering grounds to spawning areas. Spawning occurs from mid/late April to mid/late May. Post-spawned sturgeon migrate downstream to feed throughout the summer.

As water temperatures decline below 8° C again in the fall, shortnose sturgeon move to overwintering concentration areas and exhibit little movement until water temperatures rise again in spring (NMFS 1998). Young-of-the-year shortnose sturgeon are believed to move downstream after hatching (NMFS 1998) but remain within freshwater habitats. Older juveniles tend to move downstream in fall and winter as water temperatures decline and the salt wedge recedes. Juveniles move upstream in spring and feed mostly in freshwater reaches during summer.

Shortnose sturgeon spawn in freshwater sections of rivers, typically below the first impassable barrier on the river *(e.g.,* dam). Spawning occurs over channel habitats containing gravel, rubble, or rock-cobble substrates (NMFS 1998). Additional environmental conditions associated with spawning activity include decreasing river discharge following the peak spring freshet, water temperatures ranging from 9 -12 C, and bottom water velocities of 0.4 - 0.7 m/sec (NMFS

1998).

Atlantic salmon

The recent ESA-listing for Atlantic salmon covers the wild population of Atlantic salmon found in rivers and streams from the lower Kennebec River north to the U.S.-Canada border. These include the Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot Rivers and Cove Brook. Atlantic salmon are an anadromous species with spawning and juvenile rearing occurring in freshwater rivers followed by migration to the marine environment. Juvenile salmon in New England rivers typically migrate to sea in May after a two to three year period of development in freshwater streams, and remain at sea for two winters before returning to their U.S. natal rivers to spawn from mid October through early November. While at sea, salmon generally undergo an extensive northward migration to waters off Canada and Greenland. Data from past commercial harvest indicate that post-smolts overwinter in the southern Labrador Sea and in the Bay of Fundy. The numbers of returning wild Atlantic salmon within the Gulf of Maine Distinct Population Segment (DPS) are perilously small with total run sizes of approximately 150 spawners occurring in 1999 (Baum 2000). Although capture of Atlantic salmon has occurred in commercial fisheries (usually otter trawl or gillnet gear) or by research/survey, no salmon have been reported captured in the Atlantic mackerel, squid and butterfish fisheries.

Seabirds

Most of the following information about seabirds is taken from the Mid-Atlantic Regional Marine Research Program (1994) and Peterson (1963). Fulmars occur as far south as Virginia in late winter and early spring. Shearwaters, storm petrels (both Leach's and Wilson's), jaegers, skuas, and some terns pass through this region in their annual migrations. Gannets and phalaropes occur in the Mid-Atlantic during winter months. Nine species of gulls breed in eastern North America and occur in shelf waters off the northeastern US. These gulls include: glaucous, Iceland, great black-backed, herring, laughing, ring-billed, Bonaparte's and Sabine's gulls, and black-legged caduceus. Royal and sandwich terns are coastal inhabitants from Chesapeake Bay south to the Gulf of Mexico. The Roseate tern is listed as endangered under the ESA, while the Least tern is considered threatened (Safina pers. comm.). In addition, the bald eagle is listed as threatened under the ESA and is a bird of aquatic ecosystems.

Like marine mammals, seabirds are vulnerable to entanglement in commercial and recreational fishing gear. The interaction has not been quantified in the recreational fishery, but impacts are not considered significant. Human activities such as coastal development, habitat degradation and destruction, and the presence of organochlorine contaminants are considered the major threats to some seabird populations.

Fishery Classification under Section 118 of Marine Mammal Protection Act

Under section 118 of the MMPA , the NMFS must publish and annually update the List of Fisheries (LOF), which places all US commercial fisheries in one of three categories based on the level of incidental serious injury and mortality of marine mammals in each fishery (arranging them according to a two tiered classification system). The categorization of a fishery in the LOF determines whether participants in that fishery may be required to comply with certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements. The classification criteria consists of a two tiered, stock-specific approach that first addresses the total impact of all fisheries on each marine mammal stock (Tier 1) and then addresses the impact of the individual fisheries on each stock (Tier 2). If the total annual mortality and serious injury of all fisheries that interact with a stock is less than 10% of the PBR for the stock then the stock is designated as Tier 1 and all fisheries interacting with this stock would be placed in Category III. Otherwise, these fisheries are subject to categorization under Tier 2. Under Tier 2, individual fisheries are subject to the following categorization:

I. Annual mortality and serious injury of a stock in a given fishery is greater than or equal to 50% of the PBR level;

II. Annual mortality and serious injury of a stock in a given fishery is greater than one percent and less than 50% of the PBR level; or

III. Annual mortality and serious injury of a stock in a given fishery is less than one percent of the PBR level.

In Category I, there is documented information indicating a "frequent" incidental mortality and injury of marine mammals in the fishery. In Category II, there is documented information indicating an "occasional" incidental mortality and injury of marine mammals in the fishery. In Category III, there is information indicating no more than a "remote likelihood" of an incidental taking of a marine mammal in the fishery or, in the absence of information indicating the frequency of incidental taking of marine mammals, other factors such as fishing techniques, gear used, methods used to deter marine mammals, target species, seasons and areas fished, and species and distribution of marine mammals in the area suggest there is no more than a remote likelihood of an incidental take in the fishery. "Remote likelihood" means that it is highly unlikely that any marine mammal will be incidentally taken by a randomly selected vessel in the fishery during a 20-day period.

The Atlantic Squid, Mackerel, Butterfish Trawl Fishery is currently listed as a Category I fishery in of the List of Fisheries for 2002 for the taking of marine mammals by commercial fishing operations under section 118 of the Marine Mammal Protection Act (MMPA) of 1972. The Atlantic Squid, Mackerel, Butterfish Trawl Fishery was previously NMFS classified as a Category II fishery. This change resulted from a Tier 1 evaluation of NMFS Sea Sampling data which demonstrated that the Atlantic Squid, Mackerel, Butterfish Trawl Fishery incidentally injured and killed the following marine mammal species and stocks during 1996-1998: common dolphin (WNA stock), white-sided dolphin (WNA stock) and *Globicephala* sp. (includes long-finned and short-finned pilot whales) (WNA stock). Based on data presented in the draft 2000 Stock Assessment Report (SAR), annual serious injury and mortality across all fisheries for pilot whale, common dolphin and white sided dolphin stocks exceeds 10% of the PBR (78, 184, and 107 respectively). Therefore, the Atlantic Squid, Mackerel, Butterfish Trawl Fishery was subject to Tier 2 analysis. The 2000 draft SAR analyses estimated an annual average mortality of 43 pilot whales and 367 common dolphins per year in this fishery, which is greater than 50% of PBR for each species. Therefore, the NMFS elevated this fishery to Category I in the 2001 LOF. Since this fishery has become a Category I fishery under MMPA, it will receive a high priority with respect to observer coverage and consideration for measures under future Take Reduction Plans for any of the species listed above.

Description of species of concern which are protected under MMPA

The following is a description of species of concern because they are protected under MMPA and, as discussed above, have had documented interactions with fishing gears used to harvest species managed under this FMP.

Common dolphin

The common dolphin may be one of the most widely distributed species of cetaceans, as it is found worldwide in temperate, tropical, and subtropical seas. In the North Atlantic, common dolphin appear to be present along the coast over the continental shelf along the 200-300m isobaths or over prominent underwater topography from 50/ N to 40/S latitude (Evans 1994; Waring *et al.* 2002). The species is less common south of Cape Hatteras, although schools have been reported as far south as eastern Florida (Gaskin 1992). Common dolphins are distributed along the continental slope (100 to 2,000 meters), and are associated with Gulf Stream features in waters off the northeastern USA coast (CETAP 1982; Selzer and Payne 1988; Waring *et al.* 1992). They are widespread from Cape Hatteras northeast to Georges Bank (35° to 42° North latitude) in outer continental shelf waters from mid-January to May (Hain *et al.* 1981; CETAP 1982; Payne *et al.* 1984). Common dolphins move northward onto Georges Bank and the Scotian Shelf from mid-summer to autumn (Palka *et al.* in review). Selzer and Payne (1988) reported very large aggregations (greater than 3,000 animals) on Georges Bank in autumn. Common dolphins are rarely found in the Gulf of 1,000 m. Maine, where temperature and salinity regimes are lower than on the continental slope of the Georges Bank/mid-Atlantic region (Selzer and Payne 1988). Migration onto the Scotian Shelf and continental shelf off Newfoundland occurs during summer and autumn when water temperatures exceed 11/C (Sergeant *et al.* 1970; Gowans and Whitehead 1995; Waring *et al.* 2002).

Total numbers of common dolphins off the USA or Canadian Atlantic coast are unknown, although five estimates from selected regions of the habitat do exist for select time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas . An abundance of 29,610 common dolphins (CV=0.39) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape

Hatteras, North Carolina and Nova Scotia (CETAP 1982). An abundance of 22,215 (CV=0.40) common dolphins was estimated from a June and July 1991 shipboard line transect sighting survey conducted primarily between the 200 and 2,000m isobaths from Cape Hatteras to Georges Bank (Waring *et al.* 1992; Waring 1998). As recommended in the GAMS Workshop Report (Wade and Angliss 1997), estimates 66older than eight years are deemed unreliable, therefore should not be used for PBR determinations. Further, due to changes in survey methodology these data should not be used to make comparisons to more current estimates (Waring *et al.* 2002).

An abundance of 1,645 (CV=0.47) common dolphins was estimated from a June and July 1993 shipboard line transect sighting survey conducted principally between the 200 and 2,000 m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (Waring *et al.* 2002). Data were collected by two alternating teams that searched with 25x150 binoculars and were analyzed using DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993). Estimates include school size-bias, if applicable, but do not include corrections for g(0) or dive-time. Variability was estimated using bootstrap resampling techniques.

An abundance of 6,741 (CV=0.69) common dolphins was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Waring *et al.* 2002). Total track line length was 32,600 km. The ships covered waters between the 50 and 1000 fathom depth contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom depth contour line. Data collection and analysis methods used were described in Palka (1996).

An abundance of 30,768 (CV=0.32) common dolphins was estimated from a line transect sighting survey conducted during July 6 to September 6, 1998 by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38/ N) (Figure 1; Palka *et al.* in review). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and g(0), the probability of detecting a group on the track line. Aerial data were not corrected for g(0). No common dolphins were encountered during the SEFSC component of the joint surveys. That shipboard line transect sighting survey was conducted between 8 July and 17 August 1998 and surveyed 5,570 km of track line in waters south of Maryland (38/N) (Mullin in review). Although the 1991, 1993, 1995, and 1998 surveys did not sample the same areas or encompass the entire common dolphin habitat (e.g., little effort in Scotian shelf edge waters), they did focus on segments of known or suspected high-use habitats off the northeastern USA coast. The 1993, 1995, and 1998 data suggest that, seasonally, at least several thousand common dolphins are occupying continental shelf edge waters, with perhaps highest abundance in the Georges Bank region (Waring *et al.* 2002).

The best available abundance estimate for common dolphins is 30,768 (CV=0.32) as estimated from the July 6 to September 6, 1998 USA Atlantic surveys. This estimate is considered best because these surveys have the most complete coverage of the species' habitat. The previous best estimate of 22,215 (CV=0.40) is nearly eight years old. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the lognormally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for common dolphins is 30,768 (CV=0.32). The minimum population estimate for the western North Atlantic common dolphin is 23,655 (CV=0.32). There are insufficient data to determine the population trends for this species (Waring *et al.* 2002).

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 23,655 (CV=0.32). The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.48 because the CV of the average mortality estimate is between 0.3-0.6 (Wade and Angliss 1997), and because this stock is of unknown status. PBR for the western North Atlantic common dolphin is 227 (Waring *et al.* 2002).

Fishery Interactions

Total annual estimated average fishery-related mortality or serious injury to this stock during 1996-2000 was 375 common dolphins (CV=0.40; Waring *et al.* 2002). Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the USA. With implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA), an observer program was established which has recorded fishery data and information of incidental bycatch of marine mammals. DWF effort in the Atlantic coast Exclusive Economic Zone (EEZ) under MFCMA has been directed primarily towards Atlantic mackerel and squid. From 1977 through 1982, an average of 120 different foreign vessels per year (range 102-161) operated within the US Atlantic EEZ. In 1982, there were 112 different foreign vessels; 16%, or 18, were Japanese tuna longline vessels operating along the USA east coast. This was the first year that the Northeast Regional Observer Program assumed responsibility for observer coverage of the longline vessels. Between 1983 and 1991, the numbers of foreign vessels operating within the US Atlantic EEZ each year were 67, 52, 62, 33, 27, 26, 14, 13, and 9, respectively. Between 1983 and 1988, the numbers of DWF vessels included 3, 5, 7, 6, 8, and 8, respectively, Japanese longline vessels. Observer coverage on DWF vessels was 25-35% during 1977-1982, and increased to 58%, 86%, 95%, and 98%, respectively, in 1983-1986. From 1987-91, 100% observer coverage was maintained. Foreign fishing operations for squid and mackerel ceased at the end of the 1986 and 1991 fishing seasons, respectively .

During the period 1977-1986, observers recorded 123 mortalities in foreign Loligo squid-fishing activities (Waring *et al.* 1990). In 1985 and 1986, Italian vessels took 56 and 54 animals, respectively, which accounts for 89% (n = 110) of the total takes in foreign Loligo squid-fishing operations. No mortalities were reported in foreign Illex squid fishing operations. Because of spatial/temporal fishing restrictions, most of the bycatch occurred along the continental shelf edge (100 m) isobath during winter (December to February).

From 1977-1991, observers recorded 110 mortalities in foreign mackerel-fishing operations (Waring *et al.*1990; NMFS unpublished data). This total includes one documented take by a USA vessel involved in joint-venture fishing operations in which USA captains transfer their catches to foreign processing vessels. The bycatch occurred during winter/spring (December to May).

Data on current incidental takes in USA fisheries are available from several sources. In 1986, NMFS established a mandatory self-reported fisheries information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989, and since that year several fisheries have been covered by the program. In late 1992 and in 1993, the SEFSC provided observer coverage of pelagic longline vessels fishing off the Grand Banks (Tail of the Banks) and provides observer coverage of vessels fishing south of Cape Hatteras.

Bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet, pelagic pair trawl, pelagic longline fishery, mid-Atlantic coastal gillnet, North Atlantic bottom trawl, Northeast multispecies sink gillnet, and Atlantic squid, mackerel, butterfish trawl fisheries (Waring *et al.* 2002).

The mid-Atlantic mackerel and squid trawl fisheries were combined into the Atlantic mid-water trawl fishery in the revised proposed list of fisheries in 1995. The fishery occurs along the USA mid-Atlantic continental shelf region between New Brunswick, Canada, and Cape Hatteras year around. The mackerel trawl fishery was classified as a Category II fishery since 1990 and the squid fishery was originally classified as a Category II fishery in 1990, but was reclassified as a Category III fishery in 1992. The combined fishery was reclassified as a Category II fishery in 1995. In 1996, mackerel, squid, and butterfish trawl fisheries were combined into the Atlantic squid, mackerel, and butterfish trawl fishery, and maintained a Category II classification. As noted above, the NMFS elevated this fishery to Category I in the 2001 LOF. The Observer coverage, expressed as number of trips, was < 1% from 1996-2000. Three common dolphin mortalities were observed in 1996, 1 in 1997, 0 in 1998, 1 in 1999, and 6 in 2000. The 1996 and 2000 mortalities were in the Loligo squid fishery and the 1997 mortality occurred in the Atlantic mackerel fishery. The estimated annual fishery-related mortality and serious injury attributable to this fishery (CV in parentheses) was 940 in 1996 (0.75), 161 in 1997 70 (0.49), 0 in 1998, 49 in 1999 (0.78), and 235 in 2000 (0.57). Average annual estimated fishery-related mortality attributable to this fishery during 1996-2000 was 285 common dolphins (CV= 0.51). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage and uncertainties regarding number of vessels participating in this "fishery". In addition, a USA joint venture fishery was conducted in the mid-Atlantic region from February-May 1998. NMFS, maintained 100% observer coverage on the foreign joint venture vessels. One hundred and fifty-two transfers from the USA vessels were observed. Seventeen common dolphin mortalities were observed in March. The principal fish species in the transferred trawl nets and number of bycaught animals (in parentheses) were: squid (11), butterfish (4), and mackerel (2). Average annual estimated fishery-related mortality attributable to this fishery in 1998 was 17 common dolphins (CV=0) (Waring *et al.* 2002).

The status of common dolphins, relative to OSP, in the US Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is a strategic stock because the1996-2000 average annual fishery-related mortality and serious injury exceeds PBR (Waring *et al.* 2002).

White-sided dolphin (*Lagenorhynchus acutus*)

White-sided dolphins are found in temperate and sub-polar waters of the North Atlantic, primarily on continental shelf waters to the 100 m depth contour. The species inhabits waters from central west Greenland to North Carolina (about 35o N) and perhaps as far east as 43º W (Evans 1987). Distribution of sightings, strandings and incidental takes suggest the possible existence of three stocks units: a Gulf of Maine, a Gulf of St. Lawrence and a Labrador Sea stock (Palka *et al.* 1997). A genetic study is currently being conducted to test this proposed population structure and should be available during 2002. Evidence for a separation between the well documented unit in the southern Gulf of Maine and a Gulf of St. Lawrence population comes from a hiatus of summer sightings along the Atlantic side of Nova Scotia. This has been reported in Gaskin (1992), is evident in Smithsonian stranding records, and was seen during abundance surveys conducted in summers 1995 and 1999 that covered waters from Virginia to the entrance of the Gulf of St. Lawrence. White-sided dolphins were seen frequently in eastern Gulf of Maine waters and in waters at the mouth of the Gulf of St. Lawrence, but only a few sightings were recorded in the waters between these two regions (Waring *et al.* 2002).

The Gulf of Maine stock of white-sided dolphins is most common in continental shelf waters from Hudson Canyon (approximately 39/N) north through Georges Bank, and in the Gulf of Maine to the lower Bay of Fundy. Sightings data indicate seasonal shifts in distribution (Northridge *et al.* 1997). During January to April, low numbers of white-sided dolphins are found from Georges Bank to Jeffreys Ledge (off New Hampshire), and even lower numbers are south of Georges Bank, as documented by a few strandings collected on beaches of Virginia and North Carolina. From June through September, large numbers of white-sided dolphins are found from Georges Bank to lower Bay of Fundy. From October to December, white-sided dolphins occur at intermediate densities from southern Georges Bank to southern Gulf of Maine (Payne and Heinemann 1990). Sightings south of Georges Bank, in particular, around Hudson Canyon have been seen at all times of the year but at low densities. The Virginia and North Carolina observations appear to represent the southern extent of the species range. Prior to the 1970's, white-sided dolphins in USA waters were found primarily offshore on the continental slope, while white-beaked dolphins (L. albirostris) were found on the continental shelf. During the 1970's, there was an apparent switch in habitat use between thesetwo species. This shift may have been a result of the increase in sand lance in the continental shelf waters (Katona *et al.* 1993; Kenney *et al.* 1996).

The total number of white-sided dolphins along the eastern USA and Canadian Atlantic coast is unknown, although five estimates from select regions are available: 1) from spring, summer and autumn 1978-82; 2) July-September 1991-92; 3) June-July 1993; 4) July-September 1995 (Figure 1); and 5) July-August 1999. An abundance of 28,600 white-sided dolphins (CV=0.21) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982).

An abundance of 20,400 (CV=0.63) white-sided dolphins was estimated from two shipboard line transect surveys conducted during July to September 1991 and 1992 in the northern Gulf of Maine-lower Bay of Fundy region (Palka *et al.* 1997). This population size is a weighted-average of the 1991 and 1992 estimates, where each annual estimate was weighted by the inverse of its variance. An abundance of 729 (CV= 0.47) white-sided dolphins was estimated from a June and July 1993 shipboard line transect sighting survey conducted principally between the 200 and 2,000 m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (Waring *et al.* 2002).

An abundance of 27,200 (CV=0.43) white-sided dolphins was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Waring *et al.* 2002). Total track line length was 32,600 km. The ships covered waters between the 50 and 1000 fathom contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom contour line. Data collection and analysis methods used were described in Palka (1996). An abundance of 51,640 (CV=0.38) white-sided dolphins was estimated from a 28 July to 31 August 1999 line-transect sighting survey conducted from a ship and an airplane covering waters from Georges Bank to the mouth of the Gulf of St. Lawrence (Waring *et al.* 2002). Total track line length was 8,212 km. Similar to that used in the above 1995 survey, shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and g(0), the probability of detecting a group on the track line. Aerial data were not corrected for g(0) (Palka 2000). The 1999 estimate is larger than the 1995 estimate due to, at least in part, the fact that the 1999 survey covered the upper Bay of Fundy and the northern edge of Georges Bank for the first time and white-sided dolphins were seen. Kingsley and Reeves (1998) estimated there were 11,740 (CV=0.47) white-sided dolphins in the Gulf of St. Lawrence during 1995, and 560 (CV=0.89) white-sided dolphins in the northern Gulf of St. Lawrence during 1996 (Waring *et al.* 2002). It is assumed these estimates apply to the Gulf of St. Lawrence stock. During the 1995 survey, 8,427 km of track lines were flown in an area of 221,949 km2 during August and September. During the 1996 survey, 3,993 km of track lines were flown in an area of 94,665 km2 during July and August. Data were analyzed using Quenouille's jackknife bias reduction procedure on line transect methods that model the left truncated sighting curve (Waring *et al.* 2002). These estimates were uncorrected for visibility biases, such as g(0). The best available current abundance estimate for white-sided dolphins in the Gulf of Maine stock is 51,640 (CV=0.38) as estimated from the July to August 1999 line transect survey because this survey is recent and provided the most complete coverage of the known habitat (Waring *et al.* 2002).

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the lognormally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the Gulf of Maine stock of whitesided dolphins is 51,640 (CV=0.38). The minimum population estimate for these white-sided dolphins is 37,904 (CV=0.38). There are insufficient data to determine population trends for this species (Waring *et al.* 2002).

Current and maximum net productivity rates are unknown for this stock. Life history parameters that could be used to estimate net productivity include: calving interval is 2-3 years; lactation period is 18 months; gestation period is 10-12 months and births occur from May to early August, mainly in June and July; length at birth is 110 cm; length at sexual maturity is 230-240 cm for males, and 201-222 cm for females; age at sexual maturity is 8-9 years for males and 6-8 years for females; mean adult length is 250 cm for males and 224 cm for females (Evans 1987); and maximum reported age for males is 22 years and for females, 27 years (Sergeant *et al.* 1980). For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 37,904 (CV=0.38). The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.48 because this stock is of unknown status and the CV of the mortality estimate is between 0.3 and 0.6. PBR for the Gulf of Maine stock of the western North Atlantic whitesided dolphin is 364 (Waring *et al.* 2002).

Fishery Interactions

Recently, within USA waters, white-sided dolphins have been observed caught in the Northeast sink gillnet, mid-Atlantic coastal gillnet, pelagic drift gillnet, North Atlantic bottom trawl, and Atlantic squid, mackerel, butterfish trawl fisheries. Estimated average annual fishery-related mortality and serious injury to the Gulf of Maine stock of the western North Atlantic white-sided dolphin from these USA fisheries during 1996-2000 was 118 (CV=0.48) dolphins per year (Waring *et al.* 2002).

In the past, incidental takes of white-sided dolphins have been recorded in the Atlantic foreign mackerel fishery and pelagic drift gillnet fishery. In the mid 1980's, during a University of Maine study, gillnet fishermen reported 6 takes of white-sided dolphins of which 2 carcasses were necropsied for biological studies (Gilbert and Wynne 1987; Gaskin 1992). Atlantic foreign mackerel NMFS foreign fishery observers have reported 44 takes of Atlantic white-sided dolphins incidental to fishing activities in the continental shelf and continental slope waters between March 1977 and December 1991 (Waring *et al.* 1990. Of these animals, 96% were taken in the Atlantic mackerel fishery. This total includes 9 documented takes by USA vessels involved in joint-venture fishing operations in which USA captains transfer their catches to foreign processing vessels. Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the USA. With implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA) in that year, an observer program was established which recorded fishery data and information of incidental bycatch of marine mammals. DWF effort in the USA Atlantic Exclusive Economic Zone (EEZ) under MFCMA had been directed primarily towards Atlantic mackerel and squid. From 1977 through 1982, an average of 120 different foreign vessels per year (range 102-161) 106 operated within the US Atlantic EEZ. In 1982, there were 112 different foreign vessels; 16%, or 18, were Japanese tuna longline vessels operating along the USA east coast. This was the first year that the Northeast Regional Observer Program assumed responsibility for observer coverage of the longline vessels. Between 1983 and 1991, the numbers of foreign vessels operating within the US Atlantic EEZ each year were 67, 52, 62, 33, 27, 26, 14, 13, and 9, respectively. Between 1983 and 1988, the numbers of DWF vessels included 3, 5, 7, 6, 8, and 8, respectively, Japanese longline vessels. Observer coverage on DWF vessels was 25-35% during 1977-82, and increased to 58%, 86%, 95%, 98%, respectively, in 1983-86 and 100% observer coverage was maintained during 1987-91. Foreign fishing operations for squid ceased at the end of the 1986 fishing season and for mackerel at the end of the 1991 season (Waring *et al.* 2002).

One white-sided dolphin was observed taken in the mackerel sub-fishery during 1997 (Waring *et al.* 2002). The squid, mackerel, butterfish trawl fishery, though managed under one FMP, is actually three independent fisheries operating in different areas during different times of the year (NMFS 1998). The *Loligo* squid sub-fishery is mostly in southern New England, New York and mid-Atlantic waters, where fishing patterns reflect the seasonal migration of the *Loligo* (offshore during October to March and inshore during April to September). The *Illex* squid sub-fishery is primarily on the continental slope during June to September. The mackerel sub-fishery during January to May is primarily in the southern New England and mid-Atlantic waters, while during May to December, it is primarily in the Gulf of Maine. Butterfish is primarily a bycatch of the squid and mackerel sub-fisheries. Butterfish migrate north and inshore during the summer, and south and offshore during the winter. In 1995, the squid, mackerel, butterfish trawl fishery was classified as a Category II fishery. As noted above, the NMFS elevated this fishery to Category I in the 2001 LOF. Observer coverage was very low. Expressed as percentage of trips observed, it was 0.7% in 1996, 0.8% in 1997, 0.3% in 1998, 0.4% in 1999, and 0.7% in 2000. The bycatch, stratified by subfishery, season and geographical area, was estimated using the ratio estimator method, as was documented in Bisack (1997b). The estimated fishery-related mortality was 0 in 1996, 161 (CV=1.58) in 1997, and 0 in 1998 to 2000. The average annual estimated fishery-related mortality during 1996 to 2000 was 32 (CV=1.58)(Waring *et al.* 2002) .

The status of white-sided dolphins, relative to OSP, in the US Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for this species. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is a non-strategic stock because estimated average annual fishery-related mortality and serious injury does not exceed PBR (Waring *et al.* 2002).

Long-finned (*Globicephala melas*) and short-finned (*Globicephala macrorhynchus*) pilot whales

There are two species of pilot whales in the Western Atlantic — the Atlantic or long-finned pilot whale, *Globicephala melas*, and the short-finned pilot whale, *G. macrorhynchus*. These species are difficult to identify to the species level at sea; therefore, the descriptive material below refers to *Globicephala* sp., and is identified as such. The species boundary is considered to be in the New Jersey to Cape Hatteras area. Sightings north of this are likely *G. melas*. Pilot whales (*Globicephala* sp.) are distributed principally along the continental shelf edge in the winter and early spring off the northeast USA coast, (CETAP 1982; Payne and Heinemann 1993). In late spring, pilot whales move onto Georges Bank and into the Gulf of Maine and more northern waters, and remain in these areas through late autumn (CETAP 1982; Payne and Heinemann 1993). In general, pilot whales occupy areas of high relief or submerged banks. They are also associated with the Gulf Stream north wall and thermal fronts along the continental shelf edge (Waring *et al.* 1992; Waring *et al.* 2002).

The long-finned pilot whale is distributed from North Carolina to North Africa (and the Mediterranean) and north to Iceland, Greenland and the Barents Sea (Leatherwood *et al.* 1976; Abend 1993; Buckland *et al.* 1993). The stock structure of the North Atlantic population is uncertain (Fullard *et al.* 2000). Recent morphometrics and genetics (Siemann 1994; Fullard *et al.* 2000) studies have provided little support for stock structure across the Atlantic (Fullard *et al.* 2000). However, Fullard *et al.* (2000) have proposed a stock structure that is correlated to sea surface temperature: 1) a cold-water population west of the Labrador/North Atlantic current and 2) a warm-water population that extends across the Atlantic in the Gulf Stream (Waring *et al.* 2002).

The short-finned pilot whale is distributed worldwide in tropical to warm temperate water (Leatherwood and Reeves 1983). The northern extent of the range of this species within the USA Atlantic Exclusive Economic Zone (EEZ) is generally thought to be Cape Hatteras, North Carolina (Leatherwood and Reeves 1983). Sightings of these animals in US Atlantic EEZ occur primarily within the Gulf Stream [Southeast Fisheries Science Center (SEFSC) unpublished data], and along the continental shelf and continental slope in the northern Gulf of Mexico. There is no information on stock differentiation for the Atlantic population (Waring *et al.* 2002).

The total number of short-finned pilot whales off the eastern USA and Canadian Atlantic coast is unknown, although ten estimates from selected regions of the habitat do exist for select time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas (Waring *et al.* 2002). Two estimates were derived from catch data and population models that estimated the abundance of the entire stock. Seven seasonal estimates are available from selected regions in USA waters during spring, summer and autumn 1978-82, August 1990, June-July 1991, August-September 1991, June-July 1993, July-September 1995, and July-August 1998. Because long-finned and short-finned pilot whales 100 m and 1,000 m. are difficult to identify at sea, seasonal abundance estimates were reported for Globicephala sp., both long-finned and short-finned pilot whales. One estimate is available from the Gulf of St. Lawrence. Mitchell (1974) used cumulative catch data from the 1951-61 drive fishery off Newfoundland to estimate the initial population size (ca. 50,000 animals). Mercer (1975), used population models to estimate a population in the same region of between 43,000- 96,000 long-finned pilot whales, with a range of 50,000-60,000 being considered the best estimate.

An abundance of 11,120 (CV=0.29) *Globicephala* sp. was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982). An abundance of 3,636 (CV=0.36) *Globicephala* sp. was estimated from a June and July 1991 shipboard line transect sighting survey conducted primarily between the 200 and 2,000 m isobaths from Cape Hatteras to Georges Bank (Waring *et al.* 1992; Waring 1998; Waring *et al.* 2002). An abundance of 3,368 (CV=0.28) and 139 5,377 (CV=0.53) *Globicephala* sp. was estimated from line transect aerial surveys conducted from August to September 1991 using the Twin Otter and AT-11, respectively. As recommended in the GAMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, and therefore should not be used for PBR determinations. Further, due to changes in survey methodology, these data should not be used to make comparisons to more current estimates. An abundance of 668 (CV=0.55) Globicephala sp. was estimated from a June and July 1993 shipboard line transect sighting survey conducted principally between the 200 and 2,000 m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf . Data were collected by two alternating teams that searched with 25x150 binoculars and were analyzed using DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993). Estimates include school-size bias, if applicable, but do not include corrections for g(0) or dive-time. Variability was estimated using bootstrap resampling techniques. An abundance of 8,176 (CV=0.65) Globicephala sp. was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence. Total track line length was 32,600 km. The ships covered waters between the 50 and 1000 fathom depth contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline tothe 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom depth contour line (Waring *et al.* 2002). Data collection and analysis methods used were described in Palka (1996). Kingsley and Reeves (1998) obtained an abundance estimate of 1,600 long-finned pilot whales (CV=0.65) from a late August and early September aerial survey of cetaceans in the Gulf of St. Lawrence in 1995 and 1998. Based on an examination of long-finned pilot whale summer distribution patterns and information on stock structure, it was deemed appropriate to combine these estimates with NMFS 1995 summer survey data. The best 1995 abundance estimate for Globicephala sp., 9,776 (CV=0.55), is the sum of the estimates from the USA and Canadian surveys, where the estimate from the USA survey is 8,176 (CV=0.65) and from the Canadian, 1,600 (CV=0.65) (Waring *et al.* 2002).

An abundance of 9,800 (CV=0.34) Globicephala sp. was estimated from a line transect sighting survey conducted during July 6 to September 6, 1998 by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38/ N) (Waring *et al.* 2002). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and g(0), the probability of detecting a group on the track line. Aerial data were not corrected for g(0). An abundance of 4,724 (CV=0.61) Globicephala sp. was estimated from a shipboard line transect sighting survey conducted between 8 July and 17 August 1998 that surveyed 5,570 km of track line in waters south of Maryland (38/N) (Waring *et al.* 2002). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993) where school size bias and ship attraction were accounted for.

The best available abundance estimate for Globicephala sp., 14,524 (CV=0.30), is the sum of the estimates from the two 1998 USA Atlantic surveys, where the estimate from the northern USA Atlantic is 9,800 (CV=0.34) and from the southern USA Atlantic is 4,724 (CV=0.61) (Waring *et al.* 2002). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat.

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the lognormally distributed best abundance estimate (Waring *et al.* 2002). This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for Globicephala sp. is 14,524 (CV=0.30) (Waring *et al.* 2002). The minimum population estimate for Globicephala sp. is 11,343 (CV=0.30). There are insufficient data to determine the population trends for this species (Waring *et al.* 2002).

Current and maximum net productivity rates are unknown for this stock. For purposes of their assessment, Waring *et al.* 2002 assumed the maximum net productivity rate to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for Globicephala sp. is 11,343 (CV=0.30). The maximum productivity rate is 0.04, the default value for cetaceans. The “recovery” factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be .48 because the CV of the average mortality estimate is between 0.3-0.6 (Wade and Angliss 1997), and because this stock is of unknown status. PBR for the western North Atlantic Globicephala sp. is 108 (Waring *et al.* 2002).

Fishery Interactions

Total fishery-related mortality and serious injury cannot be estimated separately for the two species of pilot whales in the US Atlantic EEZ because of the uncertainty in species identification by fishery observers. The Atlantic Scientific Review Group advised adopting the risk-averse strategy of assuming that either species might have been subject to the observed fishery-related mortality and serious injury. Total annual estimated average fishery-related mortality or serious injury of this stock during 1996-2000 in the USA fisheries listed below was 193 pilot whales (CV=0.43) (Waring *et al.* 2002). The Canadian average annual mortality estimate for 1996 from the Nova Scotia trawl fisheries is 6 long-finned pilot whales. It is not possible to estimate variance of the Canadian estimate. The total average annual mortality estimate for 1996-2000 from the USA and Nova Scotia trawl fisheries is 199 (CV = 0.43) (Waring *et al.* 2002).

The level of past or current, direct, human-caused mortality of short-finned pilot whales in the US Atlantic EEZ is unknown. The short-finned pilot whale has been taken in the pelagic longline fishery in Atlantic waters off the southeastern USA (Lee *et al.* 1994; SEFSC unpublished data). Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the USA. A fishery observer program, which has collected fishery data and information on incidental bycatch of marine mammals, was established in 1977 with the implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA). DWF effort in the US Atlantic EEZ under MFCMA has been directed primarily towards Atlantic mackerel and squid. An average of 120 different foreign vessels per year (range 102-161) operated within the US Atlantic EEZ during 1977 through 1982. In 1982, there were 112 different foreign vessels; 18 (16%) were Japanese tuna longline vessels operating along the USA Atlantic coast. This was the first year that the Northeast Regional Observer Program assumed responsibility for observer coverage of the longline vessels. The number of foreign vessels operating within the US Atlantic EEZ each year between 1983 and 1991 averaged 33 and ranged from 9 to 67. The number of Japanese longline vessels included among the DWF vessels averaged 6 and ranged from 3 to 8 between 1983 and 1988. MFCMA observer coverage on DWF vessels was 25-35% during 1977-82, increased to 58%, 86%, 95%, and 98%, respectively, during 1983-86, 141 and 100% observer coverage was maintained from 1987-91. Foreign fishing operations for squid ceased at the end of the 1986 fishing season and, for mackerel, at the end of the 1991 fishing season.

During 1977-1991, observers in this program recorded 436 pilot whale mortalities in foreign-fishing activities (Waring *et al.* 1990; Waring 1995). A total of 391 (90%) were taken in the mackerel fishery, and 41 (9%) occurred during Loligo and Illex squid-fishing operations. This total includes 48 documented takes by USA vessels involved in joint venture fishing operations in which USA captains transfer their catches to foreign processing vessels. Due to temporal fishing restrictions, the bycatch occurred during winter/spring (December to May) in continental shelf and continental shelf edge waters; however, the majority of the takes occurred in late spring along the 100 m isobath. Two animals were also caught in both the hake fishery and tuna longline fisheries (Waring *et al.* 1990).

The distribution of long-finned pilot whale, a northern species, overlaps with that of the short-finned pilot whale, a predominantly southern species, between 35/30'N to 38/00'N (Leatherwood *et al.* 1976). Although long-finned pilot whales are most likely taken in the waters north of Delaware Bay, many of the pilot whale takes are not identified to species and bycatch does occur in the overlap area. In this summary, therefore, long-finned pilot whales (Globicephala melas) and unidentified pilot whales (Globicephala sp.) are considered together. Data on current incidental takes in USA fisheries are available from several sources. In 1986, NMFS established a mandatory self-reported fisheries information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989, and since that year several fisheries have been covered by the program. In late 1992 and in 1993, the SEFSC provided observer coverage of pelagic longline vessels fishing off the Grand Banks (Tail of the Banks) and provides observer coverage of vessels fishing south of Cape Hatteras (Waring *et al.* 2002).

Bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet, pelagic longline, and pelagic pair trawl, bluefin tuna purse seine, North Atlantic bottom trawl, Atlantic squid, mackerel, butterfish trawl, and Mid- Atlantic coastal gillnet fisheries, but no mortalities or serious injuries have documented in the Northeast multispecies sink gillnet fishery .

The mid-Atlantic mackerel and squid trawl fisheries were combined into the Atlantic mid-water trawl fishery in the revised proposed list of fisheries in 1995. The fishery occurs along the USA mid-Atlantic continental shelf region between New Brunswick, Canada, and Cape Hatteras year around. The mackerel trawl fishery was classified as a Category II fishery since 1990 and the squid fishery was originally classified as a Category II fishery in 1990, but was reclassified as a Category III fishery in 1992. The combined fishery was then reclassified as a Category II fishery in 1995. In 1996, mackerel, squid, and butterfish trawl fisheries were combined into the Atlantic squid, mackerel, butterfish trawl fishery, and maintained a Category II classification until 2001 when they were reclassified as a Category I fishery. Three fishery-related mortalities of pilot whales were reported in self-reported fisheries information from the mackerel trawl fishery between 1990-1992. Six mortalities were observed in 1996, 1 in years 1998 and 1999 and 2 in 2000. The 1996 and 1998 bycatch occurred in the Illex squid fishery, and the 1999 in the *Loligo* fishery. The estimated fishery-related mortality to pilot whales in the USA Atlantic attributable to this fishery was: 45 in 1996 (CV=1.27), 0 in 1997, 85 in 1998 (CV=0.65), 49 in 1999

(CV=0.97) and 34 in 2000 (CV=0.65); average annual mortality between 1996 and 2000 was 43 pilot whales (CV=0.45). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

Other Mortality

Pilot whales have a propensity to mass strand throughout their range, but the role of human activity in these events is unknown (Waring *et al.* 2002). Between 2 and 120 pilot whales have stranded annually either individually or in groups in NMFS Northeast Region (Anon. 1993b) since 1980. From 1992-2000, 98 long-finned pilot whale stranded between South Carolina and Maine, including 22 and 11 animals that mass stranded in 1992 and 2000, respectively, along the Massachusetts coast (NMFS unpublished data). Four of 6 animals from 1 live stranding event in Massachusetts in 2000 were rehabilitated and released. In addition 11 pilot whales that live stranded on Nantucket were returned to the water. In eastern Canada, 37 strandings of long-finned pilot whales (173 individuals) were reported on Sable Island, Nova Scotia from 1970-1998 (Lucas and Hooker 1997; Lucas and Hooker 2000). This included 130 animals that mass stranded in December 1976, and 2 smaller groups (<10 each) in autumn 1979 and summer 1992. Fourteen strandings were also recorded along Nova Scotia from 1991-1996 (Hooker *et al.* 1997). A potential human-caused source of mortality is from polychlorinated biphenyls (PCBs) and chlorinated pesticides (DDT, DDE, dieldrin, etc.) moderate levels of which have been found in pilot whale blubber (Taruski 1975; Muir *et al.* 1988; Weisbrod *et al.* 2000). Weisbrod *et al.* (2000) reported that bioaccumulation levels were more similar in whales from the same standing group than animals of the same sex or age. Also, high levels of toxic metals (mercury, lead, cadmium) and selenium were measured in pilot whales harvested in the Faroe Island drive fishery. The population effect of the observed levels of such contaminants is unknown (Waring *et al.* 2002).

The status of long-finned and short-finned pilot whales relative to OSP in US Atlantic EEZ is unknown, but stock abundance may have been affected by reduction in foreign fishing, curtailment of the Newfoundland drive fishery for pilot whales in 1971, and increased abundance of herring, mackerel, and squid stocks. There are insufficient data to determine the population trends for these species. The species are not listed under the Endangered Species Act. The total fishery-related mortality and serious injury for these stocks is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. These are a strategic stocks because the 1996-2000 estimated average annual fishery-related mortality, excluding Nova Scotia bycatches to pilot whales, Globicephala sp., exceeds PBR (Waring *et al.* 2002).

5.0 Description of the Human Environment

5.1 Description of Fisheries

5.1.1 Description of the Historical Fisheries for *Illex*

As in the case of *Loligo*, *Illex* have been exploited by US fishermen since at least late 1800's, being used primarily as bait. From 1928 to 1967, reported annual US squid landings from Maine to North Carolina (including *Loligo pealei*) ranged from 500-2,000 mt (Lange and Sissenwine 1980). However, foreign fishing fleets became interested in exploitation of the neritic squid stocks of the Northwest Atlantic Ocean when the USSR first reported squid bycatches in the mid-1960's. By 1972, foreign fishing fleets reported landing 17,200 thousand mt of *Illex* from Cape Hatteras to the Gulf of Maine. During the period 1973-1982, foreign landings of *Illex* in US waters averaged about 18,000 mt, while US fisherman averaged only slightly more than 1,100 mt per year. Foreign landings from 1983-1986 were part of the US joint venture fishery which ended in 1987 (NMFS 1994a). The domestic fishery for *Illex* increased steadily during the 1980's as foreign fishing was eliminated in the US EEZ. US landings first exceeded 10,000 mt in 1987 and ranged roughly from 11,000 mt in 1990 to 17,800 mt in 1992.

Because their geographical range extends well beyond the US EEZ, *Illex* are subject to heavy exploitation in waters outside of US jurisdiction. During the mid-1970's, a large directed fishery for *Illex* developed in NAFO subareas 2-4. Reported landings of *Illex* increased dramatically from 17,700 mt in 1975 to 162,000 mt in 1979. *Illex* landings in NAFO subareas 2-4 subsequently plummeted to slightly less than 13,000 mt by 1982. Hence, within the total stock of *Illex* (NAFO Subareas 2-6) landings peaked in 1979 at 180,000 mt but have since declined sharply, ranging from 2,800 to 22,200 mt during the period 1983-1991 (NMFS 1994a).

In 1992, US *Illex* landings were a then record high 17,827 mt with an ex-vessel value of $9,700,000 (average price=$0.54 per kg/$0.25 per lb). Statistical area 622 accounted for 63% of the total harvest, while three areas (SA 622,626, and 632) accounted for 96% of the total in 1992. Temporally, 94% of the 1992 *Illex* landings were taken during June through October. Otter trawl gear accounted for virtually all (99.9%) of the 1992 landings.

Illex landings reached 18,012 mt in 1993 and then rose slightly to a then record high 18,344 mt in 1994. In 1993, prices fell to $473/mt but rose sharply in 1994 to $569/mt. NMFS weighout data indicate that *Illex* landings declined to 14,049 mt in 1995 (dockside value declined to $8.0 million). In 1996, US *Illex* landings increased to 16,969 mt (valued at $9.7 million) and then declined to 13,632 mt (valued at $6.1 million) in 1997. *Illex* landings were 22,705 mt in 1998 valued at $9.2 million. *Illex* landings averaged 17,142 mt for the period 1994-1998. Unpublished NMFS weighout data indicate that 7,361 mt of *Illex* valued at $3.9 million was landed in 1999and that 9,041 mt of *Illex* valued at $3.7 million was landed in 2000. Unpublished NMFS weighout data indicate that 3,939 mt of *Illex* valued at $1.8 million was landed in 2001.

5.1.2 Description of 2002 *Illex* Fishery

Unpublished NMFS weighout data indicate that 2,723 mt of *Illex* valued at $1.4 million was landed in 2002. The 2002 landings of *Illex* by state are given in Table 1. Two states, Rhode Island and New Jersey accounted for the majority (>95%) of *Illex* landings in 2002. Rhode Island accounted for more than 87% of the 2002 *Illex* landings. The 2002 landings of *Illex* by month are given in Table 2. The majority of *Illex* landings occurred in the summer and early fall. Virtually all (99.9%) were taken by bottom otter trawls (Table 3).

The landings of *Illex* by port in 2002 are given in Table 4. North Kingstown, RI accounted for greater than 70 % of the *Illex* landings in 2002. Other important ports in terms of *Illex* landings included Point Judith, RI (16.6%), Cape May, NJ (4.8%), and Elizabeth, NJ (3.4%). North Kingstown, RI was the only port that was dependent on *Illex* for more than 10% of the value of total fishery landings in 2002 (Table 5).

According to unpublished NMFS permit file data, there were 72 vessels with *Illex* moratorium permits in 2002. These are limited access permits and are available only to vessels which meet the qualifications specified in Amendment 5 to the FMP. The distribution of vessels which possessed *Illex* moratorium permits in 2002 by home port state is given in Table 6. Most of these vessels were from the states of New Jersey (20.8%) Massachusetts (20.8%), Rhode Island (15.3%) New York (11.1%), and North Carolina (12.5%). In addition, there were 362 dealers which possessed Atlantic mackerel, squid and butterfish dealer permits in 2002. The distribution of these dealers is given by state in Table 7. Of the 362 dealers which possessed an Atlantic mackerel, squid and butterfish dealer permit in 2001, there were 19 dealers that reported buying *Illex* in 2002 (Table 8).

5.1.3 Analysis of Human Environment/Permit Data

Based on NMFS dealer reports, a total of 36 vessels landed 2,723 mt of *Illex* valued at $1.4 million in 2001 (Table 9). Virtually all of the *Illex* landed in 2002 was taken by *Illex* moratorium permit holders (Table 10). However, only 15% of the vessels which possessed *Illex* moratorium permits in 2001 actually landed *Illex*. Thus, most of the *Illex* fleet was inactive in the 2002 *Illex* fishery. Most of the vessels which landed *Illex* during 2002 also possessed *Loligo*/butterfish moratorium and Atlantic mackerel permits (Table 10). There were 11 vessels which landed 0.3 mt of *Illex* which possessed incidental catch permits.

The distribution of other northeast fishery permits held by the universe of *Illex* moratorium permit holders in 2002 is given in Table 11. Tables 12 and 13 list the species landed (pounds and value) by the 72 vessels which possessed *Illex* moratorium permits during the five year period 1998-2002. It is important to note that Tables 12 and 13 are inclusive of all *Illex* moratorium permit holders, many of which have not been active in the fishery recently. Tables 12 and 13 indicate that *Illex* moratorium fleet is dependent upon a number of species, many of which are pelagic in nature. By weight, the top five species landed by *Illex* moratorium permit holders during the period 1998-2002 included Atlantic herring (22.1%), Atlantic mackerel, (17.2%), *Illex* squid (14.6%), Atlantic menhaden (14.0%), and *Loligo* squid (12.3%). In terms of value, the top five species landed by Illex moratorium permit holders included *Loligo* squid

(25.9%), sea scallop (16.9%), *Illex* squid (8.3%), Atlantic mackerel (5.9%) ans silver hake (4.5%). During 1998, *Illex* and *Loligo* squid accounted for almost half of the value of the landings by *Illex* moratorium vessels (Table 13).

5.1.4 Description of the areas fished

The 2002 landings of *Illex* by statistical area (Figure 1) are given in Table 14 (includes only the three digit statistical areas that individually accounted for greater than 1% of the *Illex* landings in 2002). Three statistical areas (632,626 and 622) accounted for the vast majority (91%) of *Illex* landings in 2001. Two-digit statistical area 62 accounted for 45% of total *Illex* landings in 2002.

5.2 Port and Community Description

A complete description of the ports and communities that are dependent on the Atlantic mackerel, squid and butterfish fisheries is given in Appendix 1.

6.0 Environmental Consequences of the Alternatives

6.1 Alternatives for *Illex* moratorium expiration

ALTERNATIVES FOR *ILLEX* MORATORIUM EXTENSION ANALYZED			
ALTERNATIVE	DESCRIPTION	SECTION DESCRIBED	SECTION EVALUATED
1 (preferred alternative and most restrictive)	Extend moratorium with five year sunset	3.1.1	6.1
2	Extend moratorium with two year sunset	3.1.2	6.1
3 (least restrictive)	No action	3.1.3	6.1
4	Extend moratorium with no sunset	3.2.1	6.1

The purpose of this section is to analyze the potential effects of the three *Illex* moratorium expiration options described above on the human environment. A discussion of the possible biological, economic, social and community impacts as well as impacts on EFH and protected resources are discussed below.

The Mid-Atlantic Fishery Management Council (MAFMC), in cooperation with the Atlantic States Marine Fisheries Commission (ASMFC), the National Marine Fisheries Service (NMFS, now NOAA Fisheries, the New England Fishery Management Council (NEFMC), and the South Atlantic Fishery Management Council (SAFMC) implemented Amendment 5, which imposed a moratorium permit for *Illex* in July 1997. The original purpose of the moratorium permit was to ensure that vessels harvesting *Illex* would not harvest in excess of the allowable biological catch (ABC). At the present time (2003), there is a total allowable catch of 24,000 mt. The 1997 moratorium, however, also imposed a five-year sunset provision, which would take effect in 2002. In 2003, however, the moratorium was extended under Framework Adjustment 3. In July 2004, the moratorium is again scheduled to expire.

The moratorium was implemented out of concern about excess harvesting capacity. In 1994, 87 vessels landed 44.4 million pounds (live weight) of *Illex*. Landings subsequently declined until 1998, when they increased to nearly 52 million pounds. In 1998, the fleet, however, exceeded the TAC of 19,000 mt (41.9 million pounds), and the fishery had to be closed. Since 1998, landings have generally decreased. In 2001, 32 vessels landed 8.8 million pounds, which was well below the TAC. The maximum sustainable yield (MSY), which also equals the current total allowable catch (TAC), is 24,000 mt (52.9 million pounds). There are presently 73 moratorium permits for *Illex*. There is also an open access *Illex* fishery. Vessel owners not holding a moratorium permit are allowed to land up to 5,000 pounds per trip, but not more than 5,000 pounds within a 24-hour trip. Landings by these vessels, however, are relatively miniscule compared to the landings by vessels holding moratorium permits. Given that *Illex* is an annual species and the fleet has demonstrated that it has the capacity to land very large quantities of *Illex*, the Mid-Atlantic Fishery Management Council (MAFMC) is concerned about the potential ramifications of eliminating the moratorium.

The MAFMC is considering several alternatives relative to the moratorium. The options being considered in this framework action are as follows: (1) extend the moratorium on entry to the *Illex* fishery with a five year sunset provision; (2) extend the moratorium on entry to the *Illex* fishery for an two years (moratorium on entry to the *Illex* fishery would expire in 2006 unless extended in a future amendment); (3) allow the moratorium on entry to the *Illex* fishery to expire in 2004 (no action). A fourth alternative, extension of the moratorium without a sunset provision, was considered but rejected from further consideration. However, the potential impacts all four alternatives are presented below. Option1 is the preferred and most restrictive alternative considered by the Council. Option 1 also maintains the status quo for five years. Option 2 would maintain the status quo for two years. Option 3 is the no action alternative and was the least restrictive alternative considered by the Council.

Biological Impacts

Amendment 5 established a moratorium on new entry into the commercial fishery for *Illex* squid. The Council placed a five year sunset provision on the moratorium which was set to expire in July 2002 until the measure was extended for an additional year under Framework 2. Under this alternative, the moratorium on entry to the *Illex* fishery would continue without a sunset provision , unless it is otherwise altered in a future amendment.

The extension of the moratorium under this framework option would maintain the moratorium program established under Amendment 5. Vessels which took small quantities in the past will be able to continue to do so under the incidental catch provision of the FMP. However, further expansion of entry into the directed *Illex* fisheries will be controlled and additional capitalization will be avoided. The only differences between the alternatives are the amount of time to maintain the moratorium program. Because *Illex* squid is an annual species, living only one year, the biological impacts on the stock of extending the moratorium for various periods of time differ only in terms of when they occur. It is not certain that removing the moratorium would necessarily result in a large increase in landings of *Illex* because the species is not always available to the fishery. It is clear, however, that removing the moratorium would result in excess capacity and the likelihood of overharvest if fish were available at whatever point the moratorium expired.

The *Illex* fishery is managed pursuant to this FMP through an annual quota specification process. Annual quotas are specified based on the overfishing definition established in Amendment 8. The approved overfishing definition for *Illex* is, "Overfishing for *Illex* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{MSY} is exceeded. Maximum OY will be specified as the catch associated with a fishing mortality rate of F_{MSY}. In addition, the biomass target is specified to equal B_{MSY}. The minimum biomass threshold is specified as ½ B_{MSY}." The Max OY for *Illex* squid is currently specified at 24,000 mt. The Council specified ABC at 24,000 mt for 2002, which is equal to the quota associated with F_{MSY}.

Since the annual quota is the chief mechanism used to control fishing mortality in the *Illex* fishery, an extension of the moratorium on entry to the *Illex* fishery is not expected to have any negative biological impacts on the *Illex* stock or non-target species. To the contrary, this measure is expected to have a positive impact on the *Illex* stock because it would prevent additional over-capitalization of the *Illex* fishery and help to prevent overfishing. If the moratorium on entry to the *Illex* fishery was not extended, the fishery would revert to open access conditions. Under open access conditions, a much larger number of vessels could enter the fishery. This would result in dramatic increases in fishing effort in the *Illex* fishery and, in turn, increase the chance that the annual quota might be exceeded and that the overfishing threshold might be exceeded. Since Alternatives 1, 2, and 4 maintain the moratorium on new entry to the *Illex* fishery established under Amendment 5, there are no biological impacts expected as a result of this alternative.

Under alternative 3, the Council would not extend the *Illex* moratorium beyond the expiration date (July 2004). If the moratorium on entry to the *Illex* fishery was not extended, the fishery would revert to open access conditions. Under open access conditions, it is possible that a much larger number of vessels would enter the fishery. This could result in dramatic increases in fishing effort in the *Illex* fishery and, in turn, increase the chance that the annual quota might be exceeded and that the overfishing threshold might be exceeded.

This would have a negative impact on the *Illex* stock which, in turn, would be expected to negatively affect the large number of species and stocks of marine mammals and predatory fish which prey on *Illex* squid. Known predators of *Illex* are the fourspot flounder, goosefish, and swordfish. *Illex* is probably eaten by a substantially greater number of fish, however, partially digested animals are often difficult to identify and are simply recorded as squid remains, with no reference to the species. There are at least 47 other species of fish that are known to eat "squid". All of these species could be negatively impacted if the abundance of *Illex* were to decline as a result of overfishing.

Economic Impacts

Assessing the Potential for Excess Capacity

Previous analyses of the *Illex* moratorium by MAFMC staff indicated that there was the potential for over-capitalization and excess capacity (MAFMC, 1996). That is, investment in capital could be excessive and the fleet had the potential to harvest in excess of the TAC. Analyses by the Northeast Fisheries Science Center staff (NEFSC, 2002) also indicated that there was excess harvesting capacity relative to *Illex*. In this more recent analysis, however, excess capacity was simply defined as the ability to harvest in excess of what was actually harvested; the analysis did not assess whether or not the fleet had the capability to harvest *Illex* in excess of the 24,000 mt TAC. The analysis by the NEFSC staff considered two multi-species fisheries—the large mesh multi-species fishery and the small-mesh multi-species fishery. A method called data envelopment analysis (DEA) was used to estimate capacity.

Data envelopment analysis is based on mathematical programming. The approach was originally developed by Charnes, Cooper, and Rhodes (1978) as a way to estimate technical efficiency. F@re et al. (1989), subsequently, offer a DEA framework for estimating capacity output; Kirkley et al. (2000) provide a detailed discussing on using DEA to estimate capacity in fisheries. The approach attempts to determine the maximum potential output that could be produced given fixed (e.g., engine horsepower and vessel hold capacity) and variable inputs (e.g., fuel and labor). Numerous other approaches may also be used to estimate capacity (see, for example, Kirkley et al. 2002).

Estimates of Excess Capacity

In this section, the potential for the fleet to harvest in excess of the 24,000 mt TAC is analyzed. Initially, 1998 is established as a reference year; this is because fleet activity and landings were highest in 1998; 1998 was also a year in which the landings of *Illex* exceed the 19,000 mt TAC. It must be remembered, however, that landings and fleet activity directed at *Illex* since 1998 have declined. Important issues related to the various regulatory alternatives, however, cannot be adequately analyzed. For example, Alternatives one and three, which respectively extend the moratorium for five years or allow the moratorium to expire in 2004, require an assessment of potential entry into the fishery and the potential number of trips or days that would be directed at harvesting *Illex*. Available data, however, suggest declining activity relative to *Illex*; the number of trips and total days steadily declined between 1998 and 2001, the latest year for which data are available. Any forecasts of future activity, based on available data, would suggest a continued decline in the number of trips targeting *Illex*. For example, statistical results of a simple regression of the number of trips for which landings per trip were greater than 5,000 pounds against time suggests an average decline of 54 trips per year. Alternatively, a regression of the number of trips per year, by the same fleet, against price or expected price, which equals ex-vessel prices lagged one year, was found to be statistically insignificant. Data required to estimate entry/exit and effort models, which are required to assess the potential entry given the different regulatory options, are not available.

There are two additional major problems with estimating or assessing capacity relative to *Illex*. First, *Illex* are just one of many other species taken throughout the year, and thus, any analysis of capacity must consider the fact that these vessels pursue and land a multitude of species in addition to *Illex* (see Table FEIS-1); this was well recognized by the NEFSC staff in their 2002 analysis. Second, there are rather severe data problems. Presently, three data sets must be used to conduct an analysis of capacity—the dealer or weigh-out data, the vessel trip reporting data (VTR data), and the NMFS permit file. The dealer or weigh-out data file contains information on the quantity landed by vessel permit, but no information about days at sea or vessel characteristics, such as vessel gross registered tonnage (GRT), vessel length, and engine horsepower. The VTR data file provide information about days at sea and crew size, but report only hail or skipper estimates of the weight of each species landed; landings reported in the dealer and VTR data files typically do not match. A remaining problem is that information about vessel characteristics must be obtained from the NMFS permit file; it is not uncommon for the permit file to have discrepancies about vessel characteristics. Information on landings, vessel characteristics, days at sea, and crew size are necessary for estimating the capacity of a fishing vessel and the fleet.

The critical issue that must be examined relative to all three moratorium options is whether or not the fleet has the potential to harvest more than the TAC. Using the NEFSC estimates of capacity, the 1998 fleet would have been able to harvest approximately 3.74 times the observed total level of production, or 194.3 million pounds. This would require that each vessel, on average, be at sea approximately 73 days per year and landing *Illex* along with numerous other species. The NMFS estimates of capacity, however, were based on average annual landings and days at sea per vessel operating between 1999 and 2001; *Illex* activity between 1999 and 2001 was considerably less than it was in 1998. The NMFS analysis was based on the various species routinely considered to comprise the large and small mesh fleets; NMFS included skates, *Loligo*, *Illex*, silver hake or whiting, croaker, fluke, monkfish, scup, crabs, and black seabass in their analysis of capacity.

Using information specific for 1998 and considering trips between active *Illex* moratorium permitted vessels and the open-access vessels, alternative estimates of capacity were obtained using DEA. In 1998, 34 vessels had trips for which landings exceeded 5,000 pounds. One-hundred vessels had landings for which trips were less than or equal to 5,000 pounds, some of which held *Illex* moratorium permits. From the weigh-out data, 120 vessels can be uniquely identified. The 34 vessels had the capability to harvest 51.7 million pounds of *Illex*, provided they increased their days at sea for the year to approximately 75 per vessel. The average capacity output per vessel for the fleet of 34 moratorium vessels equaled 1.52 million pounds in 1998. There are 73 vessels holding *Illex* moratorium permits. If the additional 39 *Illex* moratorium permitted vessels had also operated at full capacity in 1998, they would have had the capability to harvest 59.3 million pounds. The remaining 47 vessels, recognizing the restriction that landings cannot exceed 5,000 pounds for 24 hour or longer trips, had the potential to harvest 223.8 thousand pounds or 4,762 pounds per vessel in 1998. The analysis for the non-moratorium permitted vessels assumes customary and usual operating procedures and no major changes in their fishing strategies. In actuality, they have a much higher capability. If the 47 vessels operated only at their observed average number of trips per year—5, and caught only the average capacity per trip of 4,762 pounds, they had the potential to harvest 1.1 million pounds. The combined capacity of the 120 vessels operating in 1998 equaled 112.1 million pounds, which is slightly more than double the present TAC of 24,000 mt or 52.9 million pounds.

It must be remembered, however, that landings exceeded the TAC in 1998. The TAC was 41.9 million pounds in 1998, and landings equaled nearly 52.0 million pounds. The fishery was shut down; it is highly likely that additional landings would have been taken had the fishery not been shut down.

The estimates of capacity, however, may be problematic. This is because of severe data problems, which limited a more detailed analysis of capacity. Alternatively, it was simply not possible to adequately estimate capacity for all vessels because actual landings for all vessels landing in 1998 were not available. In addition, the analysis restricts some of the moratorium vessels to levels of landings less than or equal to 5,000 pounds; this was necessary since some trips for moratorium permitted vessels could not be identified. According to the dealer data and the VTR data, 167 vessels landed some quantity of *Illex* in 1998. The 1998 VTR data contains information on 93 vessels, and the weigh-out data contains information on 120 unique vessels. When the two data sets are combined, information for estimating capacity is available for only 50 vessels. These 50 vessels, however, accounted for 94.3 percent of the total *Illex* landings of reported in 1998.

An alternative analysis conducted using 1998 data obtained directly from the Northeast Fisheries Science Center provided a somewhat different conclusion relative to excess capacity. The data provided pertained only to the small mesh fleet. The NEFSC Economic and Social Sciences Division have allocated substantial resources to improving the data base for the small mesh fleet. The NEFSC considers ten possible species for the small mesh fleet: (1) bluefish, (2) mackerel, (3) butterfish, (4) *Loligo*, (5) *Illex*, (6) silver hake or whiting, (7) red hake, (8) herring, (9) tilefish, (10) croaker, (11) fluke or summer flounder, and (12) weakfish.

There were 321 trips for which *Illex* was reported to be landed; of this total, 236 trips had landings higher than 5,000 pounds and 85 trips had landings less than or equal to 5,000 pounds. These levels of landings are used to approximate the vessels operating under the moratorium and those vessels without a moratorium permit. The number of vessels included in the 5,000 pound plus trips equaled 28; the number of vessels corresponding to the 5,000 pounds or less level of landings equaled 30. The data were separated based on trip landings--5,000 plus pound trips and less than or equal to 5,000 pound trips. Subsequently, DEA or mathematical programming models were formulated and estimated for each group. Both models involved multi-species activities. Vessel tonnage, length, and horsepower were the fixed inputs. For the 5,000 plus pound trips, *Loli*go and *Illex* were the only species of any significance relative to landings; this fleet did, however, land bluefish, mackerel, butterfish, silver hake, red hake, tilefish, croaker, and fluke. Mackerel, butterfish, *Loligo*, and *Illex* were included for the trips landing 5,000 pounds or less.

The selection of the species to include in the analysis was based on mean levels of landings per trip and number of trips in which a given species was landed (Table FEIS-1). It was determined to base the inclusion of species on average landings per trip and number of trips in which the species was landed. For the trips landing 5,000 pounds or more, *Loligo* and *Illex* were included; butterfish might also have been included, but only six out of 236 trips had reported landings of butterfish. For the trips landing less than 5,000 pounds, only mackerel, butterfish, *Loligo*, and *Illex* were included in the analysis. An argument could be made that silver hake or whiting and croaker should have been included in the analysis. Croaker was excluded because only ten out of the 85 trips had reported landings of croaker. Silver hake was considered in an initial analysis, but subsequently removed from the analysis because the capacity estimates for *Illex*, with silver hake included, were nearly identical to the estimates with silver hake excluded.

Table FEIS-1. Mean Landings and Number of Trips in Which Species Landed

Species	Mean Landings Per Trip		Number of Trips Species Landed	
	$ 5,000 lbs	< 5,000 lbs	$ 5,000 lbs	< 5,000 lbs
Bluefish	3.00	139.34	3	16
Mackerel	235.97	2371.94	4	13
Butterfish	1436.82	154.08	6	42
Loligo	1437.79	15976.02	11	29
Illex	111805.80	837.22	236	85
Silver Hake	0.55	390.40	NA[a]	42
Red Hake	0.08	11.71	NA[a]	5
Herring	0.00	235.59	0	NA[a]
Tilefish	0.52	2.00	3	3
Croaker	1.70	772.33	NA[a]	10
Fluke	0.99	84.66	NA[a]	23
Weakfish	0.00	177.29	0	14

[a]Information pertaining to fewer than three observations is viewed as being confidential and cannot be published; NA indicates not available.

Capacity output estimated for the 28 vessels holding moratorium permits equals 62.0 million pounds, which is nearly 10.0 million pounds higher than the present TAC. Capacity output for the non-moratorium vessels was estimated to equal only 126,247 pounds. Observed landings for observations used in the analysis corresponding, respectively, to the moratorium and non-moratorium trips equaled 26.4 million and 71,164 pounds. The average capacity output per trip for the moratorium and non-moratorium trips was estimated to equal, respectively, 262,798 and 1,485 pounds.

Assessing the potential ramifications of moratorium options

In 1998, the average revenue per vessel associated with *Illex* landings equaled $81,110; after adjusting for inflation, the average revenue per vessel associated with *Illex* was $88,126 (2001 constant dollar value). A critical aspect relative to the moratorium options is the potential economic ramification of entry into the fishery (i.e., changes in ex-vessel revenues). Presently, there are 73 *Illex* moratorium permit holders. All 73 permit holders do not capture large quantities of *Illex*. In order to estimate potential changes in revenues associated with new entry or increased exploitation of *Illex*, an inverse demand model must be estimated.

The inverse demand for short-finned squid (*Illex*) is specified in terms of the partial adjustment model of Nerlove (1956). Although imported squid might be a substitute for *Illex*, the possibility of substituting other squid for *Illex* could not be determined from the available data. In addition, the prices of imported squid were too high for them to be a substitute. We could not determine a reasonable way to select a price below which the import could be defined as an *Illex* substitute. The data used for estimation corresponded to monthly landings and value between 1990 and 2001. The estimation voided months during which there were fewer than 100,000 pounds of *Illex* harvested harvested. The rationale for this decision is that the small harvest months may reflect actions not representative of the entire market.

There is also the possibility that the processors/wholesalers adjust their bids slowly, in a fashion in which they only partially adjust prices in a given period (Nerlove,1956). Specifically, the wholesalers have a "desired" price (P^*_t) in period t based on the level of harvest q_t and the level of harvest and existing stocks (S_t). Let the relationship between the desired price and the level of harvest and existing stocks be linear so that

$$P^*_t = \phi + \beta q_t + \gamma S_t$$

Given that the adjusted actual current price and the previous period's price can be described as a a proportion of the desired price to previous price, $P_t - P_{t-1} = \alpha(P^*_t - P_{t-1})$, then the inverse demand is given by

$$P_t = \phi / (1-\alpha) + \beta / (1-\alpha) q_t + \gamma / (1-\alpha) S_t + (1-\alpha) P_{t-1}$$

In addition to this fundamental relationship, we also include monthly and annual dummy variables to adjust for seasonal and annual variations in other variables. The results of the estimation are provided in Table FEIS-2. The estimation indicates a negative relationship between ex-vessel price and harvest that can be interpreted as the demand response. The ex-vessel price was negatively related to price, and its coefficent was statistically significant. The estimated effect on price of quantity changes is, however, quite small, and thus, nearly indicating no price response to changes in quantities. This suggests that regulations that reduce harvests would produce a small economic loss for *Illex* consumers. The partial adjustment coefficient (") is estimated to be 0.78 (1-0.22) indicating that nearly 80% of the adjustment to desired price is accomplished in the first month. Nearly one-hundred percent of the adjustment will occur after two months.

The estimation indicates strong seasonal variation, with the greatest demand from July through December. There is also an indication of the weak economy since 2000. All years prior to 2000 have significantly greater prices (after adjusting for landings and seasonality). This may also be a reflection of greater imports but it is difficult to ascertain which of the imports are competing with Illex.

Based on the inverse demand model for *Illex*, price changes and revenues were estimated relative to different levels of entry (all estimates are in terms for 2001 constant dollar values). As previously illustrated, 28 small mesh vessels had the capability to harvest the TAC in 1998; approximately 24 vessels operating at full capacity (2.2 million pounds per year) could, thus, harvest the TAC of 52.9 million pounds. In terms of 2001 constant dollar values, the ex-vessel revenue corresponding to the 1998 harvest by the 28 moratorium vessels equaled $10.5 million. The revenue corresponding to the TAC is estimated to equal $9.9 million; the decline in revenue is associated with price decreases resulting from the slight increase in annual landings (observed landings in 1998 equaled 51.958 million pounds and landings corresponding to the TAC equal 52.9 million pounds). The real or 2001 constant dollar price was estimated to decrease from $0.202 to $0.187 per pound; this is with respect to the 1998 price level.

Table FEIS-2: Estimated Monthly Inverse Demand for East Coast Short-finned Squid (*Illex*), 1990-2001			
Variable	**Mean**	**Estimated Coefficient**	**T-ratio[1]**
Intercept	1.00	0.19	2.95
Illex harvest	1.705 million lbss/month	-0.0065	-3.22
Lagged *Illex* Ex-vessel Price	$ 0.24/lb	0.221	2.68
January	0.000	0.000	-0.76
February	0.001	0.001	-1.08
April	0.004	0.004	-2.2
May	0.035	0.035	-4.54
June	0.209	0.209	-2.55
August	0.306	0.306	-1.74
September	0.261	0.261	-1.49
October	0.113	0.113	-1.06
December	0.060	0.060	-0.35
1990	0.037	0.037	2.11
1991	0.032	0.032	2.24
1992	0.078	0.078	2.14
1993	0.088	0.088	1.12
1994	0.093	0.093	2.4
1995	0.084	0.084	2.35
1996	0.163	0.163	2.87
1997	0.127	0.127	1.93
1998	0.224	0.224	2.54
1999	0.030	0.030	1.14
2000	0.039	0.039	0.27
Observations=66, F-Stat=12.81, $Rbar^2$ = .83, Durbin/Watson statistic=2.11			

[1] The t-ratio is based on the null hypothesis of the coefficient value equally zero.

Potential Economic Impacts of Moratorium Options

Regulatory analysis in support of fisheries management and regulation typically requires a full assessment of the potential economic ramifications of proposed regulatory actions. For this framework action, the MAFMC has proposed three possible alternatives:1) extend the moratorium on entry to the *Illex* fishery for an additional five years, 2) extend the moratorium on entry to the *Illex* fishery for an additional two years, and (3) allow the moratorium on entry to the *Illex* fishery to expire in 2004 (no action). At a minimum, the economic assessment of proposed regulatory options should consider changes in ex-vessel prices and revenues, and changes in gross benefits, consumer surplus, and producer surplus (the combination of consumer and producer surplus is typically referred to as net national benefits). Consumer surplus equals the amount consumers are willing to pay less what they actually have to pay to acquire a good or service. Producer surplus is approximately equal to rent or profit; more formally, producer surplus equals total revenue minus total variable cost (the cost of using items that vary with production such as fuel and labor).

Unfortunately, it is not possible to provide a comprehensive assessment of the potential economic ramifications of the various moratorium options. Data necessary for estimating producer surplus are simply not available (e.g., costs and earnings). More important, however, there is no basis upon which to develop economic models for assessing potential responses by industry to the various proposed moratorium options. That is, it is difficult to predict how the existing fleet of moratorium and non-moratorium permit holders would respond to each of the regulatory options. There is no indication that removing the moratorium would necessarily result in a large increase in landings of *Illex* because the species is not always available to the fishery. It is clear, however, that removing the moratorium would result in excess capacity and the likelihood of overharvest if fish where available. It is true, however, that landings in 1998 exceeded the 19,000 mt (41.9 million pounds) TAC, and the fishery had to be closed. Industry has also indicated that without the closure, more landings would have been taken.

Albeit recent information indicates a decline in *Illex* directed activity, there is always the possibility that changes in the management, availability, resource abundance, or prices of other species could occur, and that these changes could induce additional entry and enhanced fishing in the absence of a moratorium. Assessment of potential changes in entry/exit and fishing strategies requires development of a comprehensive behavioral model. The data necessary for developing an appropriate behavioral model of potential entry/exit behavior or supply response are not available.

It was hypothesized that a relatively simple model relating pounds landed to expected ex-vessel prices (prices lagged one year) and a time trend might indicate a possible trend in landings relative to time and prices. The statistical results of an analysis between landings, expected prices, and a time trend, however, revealed no significant results that could provide a basis for predicting behavior in response to price and temporal changes.

Although it is not possible to adequately assess the three proposed moratorium options, it is possible to provide an analysis of consumer surplus and gross benefits to the nation from *Illex* landings in 1998, which provides a reference year during which the fleet harvested close to the present 24,000 mt TAC. The inverse demand model provides the mathematical specification for assessing changes in ex-vessel prices, gross benefits, and consumer surplus.

The welfare change, as measured in terms of consumer surplus, from a policy change when using a linear inverse demand is straightforward to estimate. The consumer surplus from a quantity change is given by:

$$CS = \frac{\Delta q\,\Delta \mathrm{p}}{2} = \frac{\Delta q(\beta\Delta q)}{2} = \frac{\beta\Delta q^2}{2}$$

where the β is the coefficient associated with the harvest variable. Alternatively, consumer surplus may be estimated as the area underneath a demand curve less total expenditures of a given quantity of a good or service. The area underneath a demand curve may be calculated by determining the value of the corresponding mathematical integral.

We also stress, however, that one area that we cannot analyze, but that would be affected by selecting the different options, is producer surplus. Provided the TAC is maintained at 24,000 mt and enforced and given current conditions in the fishery, it is doubtful that the ex-vessel price, revenue, and subsequent consumer surplus would change under the current regulatory regime. It would, however, be possible for landings to become even more concentrated in a given month if the moratorium were allowed to expire. This would likely result in producer surplus becoming zero and consumer surplus decreasing. The latter would likely happen because of increased landings and depressed prices over a short period of time. These changes, however, would depend upon whether or not existing participants increased their landings of *Illex*.

Using data obtained from NOAA Fisheries, "Commercial Landings," electronic data base and the estimated inverse demand curve for *Illex*, estimates of consumer surplus for the 1998 status quo are presented. Consumer surplus is estimated as the mathematical value of the area below the demand curve, but with total revenue deducted. We stress, however, that the NOAA Fisheries data obtained from their electronic data base are different than those provided by the MAFMC and the NEFSC. In 1998, society received $1.35 million in consumer benefits. Gross benefits (before deducting revenues and producer surplus) equaled $9.3 million to society. The observed revenue equaled $5.7 million. The estimate of consumer surplus is derived from deducting estimated revenues from the mathematical value of the area below the inverse demand curve. Also, it should be observed that most of the consumer surplus occurs between June and August, periods during which landings of *Illex* are highest. In previous analyses conducted to support management and regulation of the *Illex* resource, there were no estimates of the inverse demand curve for *Illex*.

Conclusions of Economic Analysis

For this framework action, the MAFMC has proposed three possible alternatives relative to the current moratorium: 1) extend the moratorium on entry to the *Illex* fishery for an additional five years, 2) extend the moratorium on entry to the *Illex* fishery for an additional two years, and (3) allow the moratorium on entry to the *Illex* fishery to expire in 2004 (no action). A fourth option, extension of the moratorium without a sunset provision, was considered by the Council but was rejected because it was considered to be beyond the scope of actions to be taken under framework adjustments established under Amendment 8. However, this option is being considered in Amendment 9 to the FMP which is also currently under development by the Council. Analysis of the potential benefits and costs of the various options is complicated by the fact that the fishery for *Illex* has been in an apparent state of decline. Landings and number of trips by moratorium permitted vessels have both declined, particularly relative to 1998, which was the year with the highest level of reported activity for *Illex*.

It was possible to provide only a limited analysis of capacity and the potential economic ramifications of the various alternatives considered relative to the moratorium. There is no doubt that the existing fleet has the capability to harvest in excess of the present TAC. Analysis indicated that 24 moratorium permitted vessels had the capability in 1998 to harvest more than the present TAC of 24,000 mt. The 1998 fleet harvested well in excess of the allowable 19,000 mt TAC and only about 900,000 pounds (408.2 mt) less than the present TAC. If the fleet had been allowed to continue fishing in 1998, it is highly likely that landings would have been considerably higher than the nearly 52.0 million pounds actually landed.

There has been a downward trend in fishing activity for *Illex* since 1998. Landings in 2001, the most recent year for which data are available, equaled 16.7 percent of the TAC. Over a 38 year history of the fishery (1963-2001), reported landings of *Illex* have never equaled or exceeded the present TAC of 24,000 mt. Out of 509 trips having landings less than or equal to 5,000 pounds per trip in 1998, only 26 trips or 5.1 % of the 509 trips landed more than 3,000 pounds per trip. The average or mean level of landings per trip for these 26 trips equaled 4,290 pounds. To a large extent, it has been hypothesized that the landings of *Illex* are highly related to availability (MAFMC, 1998). The last stock assessment of *Illex* was conducted in 2003. This recent assessment indicates that the stock is currently in a low productivity regime. In addition, another indicator of the low productivity is the extended period of low mean body weights, which has occurred since 1982. Both the mean kg per tow, a relative biomass indicator, and the mean body weight indicate low productivity of the resource. Low abundance of the resource is likely the major reason why landings did not increase after 1998, and offers a viable reason to retain the moratorium for five years.

The available economic analysis does lead to a clear conclusion that would allow the Council to determine the most appropriate regulatory option regarding the moratorium. The fact that the 2001 fleet harvested only 16.7 percent of the TAC, very few non-moratorium vessels harvested any substantial quantity of *Illex* in either 1998 or 2001, and resource productivity is low suggest that there is a low probability of increased harvesting activity for *Illex* in the near term. However, if Amendment 13 for the groundfish FMP is implemented or resource and economic conditions for the Illex squid fishey changes, it is possible that participants will increase their landings of *Illex*. This, coupled with the fact that resource productivity is low, argue argue for maintaining a precautionary approach relative to the moratorium (i.e., maintain the moratorium for five more years). Alternatively, if the availability were to suddenly increase and *Illex* activity is strongly related to resource availability, a five year moratorium, along with the TAC, would be sufficient to protect the resource and to facilitate the determination of the possible relationship between *Illex* activity and resource availability. In 2001, 68 trips were made in which landings were less than or equal to 5,000 pounds. Of these trips, only 5 had landings between 3,000 and 5,000 pounds. Increased activity by these vessels is not highly apparent from the available data.

Unfortunately, the benefits and costs of the moratorium options cannot be easily analyzed. Maintaining the moratorium, however, does offer the opportunity to prevent the dissipation of rent or producer surplus in the future. Available data suggest that vessel activity related to *Illex* will likely decline in the near future, and thus, there are no apparent substantial short-run gains of either of the moratorium options relative to permitting an open-access fishery. It must be remembered, however, that in all open-access fisheries, there is eventually entry into a fishery until rent is dissipated, overfishing occurs, and technical and economic efficiency are diminished. Then, managers, fishers, and society incur costs to correct the problems caused by an open-access fishery. This is a situation that the Mid-Atlantic Council seeks to avoid.

It is possible to provide a qualitative analysis of the potential moratorium options. The available information suggests that if the moratorium were allowed to expire in 2004 and economic and resource conditions remain relatively unchanged from their 2001 levels, there would not be any substantial increase in landings of *Illex* relative to the landings likely to occur with a moratorium. If, however, economic conditions changed to promote increased activity on *Illex*, landings of not only *Illex* would increase, but so would the landings of other species (e.g., croaker, butterfish, mackerel, *Loligo*, silver hake, etc.). In 1998, the nominal price of *Illex* was $0.19 per pound; in 2001 constant dollar value, it was $0.21 per pound. In 1999, the 2001 price equaled $0.23 per pound, but landings were only 6.8 million pounds, which represented a decline of 86.5 percent in landings relative to landings in 1998. Reported landings in 2001 equaled 2.62 percent of the landings in 1998.

Alternative 1 (extending the moratorium on entry to the *Illex* fishery for an additional five years) offers some degree of protection against risk of an expanding fishery and risk of further depressing the resource. This option, however, does not appear to generate landings, revenue, or potential benefit streams any different that those levels most likely to occur with a removal of the moratorium. Again, this is primarily based on a qualitative assessment of available information. Alternative 1 does, however, offer some protection against the possibility that fishing activity for *Illex* might increase in the near future. It is sufficiently long to permit the Council to better determine the possibility for the fishery to expand, but it is not so long as to prevent the Council from allowing entry into the fishery at some future date.

In summary, it appears that all three options would generate approximately the same level of landings, revenues, and consumer surplus (in the near term). There is also, however, a very small possibility that ten or so vessels might increase their landings of *Illex* if the moratorium was allowed to expire. If these ten potential vessels increased their landings to the average annual landings of moratorium vessels in 1998, landings might increase by 6,937.4 mt. Adding this potential level of landings to the landings in 2001 yields a total of 10,946.1 mt, which is still well below the 24,000 mt TAC. If landings increased, ex-vessel prices would be expected to decline, and revenues and consumer surplus would be expected to marginally increase; the price for *Illex* appears to be nearly non-responsive to changes in landings. Given current condition, Alternative 1 would not likely yield landings and revenue much different than those likely to occur with the lifting of the moratorium. This option does impose some short-run costs in that it would prevent entry into the fishery for five years. That is, individuals desiring to enter the fishery would be denied the potential revenues that might be realized if they could land more *Illex*. However, the Council could offset these losses by increasing the non-moratorium bycatch allowance to allow increased participation- albeit controlled. Alternative 1, however, also offers protection against the dissipation of rent in the case that the moratorium was lifted and vessel operators desired to expand production. Alternative 1 also offers additional protection of the resource, which presently has low productivity. Last, Alternative 1 also allows sufficient time for the Council to closely monitor the fishery for *Illex* and better determine the need for a moratorium.

Although the analysis of capacity and recent capacity utilization for *Illex* are inconclusive relative to the continuation of a moratorium, a review of potential ramifications of allowing the moratorium to expire offers support for continuing the moratorium. In particular, Alternative 1 appears to offer a balanced option. It allows for protection of the resource and prevention of the dissipation of rent should economic conditions or other factors change such that vessel operators would want to increase their landings of *Illex*.

Social and Community Impacts

Prior to the 1980's, the fishery for *Illex* in the US EEZ was prosecuted primarily by the foreign distant water fleets. With the implementation of the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan and it's subsequent Amendments, the fishery has become fully Americanized. At the same time that the domestic fishery was undergoing development, new biological data became available which indicated that *Illex* is an annual species. This resulted in downwardly revised estimates of the potential yield from this fishery. The simultaneous growth of the domestic fishery and reduction in estimates of sustainable yields resulted in the fishery moving towards a fully capitalized and exploited state. Hence, there was a moratorium on entry of additional commercial vessels into the *Illex* squid fisheries in the EEZ implemented as part Amendment 5.

Under the Amendment 5, a vessel was eligible for a moratorium permit in the *Illex* fishery if it met any of the following criteria: 1) The vessel had five landings (including at-sea joint venture transfers) of 5,000 pounds of *Illex* (that is, landed 5 trips of at least 5,000 pounds) between 13 August 1981 and 13 August 1993, or 2) The vessel is replacing a vessel of substantially similar harvesting capacity which involuntarily left the *Illex* squid fishery during the moratorium, and both the entering and replaced vessels are owned by the same person. "Substantially similar harvesting capacity" means the same or less GRT and vessel registered length for commercial vessels, or 3) the vessel was under construction for, or was being rerigged for, use in the directed fishery for *Illex* on 13 August 1993 and provided the vessel has landed the required amount of *Illex* for sale specified above (5 trips of at least 5,000 lbs) prior to December 31, 1994. For the purpose of this paragraph, "under construction" means that the keel had been laid or the vessel was under written agreement for construction or the vessel was under written contract for purchase. "Being rerigged" means physical alteration of the vessel or its gear had begun to transform the vessel into one capable of fishing commercially for *Illex*. 4) Vessels that are judged unseaworthy by the Coast Guard for reasons other than lack of maintenance may be replaced by a vessel with the same GRT and vessel registered length for commercial vessels 5) The moratorium terminates at the end of the fifth year following implementation unless extended by FMP Amendment.

One of the major concerns raised during the development of the original moratorium program in Amendment 5 was that the fleet which would qualify under the proposed *Illex* moratorium program would not be capable of taking the entire annual quota. In response to this concern, the Council placed the five year sunset provision on the *Illex* moratorium program. The intent of this measure was to allow time to determine if the harvest capacity of the fleet was sufficient to take all of the available annual quota. Since then, the *Illex* fleet has demonstrated that fleet capacity was more than sufficient to land the annual quota when the *Illex* fleet landed in excess of the annual quota in 1998. During 1998, a number of factors contributed to the record harvest of the domestic squid *Illex illecebrosus* and early closure of the fishery. These included relatively high abundance and availability of *Illex illecebrosus* to the US fleet combined with high world market price and demand resulting from a major decline in production of *Illex argentenius* in the Falkland Islands in the South Atlantic. As a result of these conditions, US production of *Illex* exceeded 23,000 mt in1998, thus demonstrating that US harvest capacity under the *Illex* moratorium program adopted in Amendment 5 was more than sufficient to land the long term sustainable level of harvest. While more recent landings data are available to describe the *Illex* fishery, a discussion of the 1998 fishery is given here because it demonstrates that the harvest capacity of the *Illex* moratorium fleet is sufficient to land the long term level of sustainable yield for this resource. In addition, a discussion of the data available at the time that Amendment 5 was being developed is also given to describe the context within which the Council made decisions relative to limiting access to the *Illex* fishery.

The most recent data available at the time that Amendment 5 was being developed indicated that there were 3,061 vessels with Federal commercial permits issued pursuant to the Atlantic Mackerel, Squid, and Butterfish FMP (based on 1993 NMFS data). The hold capacity of those vessels was determined to be approximately 50,000 mt. Based on unpublished 1993 NMFS weighout data for *Illex*, 18 out of 53 vessels (33%) which reported landing any *Illex* accounted for 99% of the total. Total US *Illex* landings were 18,012 mt in 1993. A total of 53 vessels made these landings in 438 trips during 1993. The average catch per trip was 90,662 lbs. The majority of vessels landed in excess of 50,000 lbs per trip. In terms of landings per year, the average vessel in the *Illex* fishery landed roughly 750,000 lbs in 1993. These data were significant in determining the need for entry limitation into the *Illex* fishery because they highlighted the nature of the vessels engaged in this fully-utilized fishery. Unlike the *Loligo* fishery, the *Illex* fleet and fishery are comprised of relatively large vessels which land substantial quantities of *Illex* per vessel. As a result, the Council concluded during the development of Amendment 5 that incremental entry of new effort into this fishery would quickly result in it's over-capitalization and jeopardize both the stock and the fishery. This situation has not changed.

Discussion of the number of vessels that would qualify for the *Illex* squid moratorium was based on the Northeast Fishery Science Center weighout files. Under the preferred alternative qualifying criteria for an *Illex* moratorium permit in Amendment 5, 52 vessels were expected to qualify based on NMFS weighout data. However, the number of vessels which actually qualified for an *Illex* moratorium permit under Amendment 5 was much larger. In 2000, there were 77 vessels which possessed *Illex* moratorium permits and 1,704 vessels which possessed incidental catch permits. As noted above, analyses conducted for Amendment 5 estimated that approximately 52 vessels would qualify for *Illex* moratorium permits. This estimate was based on an analysis of NMFS weighout data which did not include landings taken as a result of joint venture activities during the 1980's. Vessels could qualify for an *Illex* moratorium permit if they demonstrated landing five trips of 5,000 pounds over a qualifying period which extended back to 1981 (landings made as a result of joint ventures were also eligible). As a result, a much larger number of vessels qualified for an *Illex* moratorium permit than was anticipated based on data and analyses considered during the development of Amendment 5 (i.e., as estimated based on weighout data alone). Hence, the harvest capacity of the vessels which qualified under the *Illex* moratorium program established in Amendment 5 substantially exceeds the level necessary to harvest the long term sustainable yield for *Illex*. This became apparent in 1998, when a total of 110 vessels landed 23,567 mt of *Illex* squid (i.e., the annual quota was exceeded). These vessels included two categories: vessels with moratorium permits and vessels with incidental catch permits. While there were 77 vessels which could have landed *Illex* in the directed fishery because they possessed moratorium permits, however 18 vessels accounted for more than 95% of the *Illex* landings in 1998.

Fishery performance and production in 1998 clearly indicated that the current *Illex* moratorium fleet possesses harvest capacity far in excess of what is necessary to harvest the long term potential yield from this fishery. For example, there were 34 vessels which possessed moratorium permits that landed *Illex* in 1998. Therefore, the remaining 43 vessels which possessed *Illex* permits did not land any *Illex* in 1998. An estimate of latent capacity of the fleet possessing *Illex* which was idle in 1998 was derived by expanding the landings by vessel size class for vessels which did report landing *Illex* in 1998. Based on this expansion, had the entire *Illex* moratorium fleet fished in 1998, total landings of *Illex* would have been 52,000 mt (114,746,619 lbs). The 2002 allowable biological catch for *Illex* is 24,000 mt (52.9 million lbs). Thus, current *Illex* moratorium fleet possesses at least enough harvest capacity to land at least about two times the long term sustainable yield for *Illex*.

Failure to extend the moratorium would result in further overcapitalization of this sector of the fishing industry, which in turn would have negative economic consequences for the vessels and communities which depend upon the *Illex* resource. Extension of the *Illex* moratorium program will provide positive benefits to the communities which are dependent on the commercial *Illex* fishery. A complete description of the ports and communities which are dependent on the *Illex* fishery are described in detail in Appendix 1. Additional discussion of the social and community impacts expected as a result of this alternative is given in the social impact analysis contained in Amendment 9. The primary ports and surrounding communities where *Illex* are landed would be the most affected by the no action alternative. The only port dependent upon *Illex* for more than 10 % of total revenues in 2002 was North Kingstown, RI (24.4%). Therefore, the vessel owners, crew, dealers or processors and fishing communities associated with this port are expected to be affected the most by failure to extend the moratorium program for *Illex*. The distribution *Illex* moratorium holders by home port state is given in Table 6 which indicates that additional entry into this fishery would most affect the states of New Jersey, Massachusetts, Rhode Island, New York and North Carolina. In 2002, there were 362 dealers with federal Atlantic mackerel, squid and butterfish dealers permits (Table 7), but only 19 dealers which actually purchased *Illex* (Table 8). The dealers which would be most affected by the alternatives proposed in this framework action were from the states of Rhode Island, Massachusetts, North Carolina, New Jersey and Virginia (Table 8).

Effects on Protected Species

Amendment 5 established a moratorium on new entry into the commercial fishery for *Illex* squid. The Council placed a five year sunset provision on the moratorium which was set to expire in July 2002, but was extended until July 2004 under Framework 3. Since alternatives 1, 2 and 4 extend the moratorium for five years, two years and without sunset, respectively (thereby maintaining the status quo), they should not result in an increase in fishing effort or redistribute effort by gear type. As such, the implementation of alternatives 1, 2 and 4 are not expected to impact the protected species described in section 4.3 relative to the current FMP for *Illex*.

Under alternative 3 (no action), the moratorium on entry to the *Illex* fishery would be allowed to expire in 2004. If the *Illex* moratorium was allowed to expire through no action, entry of additional fishing effort into the *Illex* fishery could result. The expected level of increased effort is difficult to predict because it would depend on variety of factors including world demand and price of *Illex*, abundance and availability of *Illex* in US waters and conditions in other fisheries.

None the less, any level of increased fishing effort in this fishery would have the potential for increased interactions with the protected species described in section 4.3.

As noted above, the Protected resource species which are found within the general area of the management unit of this FMP are fully described in section 4.3. Several species groups are of particular concern. The first group includes the species listed as endangered under the Endangered Species Act. There are six species of large whales which are listed as endangered under the ESA: the northern right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), blue whale (*Balaenoptera musculus*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus).* The most prominent species in this group is the north Atlantic right whale, which is the most endangered large whale in the world. While fishery interactions are a major concern relative to the survival of this species, the *Illex* fishery is not known to interact with right whales. The *Illex* fishery is prosecuted offshore along the edge of the continental shelf during the summer and early fall months. Right whales are distributed inshore and north of the area during the time of the directed *Illex* fishery. As result, there are no known interactions between right whales and the *Illex* squid trawl fishery. Likewise, there are no known interactions between the *Illex* fishery and any of the other large whales listed as endangered that are found in US EEZ.

In addition to the large whales, there are nine other species found within the management unit of the FMP which are listed as endangered under the Endangered Species Act . These include five species of sea turtles: the leatherback sea turtle (*Dermochelys coriacea*), Kemp's ridley sea turtle (*Lepidochelys kempii*), green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), and loggerhead sea turtle (*Caretta caretta*); two species of fish: the shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic salmon (*Salmo salar*); and two species of birds: the roseate tern (*Sterna dougallii dougallii*) and piping plover (*Charadrius melodus*). None of these endangered are known to interact with the *Illex* squid fishery because they do not inhabit the area where the directed *Illex* fishery occurs.

Finally, there are eight additional groups of cetaceans found within the management unit of the FMP which are protected under the Marine Mammal Protection Act. These include the Minke whale (*Balaenoptera acutorostrata*), beaked whales (*Ziphius and Mesoplodon spp*.), Risso's dolphin (*Grampus griseus*), pilot whales (*Globicephala spp*.), white-sided dolphin (*Lagenorhynchus acutus*), common dolphin (*Delphinus delphis*), spotted and striped dolphins (*Stenella spp*.), and bottlenose dolphin (*Tursiops truncatus*). Within this group, three species are of particular concern because they have been documented as interacting with the Atlantic mackerel, squid and butterfish trawl fishery as defined under the MMPA. These include common dolphin, white-sided dolphin and pilot whales.

The status of common dolphins, relative to OSP, in the US Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is a strategic stock because the1996-2000 average annual fishery-related mortality and serious injury exceeds PBR (Waring *et al.* 2002).

There are two sources of information relative to fishery interactions in the Atlantic mackerel, squid and butterfish trawl fishery. After passage of the Magnuson Fisheries Conservation and Management Act (MFCMA), an observer program was established which recorded fishery data and information on incidental bycatch of marine mammals in the distant water foreign (DWF) fisheries which operated in the US EEZ. In addition, data on current incidental takes in USA fisheries are available from several sources (see section 6.3). DWF effort in the Atlantic coast Exclusive Economic Zone (EEZ) under MFCMA was directed primarily towards Atlantic mackerel and squid. Records of the sampling of these fisheries indicated that no mortalities of common dolphin were observed reported in foreign *Illex* squid fishing operations during the period 1977-1991. For the more recent domestic fisheries, three common dolphin mortalities were observed in 1996, 1 in 1997, 0 in 1998, 1 in 1999, and 6 in 2000 in the general category of the "Atlantic mackerel, squid and butterfish trawl" fishery . The 1996 and 2000 mortalities were in the *Loligo* squid fishery and the 1997 mortality occurred in the Atlantic mackerel fishery. The estimated annual fishery-related mortality and serious injury attributable to this general fishery category (CV in parentheses) was 940 in 1996 (0.75), 161 in 1997 70 (0.49), 0 in 1998, 49 in 1999 (0.78), and 235 in 2000 (0.57). Average annual estimated fishery-related mortality attributable to this general fishery category during 1996-2000 was 285 common dolphins (CV= 0.51). However, none of the observed takes of common dolphin in the Atlantic mackerel, squid and butterfish trawl fishery are attributed to the *Illex* squid sub-fishery by Waring *et al.* 2002.

The status of white-sided dolphins, relative to OSP, in the US Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for this species. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is a non-strategic stock because estimated average annual fishery-related mortality and serious injury does not exceed PBR (Waring *et al.* 2002).

In the past, incidental takes of white-sided dolphins have been recorded in the Atlantic foreign mackerel fishery and pelagic drift gillnet fishery. Atlantic foreign mackerel NMFS foreign fishery observers have reported 44 takes of Atlantic white-sided dolphins incidental to fishing activities in the continental shelf and continental slope waters between March 1977 and December 1991 (Waring *et al.* 2002). Of these animals, 96% were taken in the Atlantic mackerel fishery. This total includes 9 documented takes by USA vessels involved in joint-venture fishing operations in which USA captains transfer their catches to foreign processing vessels. One white-sided dolphin was observed taken in the mackerel sub-fishery during 1997 (Waring *et al.* 2002). None of the observed takes of white-sided dolphin in the Atlantic mackerel, squid and butterfish trawl fishery are attributed to the *Illex* squid sub-fishery by Waring *et al.* 2002.

During 1977-1991, observers in this DWF program recorded 436 pilot whale mortalities in foreign-fishing activities (Waring *et al.* 1990; Waring 1995). A total of 391 (90%) were taken in the mackerel fishery, and 41 (9%) occurred during *Loligo* and *Illex* squid-fishing operations. This total includes 48 documented takes by USA vessels involved in joint venture fishing operations in which USA captains transfer their catches to foreign processing vessels. Due to temporal fishing restrictions, the bycatch occurred during winter/spring (December to May) in continental shelf and continental shelf edge waters (Fairfield *et al.* 1993; Waring 1995); however, the majority of the takes occurred in late spring along the 100 m isobath. Two animals were also caught in both the hake fishery and tuna longline fisheries (Waring *et al.* 1990).

In the more recent domestic fisheries, three fishery-related mortalities of pilot whales were reported in self-reported fisheries information from the mackerel trawl fishery between 1990-1992. Six mortalities were observed in 1996, 1 in years 1998 and 1999 and 2 in 2000. The 1996 and 1998 bycatch occurred in the *Illex* squid fishery, and the 1999 in the *Loligo* fishery. The estimated fishery-related mortality to pilot whales in the USA Atlantic attributable to the general Atlantic mackerel, squid and butterfish fishery category was: 45 in 1996 (CV=1.27), 0 in 1997, 85 in 1998 (CV=0.65), 49 in 1999 (CV=0.97) and 34 in 2000 (CV=0.65); average annual mortality between 1996 and 2000 was 43 pilot whales (CV=0.45). However, Waring *et al.* 2002 stated these estimates should be viewed with caution due to the extremely low (<1%) observer coverage. The proportion of the total estimate that can be attributed directly to the *Illex* fishery is not given. However, clearly some of the takes of pilot whales can be attributed to directed *Illex* fishery based on the information provided by Waring *et al.* 2002 . As a result, the no action alternative (alternative 3) relative to the *Illex* moratorium could result in increased interactions with pilot whales in this fishery. This could occur if effort in the fishery were to increase as a result of allowing the *Illex* moratorium to expire and reversion to an open access condition were to occur. In addition to an overall increase in fishing effort, allowing the fishery to revert to an open access condition would result in an increase in fishing effort from new participants. Most, if not all, of these new entrants would be unfamiliar with the current fishing practices which have evolved over the years since the *Illex* fishery was first developed. Part of that evolution included the development of fishing practices and techniques by the *Illex* fishing industry which minimize interactions with cetaceans, pilot whales in particular. A sudden flood of new, inexperienced entrants would likely increase the chance of interactions with pilot whales, but the degree of risk can not be determined based on current information.

Effects on Essential Fish Habitat

Otter trawls are the principal gear used in this fishery. In general, bottom tending mobile gear have the potential to reduce habitat complexity and change benthic communities. Available research indicates that the effects of mobile gear are cumulative and are a function of the frequency and intensity with which an area is fished, the complexity of the benthic habitat (structure), energy of the environment (high energy and variable or low energy and stable), and ecology of the community (long-lived versus short lived). The extent of an adverse impact on habitat requires high resolution data on the location of fishing effort by gear and the location of specific seafloor habitats. While the otter trawls utilized in this fishery have the potential to adversely affect EFH, available effort data are currently insufficient to predict the extent of adverse impact from this fishery. However, since alternatives 1, 2 and 4 extend the moratorium for five years, two years and without sunset, respectively (thereby maintaining the status quo), they should not result in an increase in fishing effort or redistribute effort by gear type. Therefore, these alternative are not expected to increase any existing impacts on EFH caused by this fishery relative to the status quo. There may also be slight positive effects due to reduced bottom time. This is more prevalent in alternative 1 (five year moratorium) as a result of slightly reduced impact to EFH.

Under alternative 3 the moratorium on entry to the *Illex* fishery would be allowed to expire in 2004. Otter trawls are the principal gear used in this fishery. In general, bottom tending mobile gear have the potential to reduce habitat complexity and change benthic communities. Since this alternative would allow the moratorium to expire, it could result in an increase in fishing effort or redistribute effort by gear type. Therefore, the no action alternative could potentially increase any existing impacts on EFH caused by this fishery.

The Council is currently developing a draft of Amendment 9 which includes measures which address the moratorium expiration issue as well as gear impacts on essential fish habitat. As a result, the Council will present a more thorough analysis of the effects of gears used in the *Illex* fishery on Essential Fish Habitat in Amendment 9.

A full discussion of the *Illex* fishery EFH is described in detail in section 4.2.

6.2 Cumulative Impacts

A cumulative impact analysis is required as specified by the Council on Environmental Quality's (CEQ) regulation for implementing the NEPA. Cumulative effects are defined under NEPA as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other action (40 CFR § 1508.7)."

Effective federal fishery management of Atlantic mackerel, *Loligo* and *Illex* squid, and butterfish has occurred for the past two decades. Atlantic mackerel, *Loligo* and *Illex* squid, and butterfish were heavily exploited off the Northeastern Coast of the United States by distant-water foreign fleets during the 1960's and 1970's. With the advent of extended jurisdiction following passage of the Magnuson Act in 1976, foreign fishing for the species complex began to be strictly regulated. The Mid-Atlantic Fishery Management Council initiated formal management of these resources through the development of the Atlantic Mackerel, *Loligo* and *Illex* squid, and Atlantic Butterfish Fishery Management Plan which was adopted in 1983.

The management strategy during the first phase of the Atlantic Mackerel, Squid, and Butterfish FMP was to provide for the orderly development of the domestic fisheries for these resources under the purview of the Magnuson Act. This process involved the sequential phasing out of foreign fishing for these species in US waters and the gradual transfer of offshore fishing methods and technology to the domestic fishing fleet. For both squid species and butterfish, the domestic fisheries have been fully developed. All three species are considered to be fully utilized by the US domestic fishery and none are considered to be overfished as a result of the management plan developed by the Council.

For Atlantic mackerel, the full development of the domestic fishery is still ongoing. While the Atlantic mackerel fishery in US waters has been utilized domestically for the past two centuries, the modern northwest Atlantic mackerel fishery underwent dramatic change with the arrival of the European distant-water fleets (DWF) in the early 1960's. While the first DWF landings reported in 1961 were not large (11,000 mt), they increased substantially to over 114,000 mt by 1969 and exceeded 350,000 mt by 1973. This fishery expansion led to overfishing and the depletion of the Atlantic mackerel spawning stock biomass. As noted above, the Magnuson Act established control of the portion of the mackerel fishery occurring in US waters (NAFO Subareas 5-6) under the auspices of the Mid-Atlantic Fishery Management Council. Reported foreign landings in US waters declined from an unregulated level of 385,000 mt in 1972 to less than 400 mt from 1978-1980 under Magnuson Act control (the foreign mackerel fishery was restricted by NOAA Foreign Fishing regulations to certain areas or "windows"). Under the control of Council's FMP and subsequent amendments, foreign mackerel catches were permitted to increase gradually to 15,000 mt in 1984 and then to a peak of almost 43,000 mt in 1988. Following that increase, Council policy under led to the elimination of the foreign fishery for mackerel in US waters by 1993. The Atlantic mackerel stock is currently considered to be in good condition and is designated as under-exploited. While it appears that this stock is capable of supporting increased levels of exploitation by the US domestic fishery, the Council is currently considering the development of a controlled access plan to control expansion of harvest capacity and avoid over-capitalization in the Atlantic mackerel fishery.

The cumulative impacts of this FMP were last fully addressed in the EIS completed for Amendment 5. All four species in the management unit are managed primarily via annual quotas to control fishing mortality. The FMP requires a specifications process which allows for the review and modifications to management measures specified in the FMP on an annual basis. In addition, the Council added a framework adjustment procedure in Amendment 8 which allows the Council to add or modify management measures through a streamlined public review process. The purpose of the last amendment (8), was to bring the Atlantic Mackerel, Squid, and Butterfish Fishery Management plan into compliance with the new and revised National Standards and other required provisions of the Sustainable Fisheries Act. The The SFA, which reauthorized and amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act, that caused the Guidelines to be significantly revised. Specifically, Amendment 8 revised the overfishing definitions for Atlantic mackerel, *Loligo* and *Illex* squid, and butterfish and addressed the new and revised National Standards relative to the existing management measures. In addition, Amendment 8 added a framework adjustment procedure that allows the Council to add or modify management measures through a streamlined public review process. Framework 1 was the omnibus amendment which created a quota "set-aside" for the purpose of conducting scientific research. Framework 2 extended the moratorium on entry to the *Illex* fishery for an additional year, included a provision that in the event the annual specifications for Atlantic mackerel, squid and butterfish are not published by the NMFS prior to the start of the fishing year, that the previous year's specifications would apply (excluding TALFF specifications), modified the control quota setting procedure for *Loligo* to allow for the specification of measures for a period of up to three years. Framework 3, extended the *Illex* moratorium until July of 2004.

In addition to the impacts due to regulations promulgated under the Atlantic Mackerel, Squid, and Butterfish, these fisheries are impacted by the cumulative effects of regulations implemented in other Federal and State FMP's. These include present restrictions placed on the Atlantic mackerel, and squid and butterfish fisheries by the Gear Restricted Areas (GRAs), which were implemented in order to reduce by-catch of scup in the small-mesh fisheries under the Summer Flounder, Scup and Black Sea Bass FMP. According to interviews with harvesting and processing sector representatives in Rhode Island, New Jersey, and New York conducted as part of the social impact analysis for this amendment , these GRA closures have resulted in significant declines in the volume of squid available and in revenues for many firms. One processor reported an 80% reduction in fresh fish between January and March, the period of GRA closure, and the loss of 15-20 positions. Another major processor reported a 20-30% reduction due to GRAs. A company that packs squid reported a two-thirds decline in revenues linked to the GRA closures, and a cooperative reported a 30% decline. Some processors said that they were still getting adequate product but the profits to vessels were down as they had to go farther to search for product. In other words, the industry feels they have little flexibility due to existing management measures, particularly the GRAs.

In addition, the Atlantic mackerel, squid, and butterfish fisheries may have also been affected by increased competition for fishing space and product from boats that have been affected by restrictions in the New England groundfish fisheries and turtle-related restrictions in fisheries of the South Atlantic. Overall, the cumulative impacts on the Atlantic mackerel, squid and butterfish fisheries due to regulations and management actions which resulted from other FMP's have generally tended to be negative. These negative impacts have resulted from increased participation in some of these fisheries from vessels displaced from other fisheries due to effort or area restrictions or due to restrictions placed on the times and areas where the Atlantic mackerel, squid and butterfish fisheries can be prosecuted.

The principal issue concerning the extension or expiration of the *Illex* moratorium is related to overcapacity in the US fishing industry. The development of excess fishing capacity in US marine fisheries, especially since the passage of the Magnuson Act, has been identified as the single most important problem currently facing the US fishing industry (NMFS 1996; NRC 1999). Most US fisheries can be characterized as overcapitalized, with too many vessels, too much gear and too much time spent at sea harvesting fish at too high a cost to both harvesters and society. Adding significantly to the problem is the fact that the increase in fishing capacity in the US has been accompanied by a dramatic increase in technological advances (NMFS 1996). The US commercial fishery has developed from a fleet of primarily sailing vessels in the 1800's to a modern fleet of vessels which has resulted in an enormous increase in fishing power throughout the 20th century. This increase in fishing vessel capacity and efficiency has resulted in over-exploitation and economic losses throughout most US marine fisheries.

The net economic benefits that could be gained by ending the open access problem in US fisheries are significant. Managing single-species fisheries with a conservative, risk averse approach should be the first step in achieving sustainable marine fisheries (NRC 1999). The NRC (1999) recommended that a moderate level of exploitation might be a better goal for fisheries management than full exploitation since the latter has almost universally resulted in over-exploitation of marine resources. The NRC (1999) concluded "At the core of today's overcapacity problem is the lack of, or ineffective, definition of fishing rights in most fisheries. Therefore, the committee recommends for many fisheries a management approach that includes the development and use of methods of allocation of exclusive shares of the fish resource or privileges and responsibilities (as opposed to open competition) and the elimination of subsidies that encourage overcapacity. A flexible and adaptive approach is essential, and careful attention must be given to equity issues associated with such approaches." In addition, the NRC (1999) strongly recommended that managers and policy makers should focus on developing or encouraging socioeconomic and other management measures that discourage overcapacity and that reward the conservative and efficient use of marine fishery resources.

The United States is currently developing a strategic plan for systematic reduction in harvest capacity in domestic fisheries based on mandates promulgated in the 1996 re-authorization of the Magnuson-Stevens Act, or the Sustainable Fisheries Act (SFA). The SFA has provided the Agency with expanded authority for implementing fishing capacity reduction programs: "to obtain the maximum sustained reduction in fishing capacity at the least cost and in a minimum period of time." The SFA re-authorization also mandated a study be completed in the summer of 1999 on the role of the Federal Government in subsidizing the expansion and contraction of fishing capacity, and otherwise influencing the aggregate level of capital investment in fisheries (Federal Fisheries Investment Task Force, 1999). The SFA is also the primary factor behind the inclusion of capacity management as a formal NOAA planning objective. Under the Build Sustainable Fisheries element of the NOAA Fisheries Strategic Plan, a 20 percent reduction in the number of overcapitalized fisheries must be achieved by the year 2005. This planning element gives NOAA, for the first time, a quantitative capacity management target and a deadline. In addition (as noted above), the recommendations of the National Research Council (1999) report calls for a reduction in excess fishing capacity and states that "...managers and policy makers should focus on developing or encouraging socioeconomic and other management measures that discourage overcapacity and that reward conservative and efficient use of marine resources and their ecosystems." The Council has concluded that the current *Illex* moratorium permit holders currently possess, at a minimum, several times greater harvest capacity relative to the long term sustainable yield for this fishery. In addition, given the national policy of systematic harvest capacity reduction, the Council has also concluded that it would be highly undesirable to allow the *Illex* fishery to revert to an open access condition given the current state of overcapitalization in this and most other fisheries in the US and throughout the world. To the contrary, in the future the Council may be required to implement measures to reduce harvest capacity in this fishery in accordance with the NMFS goal of substantially reducing overcapacity in US federally managed fisheries by 2009.

The cumulative effects of the proposed measures contained in this framework action can be examined for the following five areas: targeted species, non-targeted species, protected species, habitat, and communities.

Targeted species

First and foremost, the Council has met the obligations of National Standard 1 by adopting and implementing conservation and management measures that have prevented overfishing, while achieving, on a continuing basis, the optimum yield for the four species and the United States fishing industry. *Illex* have never been designated as overfished since the FMP was implemented.

The most obvious and immediate impact on the stocks managed under this FMP results from the mortality that occurs from fishing activities.   The Council manages Federally permitted vessels which fish for the four species managed under this FMP throughout their range in both Federal and state waters. Fishing mortality from all fishing activities that land these species is controlled and accounted for by the quotas established under the FMP. In addition to fishing mortality related landings, there are other fishing activities that take these species as bycatch that impact these populations because they represent additional sources of mortality (i.e., due to discarding). However, estimates of bycatch related mortality in non-directed fisheries are incorporated into the stock assessment for each species. Therefore, mortality from non-directed sources is explicitly accounted for in stock assessment models which form the basis for establishing the proposed quotas. The first two alternatives proposed in this Framework will not affect current levels of mortality (directly or indirect) since they will maintain the status quo and will not affect the overall quota. However, if the moratorium is allowed to expire there could be flood of new entrants into the fishery. Open access, derby style fisheries are well known for biological, as well as economic inefficiencies. For example, new entrants are relatively inexperienced fishermen in the fishery and will generally have a lower catch rate compared to current stakeholders. Thus, all things being equal, a given level of landings will require greater levels of fishing effort when novice fishermen enter the fishery. Increased fishing effort may result in increased discards of both target and non-target species.

In addition to mortality on these stocks due to fishing, there are other indirect effects on these stocks from non-fishing anthropogenic activities in the Atlantic Ocean, but these generally can't be quantified at present.   None the less, since these species occur over wide areas of the Mid- and North Atlantic Ocean and inhabit both inshore and offshore pelagic waters, it is unlikely that any indirect anthropogenic activity currently significantly impact these populations, especially in comparison to the direct effects on these populations as a result of fishing.

In summary, a major goal of this FMP has been the Americanization of these fisheries. Prior to the passage of the Magnuson Act and development of this FMP, the foreign prosecution of these fisheries occurred at much higher levels of fishing effort. The first phase of the domestic fishery development was the elimination of these foreign fisheries and the transfer of the offshore fishing technology to the US fishing fleet. Thus, the immediate and cumulative impact was to end foreign fishing on these stocks. The second phase of FMP implementation was the controlled development of these fisheries which allowed stock rebuilding, especially in the case of Atlantic mackerel. The final phase of FMP implementation has been to adopt and implement new overfishing defintions which are consistent with the SFA. The end result has been, at least in the case of *Loligo* and *Illex,* that harvest capacity and quotas have been matched to provide for long term, sustainable utilization of these resources. Both alternatives 1 and 2 would maintain this process.

Non-target species or bycatch

National Standard 9 addresses bycatch in fisheries. This National Standard requires Councils to consider the bycatch effects of existing and planned conservation and management measures. Bycatch can, in two ways, impede efforts to protect marine ecosystems and achieve sustainable fisheries and the full benefits they can provide to the Nation. First, bycatch can increase substantially the uncertainty concerning total fishing-related mortality, which makes it more difficult to assess the status of stocks, to set the appropriate optimal yield (OY) and define overfishing levels, and to ensure that OYs are attained and overfishing levels are not exceeded. Second, bycatch may also preclude other more productive uses of fishery resources.

The term "bycatch" means fish that are harvested in a fishery, but that are not sold or kept for personal use. Bycatch includes the discard of whole fish at sea or elsewhere, including economic discards and regulatory discards, and fishing mortality due to an encounter with fishing gear that does not result in capture of fish (i.e., unobserved fishing mortality). Bycatch does not include any fish that legally are retained in a fishery and kept for personal, tribal, or cultural use, or that enter commerce through sale, barter, or trade. Bycatch does not include fish released alive under a recreational catch-and-release fishery management program. A catch-and-release fishery management program is one in which the retention of a particular species is prohibited. In such a program, those fish released alive would not be considered bycatch.

Alternatives 1 and 2 for this framework action alternatives will not promote or result in increased levels of bycatch relative to the status quo. However, as noted above, Alternative 3 could result in an increase in fishing effort compared to the current moratorium fishery. In that case, it is possible that effort could increase in the directed *Illex* fishery relative to the status quo and bycatch of non-target species could increase accordingly. It is not currently possible to determine if the potential impact on these non-target species due to this increase in fishing effort would be significant.

Protected resources

There are numerous species which inhabit the environment within the management unit of this FMP that are afforded protection under the Endangered Species Act (ESA) of 1973 (i.e., for those designated as threatened or endangered) and/or the Marine Mammal Protection Act of 1972 (MMPA). Eleven are classified as endangered or threatened under the ESA, while the remainder are protected by the provisions of the MMPA. The species protected either by the Endangered Species Act of 1973 (ESA), the Marine Mammal Protection Act of 1972 (MMPA), or the Migratory Bird Act of 1918, that be found in the environment utilized by Atlantic mackerel, squid and butterfish fisheries are listed in section 4.3.

As noted above, alternatives 1 and 2 are not expected to result in increased levels of bycatch relative to the status quo, since these alternatives should not affect fishing effort. However, the no action alternative could result in an increase in fishing effort and increased interactions with pilot whales. Pilot whales are the protected species of primary concern in the *Illex* fishery. However, it is not currently possible to determine if the potential impact on pilot whales due to this increase in fishing effort would be significant.

As noted above, a major goal of this FMP has been the Americanization of these fisheries. Prior to the passage of the Magnuson Act and development of this FMP, the foreign prosecution of these fisheries occurred at much higher levels of fishing effort. As described in section 4.3, the foreign fisheries for Atlantic mackerel, squid and butterfish were a major source of mortality for a number of marine mammal stocks. The elimination of these fisheries and subsequent controlled development of the domestic fisheries for Atlantic mackerel, squid and butterfish have resulted in fishing effort levels much lower than those which occurred in the foreign fisheries prior to FMP development and implementation. The cumulative effect of the maintenance of these fishing effort levels under the current management program, in conjunction with future take reduction plan efforts under the MMPA, should be to minimize the impact of these fisheries on marine mammal stocks, including pilot whales.

Habitat

The 2002 final rule for EFH requires that fishery management plans minimize to the extent practicable adverse effects on essential fish habitat caused by fishing (section 600.815 (a) (2)). Pursuant to the final EFH regulations (50 CFR 600.815(a)(2)), FMPs must contain an evaluation of the potential adverse effects of fishing on EFH designated under the FMP, including effects of each fishing activity regulated under the FMP or other Federal FMPs. The evaluation should consider the effects of each fishing activity on each type of habitat found within EFH. FMPs must describe each fishing activity, review and discuss all available relevant information (such as information regarding the intensity, extent, and frequency of any adverse effect on EFH: the type of habitat within EFH that may be affected adversely; and the habitat functions that may be disturbed), and provide conclusions regarding whether and how each fishing activity adversely affects EFH. The evaluation should also consider the cumulative effects of multiple fishing activities on EFH.

The Council made the last determination about gear impacts on EFH in Amendment 8 (see section 7.0 below). The Council concluded in Amendment 8 that the measures implemented through the Atlantic Mackerel, Squid and Butterfish FMP, minimize the adverse effects of fishing on EFH, to the extent practicable, pursuant to Section 303(a)(7) of the MSA. Alternatives 1 and 2 in this framework action maintain the status quo, and therefore, do not alter this conclusion relative to the cumulative effects on EFH since no change in fishing effort is anticipated as a result of these alternatives. The Council is currently developing Amendment 9 to the Atlantic Mackerel, Squid and Butterfish FMP and is conducting additional analyses concerning gear impacts on EFH as part of that amendment.

Potential non-fishery impacts on the *Illex* habitat include those arising from coastal development, construction, point and non-point source pollution, dredging, hydroelectric development, sewage treatment and disposal. Although some of these activities might have a negative impact on the *Illex* habitat, it is expected that such impacts would be relatively small and localized. Given the vast area over which *Illex* migrate and spawn, none of these non-fishing activities is expected to have a significant impact on the species.

A number of fisheries in the northwest Atlantic Ocean shelf, including groundfish, sea scallops, monkfish, mackerel, butterfish, summer flounder, scup, black seabass, bluefish and spiny dogfish, use bottom tending gear such as trawls and dredges in addition to squid. Scallop dredges are used in the Sea scallop fishery and hydraulic clam dredges are used in the surf clam and ocean quahog fisheries. All these gear have had negative effects on bottom habitat (NRC 2002). This study determined that repeated use of trawls/dredges reduce the habitat complexity by the loss of erect and sessile epifauna, smoothing sedimentary bedforms and bottom roughness. This activity, when repeated over a long term also results in discernable changes in benthic communities, which involve a shift from larger bodied long-lived benthic organisms for smaller shorter-lived ones. This shift also can result in loss of benthic productivity and thus biomass available for fish predators. These effects varied with sediment type with lower level of impact to sandy communities, where there is a high natural dynamic nature to these bedforms, to a high degree of impact to hardbottom areas such as bedrock, cobble and coarse gravel, where the substrate and attached epifauna are more stable.

The cumulative effect both non-fishing and gear effects of the *Illex* fishery and other fisheries on habitat have been generally negative. Without the moratorium, these effects would continue in the foreseeable future. However, with a moratorium on the *Illex* fishery remaining in place, there would be a minor positive beneficial effect that would be due to the reduction in overall bottom contact time. This effect is minor due to the fact that the *Illex* fishery is and continues to be only a small portion of the total gear effects on fish habitat when compared to the effects of the sum of other fishery activities.

Communities

National Standard 8 requires that management measures take into account the fishing communities. The Council hired Dr Bonnie McCay and her associates from Rutgers University to describe the ports and communities that are associated with the Atlantic Mackerel, Squid and Butterfish fisheries. Communities from Maine to Virginia are involved in the harvesting of Atlantic mackerel, squid and butterfish and are described in more detail in Appendix 1 and sections 4 and 5.

With regard to alternatives that are proposed in this framework document, the impacts expected to the affected biological and physical and human environment are described in section 6. Given that no negative impacts are anticipated to result from Alternatives 1 and 2, synergistic interaction of improvements in the efficiency of the fishery are expected to generate positive impacts overall. These impacts will be felt most strongly in the social and economic dimension of the environment. Direct economic and social benefit from improved fishery efficiency is most likely to affect participants in these fisheries. These benefits are addressed in the RIR/IRFA of this document. Indirect benefits of the preferred alternatives are likely to affect consumers and in areas of the economic and social environment that interact in various ways with these fisheries.

The proposed actions, together with past and future actions are expected to result in positive cumulative impacts on the biological, physical, and human components of the environment. These fisheries have been well managed since implementation of the FMP in the early 1980s. Both the resources and the fisheries they support appear to be in good condition. As long as management continues to prevent overfishing, the fisheries and their associated communities should continue to prosper.

6.3 Summary

The anticipated impacts resulting from the three alternatives considered in this framework action are summarized in below in Table FEIS-3. Overall, the net benefits of alternatives 1 and 2 are expected to be about the same and are considered by the Council, overall, to be positive compared to alternative 3 (no action). Compared to the status quo, alternatives 1 and 2 are expected to result in no change (null effect) since they simply extend the moratorium for five and two years, respectively. In contrast, alternative 3, allowing the moratorium to expire in 2004, would result overall in net negative benefits. The economic inefficiencies of open access, derby style fisheries are well known. Allowing the fishery to revert to open access could result in a flood of new entry into the fishery, especially if economic and resource conditions return to conditions as they were in 1998. The likely result would be an increase in speculative entry into the fishery. Overall, effort levels in the fishery would be expected to increase for a given level of landings. In addition, new entrants would lack the experience of historical participants, so it is likely that the increase in effort would be accompanied by increased bycatch of non-target species, including species of cetaceans protected under the MMPA (see section 6.1). The Council also notes that given the stated NOAA national policy goal to systematically reduce capacity in US fisheries over the next 5-15 years , it would not be desirable to allow increased harvest capacity to permanently enter a fishery that has been demonstrated to currently possess over-capacity compared to long term sustainable yield. The economic analyses presented in section 6.1 indicate no difference in the economic impacts of the alternatives considered because effort in this fishery has declined dramatically in the past few years. These effort declines are believed to be related to short term reductions in abundance and availability of the *Illex* resource in combination with poor market conditions. If these conditions change, speculative entry into this fishery is likely.

This framework action seeks to maintain the status quo relative to new entry into the commercial *Illex* fishery until the Council can develop a permanent solution to this problem in Amendment

9. Consequently, fishing effort in the *Illex* fishery is not expected increase or otherwise change as a result of this framework. Therefore, the Council has concluded that no change in the cumulative impacts on the physical environment due to this action are expected. This includes *Illex* fishing gear impacts on *Illex* EFH and the EFH of other species.

Table FEIS-3. Qualitative summary of the expected impacts of various alternatives considered in Framework 4 compared to the status quo. A minus sign (-) signifies an expected negative impact and a zero (0) is used for null impact.

Environmental Dimension					
	Biologica l	Economic	Socia l	Protected Resource s	Essential Fish Habitat
Alternative 1 (extend moratorium for 5 years)	0	0	0	0	0
Alternative 2 (extend moratorium for 2 years)	0	0	0	0	0
Alternative 3 (moratorium expires in 2004)	-	-	-	-	-

6.4 AREAS OF CONTROVERSY

While it is generally recognized that the *Illex* fishery, like the vast majority of fisheries in the United States, is over-capitalized, issues related to allocation of fishery resources are always a source of controversy.

6.5 MITIGATION

There are no issues in the proposed management measures for this framework action that require mitigation.

6.6 SOCIAL IMPACT ASSESSMENT

The social and cultural impacts of each of the proposed alternatives are discussed in Section 6.0 of the DEIS. A description of the ports and communities of which are dependent on Atlantic mackerel, squid and butterfish is given in Appendix 1. In addition, a Social Impact Assessment of the measures proposed in this framework action is currently being developed for Amendment 9.

7.0 CONSISTENCY WITH APPLICABLE LAWS

7.1 The Framework Action Relative to the National Standards

Section 301(a) of the MSFCMA states: "Any fishery management plan prepared, and any regulation promulgated to implement such plan pursuant to this title shall be consistent with the following National Standards for fishery conservation and management." The following is a discussion of the standards and how this framework meets them.

7.1.1 National Standard 1 - Overfishing Definition

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

The Sustainable Fisheries Act (SFA), which reauthorized and amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) made a number of changes to the existing National Standards. With respect to National Standard 1, the SFA imposed new requirements concerning definitions of overfishing in US fishery management plans. In order to comply with National Standard 1, the SFA requires that each Council FMP define overfishing as a rate or level of fishing mortality that jeopardizes a fisheries capacity to produce maximum sustainable yield (MSY) on a continuing basis and defines an overfished stock as a stock size that is less than a minimum biomass threshold.

The SFA also requires that each FMP specify objective and measurable status determination criteria for identifying when stocks or stock complexes covered by the FMP are overfished. To fulfill the requirements of the SFA, status determination criteria are comprised of two components: 1) a maximum fishing mortality threshold and 2) a minimum stock size threshold. The maximum F threshold is specified as F_{msy}. The minimum biomass threshold is specified as ½ the MSY level. The overfishing definitions for each of the species managed under this FMP was modified in Amendment 8 to comply with the SFA. The extension of the moratorium proposed in this framework action will not affect the overfishing definition and fishing mortality control rule for *Illex* squid adopted in Amendment 8. Since the current overfishing definition for *Illex* will be unchanged and contains the necessary elements and provisions for stock rebuilding prescribed by the SFA, this framework action is consistent with National Standard 1.

7.1.2 National Standard 2 - Scientific Information

"Conservation and management measures shall be based upon the best scientific information available."

The analyses in this framework are based on the best scientific information available. Therefore, this framework action is consistent with National Standard 2.

7.1.3 National Standard 3 - Management Units

"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."

Each species in the management unit of this FMP is managed as a single unit throughout its range, from Maine through Florida. The proposed action does not alter the management unit. Therefore, this framework action is consistent with National Standard 3.

7.1.4 National Standard 4 - Allocations

"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 a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges."

This framework action is not expected to significantly alter the allocation of any of the resources managed under this FMP. If the *Illex* moratorium was allowed to expire, the fishery would revert to an open access condition. If resource and economic conditions were favorable, the likely outcome would be an influx of new entry into the *Illex* fishery (additional capitalization of the fishery) and a reduction in the amount landed by current permit holders. Depending on the level of entry, the allocation effects of *not* extending the moratorium could be severe for the current moratorium permit holders. Since the moratorium for *Illex* is already in place and, if it is extended, no allocation effects from such an extension are anticipated.

7.1.5 National Standard 5 - Efficiency

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

The management program implemented by the Amendments to the Atlantic Mackerel, Squid, and Butterfish FMP are intended to allow the fisheries managed pursuant to this FMP to operate at the lowest possible cost (e.g., fishing effort, administration, and enforcement) given the FMP's objectives. The management measures proposed in Framework 4 place no restrictions on processing, or marketing and no unnecessary restrictions on the use of efficient techniques of harvesting. Therefore the proposed action is consistent with National Standard 5.

7.1.6 National Standard 6 - Variations and Contingencies

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

The description of how this National Standard is met by the FMP was described in Amendments 5, 6 and 8. The purpose of the proposed action is to simply extend the moratorium for *Illex* squid until the issue can be addressed in Amendment 9 to the FMP. The action does not alter the basic management measures already in place in the FMP. Therefore, the proposed action is consistent with National Standard 6.

7.1.7 National Standard 7 - Cost and Benefits

"Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication."

The description of how this National Standard is met by the FMP was described in Amendments 5, 6 and 8. This framework action is not expected to alter the costs of management under this FMP. Therefore, there is no reason to alter the conclusion that this framework is consistent with National Standard 7.

7.1.8 National Standard 8 - Communities

"Conservation and management measures shall, consistent with the conservation requirements of the Magnuson-Stevens 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."

A complete description of the ports and their reliance on various species, including Atlantic mackerel, squid and butterfish is given in Appendix 1. The purpose of this FMP has been to provide a framework for the orderly development of the Atlantic mackerel, *Loligo* and *Illex* squid and butterfish fisheries while preventing overfishing. Therefore, most if not all of the fishing communities along the US east coast have been positively impacted by the FMP. There were likely some fishermen who may have caught *Illex* that did not qualify for the moratorium under Amendment 5 and were reduced to catching bycatch quantities. This issue was discussed in section 9.2.2 of Amendment 5 to the FMP and in the Resubmission document for Amendment 5.

Another issue raised during the development of Amendment 5 was that the limited entry provisions reduced the possibility that fishermen would enter the fishery that never participated in these fisheries. The most frequently mentioned group of fishermen identified in this category are those that have been negatively impacted by the severely overfished condition of the North East groundfish resources. They are seeking alternative species. However, it was the Council's conclusion that the harvesting capacity of the fleet that would qualify for the moratoria plus the fleet that will harvest the bycatch allowance can take the maximum optimum yields for the species involved and no extra capacity is needed in the fishery. The major benefit to be realized through implementation of recent Amendments to this FMP is that overfishing and over-capitalization in these fisheries will be avoided in the future. This framework action would extend the moratorium on entry into the *Illex* fishery (unless no action is taken).

The proper management of the stock complexes managed under this FMP through implementation of the management measures described in recent Amendments have been beneficial to the commercial and recreational fishing communities of the Atlantic Coast. By preventing overfishing of the stocks and overcapitalization of the industry, positive benefits to the fishing communities have and will continue to be realized. Therefore, this Framework Action is consistent with National Standard 8.

7.1.9 National Standard 9 - Bycatch

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

This national standard requires Councils to consider the bycatch effects of existing and planned conservation and management measures. Bycatch can, in two ways, impede efforts to protect marine ecosystems and achieve sustainable fisheries and the full benefits they can provide to the Nation. First, bycatch can increase substantially the uncertainty concerning total fishing-related mortality, which makes it more difficult to assess the status of stocks, to set the appropriate optimal yield (OY) and define overfishing levels, and to ensure that OYs are attained and overfishing levels are not exceeded. Second, bycatch may also preclude other more productive uses of fishery resources.

The term "bycatch" means fish that are harvested in a fishery, but that are not sold or kept for personal use. Bycatch includes the discard of whole fish at sea or elsewhere, including economic discards and regulatory discards, and fishing mortality due to an encounter with fishing gear that does not result in capture of fish (i.e., unobserved fishing mortality). Bycatch does not include any fish that legally are retained in a fishery and kept for personal, tribal, or cultural use, or that enter commerce through sale, barter, or trade. Bycatch does not include fish released alive under a recreational catch-and-release fishery management program. A catch-and-release fishery management program is one in which the retention of a particular species is prohibited. In such a program, those fish released alive would not be considered bycatch.

Compliance with this national standard and the general issue of bycatch in the commercial fishery for *Illex* was addressed in Amendment 8 and Framework 2. The moratorium extension proposed in this framework action will have no effect on bycatch in this fishery because it maintains the status quo. The commercial fishery for *Illex* is primarily prosecuted with otter trawls. For example, unpublished NMFS dealer reports indicated that greater than 99% of all *Illex* landings in 2001 were taken with otter trawls. The fishery is managed through the specification of annual quotas. No management measures -will be put into place as result of this framework action which will cause discarding of *Illex* in the commercial fishery.

One measure imposed in Amendment 5 to the FMP designed to minimize discards in the squid and butterfish fisheries was the creation of a non-moratorium incidental catch allowance. Amendment 5 created a limited access program for the squids and butterfish. To avoid discarding of squid and butterfish taken by non-moratorium vessels during the prosecution of other fisheries, a non-moratorium incidental permit category was created. Vessels that did not qualify for an *Illex* moratorium permit may land *Illex*, if (1) it possesses an incidental catch permit, (2) fishes with a net legal in the directed fishery, (3) lands no more than 5,000 pounds of *Illex* per trip, and (4) the operator of the vessel files the appropriate trip reports. The incidental catch allowance may be adjusted by the Regional Administrator based on the recommendation of the Council. This management measure was implemented specifically to minimize discarding of this species in non-directed fisheries.

The amount of discarding in the commercial fisheries for these species should be also be minimized since capping the fishery at 1996 levels avoided overfishing of *Illex* squid . In addition, Amendment 8 added framework provisions to deal with discard problems in the future, should they arise. Specifically, if a discard problem is identified, gear restrictions could be implemented to reduce discard mortality. All of these factors will result in the minimization of bycatch and discard mortality in the commercial fisheries for these species, to the extent practicable. Therefore, National Standard 9 is satisfied.

7.1.10 National Standard 10 - Safety at Sea

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

No changes to the management system are proposed in this framework, and therefore, this action should not affect the vessel operating environment, gear loading requirements or create derby style fisheries for *Illex*. The Council developed this FMP and subsequent amendments with the consultation of industry advisors to help ensure that this was the case. In summary, the Council has concluded that the proposed framework action will not impact or affect the safety of human life at sea. Therefore the action is consistent with National Standard 10.

7.2 OTHER MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT REQUIREMENTS

Section 303(a)(12) of the MSFCMA requires the Councils to 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 requirement has been addressed under section 7.1.9 of this Amendment.

Section 303(a)(13) of the MSFCMA requires the Councils to 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 resources by the commercial, recreational, and charter fishing sectors. The description of fishing activities for the recreational Atlantic mackerel was presented in section 5.1.3.1.4 of this amendment. Additional information pertaining to the recreational and charter fishing sectors is presented section 7.2.1 (Additional Characterization of the Recreational and Party/Charter Fisheries).

Section 303(a)(14) of the MSFCMA requires that to the extent that rebuilding plans or other conservation and management measures which reduce the overall harvest in a fishery are necessary, any harvest restrictions or recovery benefits are allocated fairly and equitably among commercial, recreational, and charter fishing sectors in the fishery. This amendment would not change the allocations between the recreational and commercial Atlantic mackerel fisheries.

7.2.1 Additional Characterization of the Recreational and Party/Charter Fisheries

7.2.1.1 Marine recreational descriptive statistics

In 1994, sportfishing surveys were conducted by NMFS in the Northeast Region (Maine to Virginia) to obtain demographic and economic information on marine recreational fishing participants from Maine to Virginia. Data from the surveys were then used to access socio-economic characteristics of these participants, as well as to identify their marine recreational fishing preferences and their perceptions of current and prospective fishery management regulations. This information will be used in future stages of the research to estimate statistical models of the demand for marine recreational fishing for eight important recreational species. The information that follows is excepted and paraphrased from a preliminary report by Steinback *et. al.* (1999).

"Marine recreational fishing is one of the most popular outdoor recreational activities in America. In 1992, the lowest level of participation during the last ten years, approximately 2.57 million residents of coastal states in the Northeast Region participated in marine recreational fishing in their own state. Participation increased approximately 5% in 1993 (2.7 million) and increased another 14% in 1994 (3.1 million), exceeding the ten-year average of 2.9 million. Although the total number of finfish caught in the Northeast Region has declined over the past ten years effort (trips) has remained relatively stable. An estimated 22.4 million fishing trips were taken in 1994, up from 19.3 million in 1993."

The following discussion contains demographic and socio-economic characteristics of anglers, as well as their preferences, attitudes, and opinions, toward recreational fishing activities and regulations. There was little or no difference in mean age across subregions. "The largest proportion of anglers in both subregions were 36-45 years old (NE=28%, MA=25%). However, comparatively, New England anglers were younger than Mid-Atlantic anglers. Results show that participation in marine recreational fishing increased with age, peaked between ages of 36 to 45, and subsequently declined thereafter. The resultant age distribution is similar to the findings of other marine recreational studies. However, the distribution is not reflective of the general population in these subregions. Bureau of the Census estimates indicate population peaks between the ages of 25 to 34 in both subregions, declines until the age of 64 and then increases substantially." The complete distribution of recreational anglers by age for both subregions is as follows: between the ages of 16-25, 8% in NE and 7% in Massachusetts; between 26-35, 24% in NE and 20% in Massachusetts; between 36-45, 28% in NE and 25% in Massachusetts; between 56-65, 12% in NE and 15% in Massachusetts; and 65 and over, 8% in NE and 11% in Massachusetts. In this survey anglers under the age of 16 were not interviewed and are not included in the analysis.

In both subregions at least 88% of the anglers (age 25 and over) had obtained at least a high school degree (NE=91%, MA=88%). "While the educational background is similar across subregions, a greater portion of the anglers in New England earned college or post graduate/professional degrees (NE=29%, MA=23%). The shape of the educational distribution essentially mirrored the general population in both subregions. However, the average number of anglers without a high school degree was considerably lower than Bureau of the Census estimates (age 25 and over) for the general population. On the other hand, it appears that anglers in new England and the Mid-Atlantic earned less post graduate/professional degrees than Bureau of Census estimates."

When anglers were asked to describe their racial or ethnic origin, almost all of the anglers interviewed in both subregions considered themselves to be white (NE=95%, MA=90%). "In the Mid-Atlantic, most of the remaining individuals were black (7%), leaving 3% to be of other ethnic origins. In New England, the remaining anglers were evenly distributed across other ethnic origins. The high occurrence of white fishermen is representative of the general population of the coastal states in New England, Approximately 94% of the population in 1993 was estimated to be white. However, in the Mid-Atlantic, the percentage of white anglers was considerable higher than Bureau of Census populations estimates, and the percentage of black fishermen was 12 percent lower."

When anglers were asked to indicate from a range of categories what their total annual household income was, only minor differences between subregions were found. "The largest percentage of household incomes fell between $30,001 and $45,000 for both subregions (NE=27%, MA=26%). In comparison to the general population, anglers' annual household incomes are relatively higher in both subregions. Results are consistent with previous studies which showed that angler household incomes are generally higher than the population estimates."

If it is assumed that "years fished" is a proxy for "experience," the survey data shows that anglers in New England are relatively less experienced than anglers in the Mid-Atlantic. The distribution of recreational anglers years of experience is as follows: 0-5 years of experience, 22% in NE and 16% in Massachusetts; 6-10 years of experience, 10% in NE and 10% in Massachusetts; 11-15 years of experience, 13% in NE and 14% in Massachusetts; 16-20 years of experience, 9% in NE and 9% in Massachusetts; 21-25 years of experience, 12% in NE and 12% in Massachusetts; 26-30 years of experience, 13% in NE and 12% in Massachusetts; and 30 or more years of experience, 21% NE and 26% in Massachusetts.

On average, it was found that New England anglers spent more on boat fees, lodging, and travel expenses than Mid-Atlantic anglers (due to budget and interview time constraints, expenditure information pertaining to bait, tackle, ice, or meals was not collected). "During the follow-up telephone portion of the survey, anglers that fished from a party/charter boat or a private/rental boat were asked how much they personally spent on boat fees for the trip in which they were interviewed. Boat fees averaged $61.00 per trip in New England and $51.00 in the Mid-Atlantic. Two categories of lodging expenses were obtained. The first category (Lodging (>0)) is an estimate of the mean lodging expense per night for those anglers who indicated they spent at least one night away from their residence and personally incurred lodging costs. Subsequently, the second category (Lodging (all)) is an estimate of mean lodging expenses across all overnight anglers, regardless of whether an angler incurred a lodging expense. Per night costs were estimated by dividing total lodging costs for the trip by the number of days the angler was away from his/her residence on the trip. Anglers that personally incurred lodging expenses spent $58.00 on average per night in New England and $47.00 per night in the Mid-Atlantic. Across all overnight anglers, per night lodging expenses in New England averaged $29.00 and in the Mid-Atlantic, $21.00. Anglers expenditures also included money spent on gas, travel fares, tolls, and ferry and parking fees. One-way travel expenditures averaged $11.00 in new England and $8.00 in the Mid-Atlantic per trip. Therefore, if arrival costs are tantamount to departure costs, average round-trip travel expenses would approximate $22.00 in New England and $16.00 in the Mid-Atlantic." Since certain expenditures such as parking, tolls, and other travel fares may be incurred only once, the estimated round-trip travel expense should be considered an upper bound estimate.

Survey results show that over 50% of the anglers in both subregions indicated boat ownership (NE=51%, MA=53%). These results were obtained when anglers were asked if anyone living in their household owns a boat that is used for recreational saltwater fishing.

Regarding the duration of the interviewed trip length, "at least 80 percent of the anglers in both subregions indicated they were on a one-day fishing trip (NE=80%, MA=84%). One-day fishing trips were defined to be trips in which an angler departs and returns on the same day. Less than one fourth of the respondents indicated the day fishing was part of a longer trip which they spent at least one night away from their residence (NE=20%, MA=16%)."

"Respondents were asked why they chose to fish at the site they were interviewed. "Convenience" and "better catch rates" were the main reasons why anglers chose fishing sites in both subregions. Forty-nine percent of the anglers in New England and 57 percent of the anglers in the Mid-Atlantic indicated "convenience" as either first or second reason for site choice. "Better catch rates" was the first or second stated reason for site choice by 51 percent of the anglers in New England and 50 percent of the anglers in the Mid-Atlantic. Other notable responses were "always go there," "boat ramp," "access to pier," and "scenic beauty." Results indicate that although anglers chose fishing sites for many different reasons, sites that offered good catch rates and were convenient attracted the most anglers."

Recreational anglers were asked to rate recreational fishing against their other outdoor activities during the last two months. Specifically, they were asked if fishing was their most important outdoor activity, their second most important outdoor activity, or only one of many outdoor activities? "Over 60% of the respondents in both subregions (NE=61%, MA=68%) reported marine recreational fishing was their most important outdoor activity during the past two months. Less than 30 percent in both subregions (NE=27%, MA=20%) said recreational fishing was only one of many outdoor activities. These results were consistent with national outdoor recreation surveys carried over the past three decades indicating that fishing is consistently one of the top outdoor recreational activities in terms of number of people who participate.

Recreational anglers ratings of reasons (7 preestablished reasons for fishing) for marine fishing are presented in Steinback *et. al.* (1999). More than 66% of the anglers in both subregions said that it was very important to go marine fishing because it allowed them to: spend quality time with friends and family (NE=81%, MA=85%); enjoy nature and the outdoors (NE=89%, MA=87%); experience or challenge of sport fishing (NE=69%, MA=66%); and relax and escape from my daily routine (NE=83%, MA=86%). "The reasons that were rated as not important by the largest proportion of anglers consisted of: fish to eat (NE=42%), to be alone (NE=55%, MA=58%), and to fish in a tournament or when citations were available (NE=79%, MA=73%). In the Mid-Atlantic, although to catch fish to eat was rated as being somewhat important by the largest proportion of anglers (40%), approximately 31 percent felt that catching fish to eat was very important. Whereas, in New England, only 20 percent concurred. It is clear from these responses that marine recreational fishing offers much more than just catching fish to anglers. Over 80 percent of the respondents in both subregions perceived recreational fishing as a time to spend with friends and family, a time to escape from their daily routine, and time to enjoy nature and outdoors. While catching fish to eat is somewhat important to anglers, findings of this survey generally concur with previous studies that found non-catch reasons are rated highly by almost all respondents while catch is very important for about a third and catching to eat fish is moderately important for about another third."

"The economic survey sought to solicit anglers opinions regarding four widely applied regulatory methods used to restrict total recreational catch of the species of fish for which they typically fish: (1) limits on the minimum size of the fish they can keep; (2) limits on the number of fish they can keep; (3) limits on the times of the year when they can keep the fish they catch; and (4) limits on the areas they fish. Anglers were asked whether or not they support or opposed the regulations." Strong support existed for all regulatory methods in both subregions. Limits on the minimum size of fish anglers could keep generated the highest support in both regions (NE=93%, MA=93%), while limits on the area anglers can fish, although still high, generated relatively lower support (NE=68%, MA=66%).

Regulations which limit the number of fish anglers can keep ranked second (NE=91%, MA=88%). The results from this solicitation indicate that recreational anglers in the Northeast Region appear to be conservation oriented and generally support regulations employed to restrict total catch. Not surprisingly, when analyzing anglers opinions regarding the four widely applied regulatory methods, it was found that anglers in all modes indicated strong support for the regulatory measures. With minimum size limits generating the strongest support, followed by catch limits, seasonal closures, and lastly, area closures. "Although party/charter, private/rental, and shore respondents did offer varying degrees of support for each of a selection of regulatory measures, similar support existed across all modes. Support was highest for common regulatory methods currently being implemented in New England and the Mid-Atlantic (e.g., size and bag limits), than for area and seasonal closures."

7.2.2 Essential Fish Habitat Assessment

An EFH assessment is required under 50 CFR Section 600.920 (e) "for any Federal action that may adversely affect EFH." The assessment may be incorporated into documents prepared for ESA or NEPA requirements. Additionally, the level of detail of the EFH assessment is required to be "commensurate with the complexity and the magnitude of the potential adverse effects of the action." Mandatory requirements of the EFH assessment include: "(i) A description of the action. (ii) An analysis of the potential adverse effects of the action on EFH and the managed species. (iii) The Federal agency's conclusions regarding the effects of the action on EFH. (iv) Proposed mitigation, if applicable." The mandatory requirements are as follows:

(i) A complete description of the actions proposed in this framework action can be found in section 3.0. The alternatives considered in this action include: 1) extend the moratorium on entry to the *Illex* fishery for an additional five years (moratorium on entry to the *Illex* fishery would expire after five years unless extended in a future amendment) 2) extend the moratorium on entry to the *Illex* fishery for an additional two years (moratorium on entry to the *Illex* fishery would expire after two years unless extended in a future amendment), 3) allow the moratorium on entry to the *Illex* fishery to expire in 2003 (no action), and 4) extend the moratorium on entry to the *Illex* fishery without sunset provision.

(ii) A complete description of EFH for Atlantic mackerel, squid and butterfish HAPC, and EFH for other species can be found in Amendment 8 to the FMP. As described in section 6.1, the alternatives adopted by the Council, separately or cumulatively, are not expected to adversely impact EFH. Alternatives 1 and 2 are not expected to result in an overall increase in fishing effort. In addition, *Illex* moratorium options 1 and 2 are expected to have a greater probability of achieving the annual quota, relative to allowing the moratorium to expire. This is conclusion was based on a flood of new entry in to the fishery if it were to revert to open access under option 3 and if resource and market conditions return to those observed in 1998.

(iii) The Council concludes that the actions proposed in this amendment under alternatives 1 and 2 are not expected to adversely impact EFH of Atlantic mackerel, squid and butterfish, or any other species. The Council has determined that this FMP framework action under alternatives 1 or 2, minimizes to the extent practicable any potential adverse effects of fishing on EFH, as required by Section 303(a)(7) of the MSFCMA.

(iv) Since no adverse impacts of EFH are identified, mitigation is not applicable.

7.3 REGULATORY IMPACT REVIEW

7.3.1 Introduction

The NMFS requires the preparation of a Regulatory Impact Review (RIR) for all regulatory actions that either implement a new FMP or significantly amend an existing plan. This RIR is part of the process of preparing and reviewing FMPs and provides a comprehensive review of the changes in net economic benefits to society associated with proposed regulatory actions. This analysis also provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problems. The purpose of this analysis is to ensure that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way. This RIR addresses many items in the regulatory philosophy and principles of EO 12866.

Also included is a Regulatory Flexibility Analysis (RFA) to evaluate the economic impacts of the alternatives on small business entities. Since many of the requirements of these mandates duplicate those required under the MSFCMA and NEPA, this section contains references to other appropriate sections of this document. The effects of actions were analyzed by employing quantitative approaches to the extent possible. Where quantitative data were not available, qualitative analyses were conducted. The MAFMC invites public comment on this RIR/RFA, and the qualitative and quantitative aspects of it in particular.

7.3.2 Evaluation of EO 12866 Significance

7.3.2.1 Description of the Management Objectives

A complete description of the purpose and need and objectives of this proposed rule is found under section 3.0 of the EIS. This action is taken under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and regulations at 50 CFR part 648.

7.3.2.2 Description of the Fishery

A description of the *Illex* squid fishery is presented section 5.0 of the EIS. A description of ports and communities is found in Appendix 1. An analysis of permit data is found in section 5.0 of the EIS.

7.3.2.3 A Statement of the Problem

A statement of the problems for resolution is presented under section 2.2 of the EIS.

7.3.2.4 A Description of Each Alternative

A full description of the alternatives analyzed in this section is presented in section 3.0 of the EIS. A brief description of each alternative is presented below for reference purposes.

7.3.2.5 RIR Impacts

None of the alternatives evaluated in this document will result in a significant regulatory action under EO 12866 for the following reasons. First, it will not have an annual effect on the economy of more than $100 million. The measures considered in this document will not affect total revenues, landings, or consumer surplus to the extent that a $100 million annual economic impact will occur. Based on NMFS Dealer landings data, the total Atlantic mackerel, *Loligo* squid, *Illex* squid, and butterfish commercial value (Maine through North Carolina) was estimated at $6.1, $22.9, $1.4, and $0.9 million in 2002, respectively.

As indicated in section 6.1 of the EIS, Amendment 5 established a moratorium on new entry into the commercial fishery for *Illex* squid. The Council placed a five year sunset provision on the moratorium which is set to expire in July 2004. The *Illex* fishery moratorium measures considered for analysis are intended to address the expiration of the moratorium sunset provision. However, the proposed *Illex* moratorium measures will not change the total amount of *Illex* fishermen are allowed to land.

The proposed actions are necessary to maintain the integrity of the management system for *Illex* squid. The action benefits in a material way the economy, productivity, competition and jobs. The action will not adversely affect, in the long-term, competition, jobs, the environment, public health or safety, or state, local, or tribal government communities. Second, the action will not create a serious inconsistency or otherwise interfere with an action taken or planned by another agency. No other agency has indicated that it plans an action that will affect *Illex* squid fishery in the EEZ. Third, the actions will not materially alter the budgetary impact of entitlement, grants, user fees, or loan programs or the rights and obligations of their participants. Finally, the actions do not raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in EO 12866.

The economic benefits of the Atlantic Mackerel, Squid, and Butterfish FMP have been evaluated periodically as amendments to the FMP have been implemented. Economic analyses presented have been largely qualitative in nature but quantitative analysis have been presented when data permitted. These analyses have been conducted at the time a major amendment and/or interim actions (framework adjustments or quota specifications) are developed. Landings of *Illex* squid and always been below the total harvest levels established for each species (except for 1998). At this time, the plan objectives appear to be met so there is a reasonable expectation that the original conservation and economic objectives of the plan are being met.

For each scenario potential impacts on several areas of interest are discussed. The objective of this analysis is to describe clearly and concisely the economic effects of the various alternatives. The types of effects that should be considered include the following: changes in landings, prices, consumer and producer benefits, harvesting costs, enforcement costs, and distributional effects. A qualitative approach to the economic assessment was adopted. Nevertheless, quantitative measures are provided whenever possible.

A more detailed description of the economic concepts involved can be found in "Guidelines for Economic Analysis of Fishery Management Actions" (NMFS 2000), as only a brief summary of key concepts will be presented here.

Benefit-cost analysis is conducted to evaluate the net social benefit arising from changes in consumer and producer surpluses that are expected to occur upon implementation of a regulatory action. Total Consumer Surplus (CS) is the difference between the amounts consumers are willing to pay for products or services and the amounts they actually pay. Thus CS represents net benefits to consumers. When the information necessary to plot the supply and demand curves for a particular commodity is available, consumer surplus is represented by the area that is below the demand curve and above the market clearing price where the two curves intersect.

Net benefit to producers is producer surplus (PS). Total PS is the difference between the amounts producers actually receive for providing goods and services and the economic cost producers bear to do so. Graphically, it is the area above the supply curve and below the market clearing price where supply and demand intersect. Economic costs are measured by the opportunity cost of all resources including the raw materials, physical and human capital used in the process of supplying these goods and services to consumers.

One of the more visible costs to society of fisheries regulation is that of enforcement. From a budgetary perspective, the cost of enforcement is equivalent to the total public expenditure devoted to enforcement. However, the economic cost of enforcement is measured by the opportunity cost of devoting resources to enforcement vis à vis some other public or private use and/or by the opportunity cost of diverting enforcement resources from one fishery to another.

Methodology

When necessary and/or possible, the alternatives will be evaluated against a base line. The base line condition provides the standard against which alternative actions are compared. This comparison will allow for the evaluation of the potential fishing opportunities associated with each alternative versus the fishing opportunities that were in place during the base line period. It was assumed that the price for these species was determine by the market clearance price or the interaction of the supply and demand curves unless otherwise noted.

7.3.3 Alternatives Evaluated

Prior to the 1980's, the fishery for *Illex* in the U.S. EEZ was prosecuted primarily by the foreign distant water fleets. With the implementation of the Atlantic Mackerel, Squid, and Butterfish FMP and it's subsequent Amendments, the fishery has become fully Americanized. At the same time that the domestic fishery was undergoing development, new biological data became available which indicated that *Illex* is an annual species. This resulted in downwardly revised estimates of the potential yield from this fishery. The simultaneous growth of the domestic fishery and reduction in estimates of sustainable yields resulted in the fishery moving towards a fully capitalized and exploited state. Hence a limited entry program became necessary and was implemented in Amendment 5. However, due to concerns that capacity might be insufficient to fully exploit the annual quota, a five year sunset provision was placed on the *Illex* moratorium when it was implemented as part of Amendment 5. The sunset provision for the moratorium entry into the *Illex* fishery, implemented in 1997, was set to expire in July 2002. Framework Adjustment 2 extended the moratorium for an additional year (i.e., until July 2003).

7.3.3.1 Extend the moratorium on entry to the *Illex* fishery for an additional five years (Alternative 1) or for an additional two years (Alternative 2)

These measures would extend the *Illex* moratorium for an additional five and two years, respectively.

Landings - The extension of the moratorium on entry to the *Illex* fishery for five or two years will not affect the overall *Illex* landings.

Prices - Given that this allocation would not affect the amount of *Illex* landings, then it is assumed that it will not change the price of *Illex*.

Consumer Surplus - Assuming *Illex* prices will not be affected under the scenario constructed above, there will be no corresponding change in CS associated with this fishery.

Harvest Costs - Since is it not anticipated that the type and number of gear employed or methods to harvest *Illex* will change as a consequence of either of these alternatives, then it would be expected that the harvest cost would remain relatively constant.

Producer Surplus - Assuming *Illex* prices will not be affected under the scenario constructed above, there will be no corresponding change in PS associated with these alternatives.

Enforcement Costs - Under this management alternative enforcement costs are expected to be similar to those under the current system.

Distributive Effects - No distributive effects are identified under this alternative.

7.3.3.2 No action: allow the moratorium on entry to the *Illex* fishery to expire in 2003 (Alternative 3)

Under this action, the *Illex* moratorium would expire in July of 2004 and the fishery would revert to open access conditions.

Landings - The elimination of the moratorium on entry to the *Illex* fishery will not affect the overall *Illex* landings. The *Illex* fishery is managed through annual specifications and management measures which are designed to assure that the target harvest level is not exceeded.

Prices - Given that this measure would not affect the amount of *Illex* landings, then it is assumed that it will not change the price of *Illex*.

Consumer Surplus - Assuming *Illex* prices will not be affected under the scenario constructed above, there will be no corresponding change in CS associated with this fishery.

Harvest Costs - Since is it not anticipated that the type and number of gear employed or methods to harvest *Illex* will change as a consequence of this alternative, then it would be expected that the harvest cost would remain relatively constant.

Producer Surplus - Assuming *Illex* prices will not be affected under the scenario constructed above, there will be no corresponding change in PS associated with this fishery.

Enforcement Costs - Properly defined, enforcement costs are not equivalent to the budgetary expense of dockside or at-sea inspection of vessels. Rather, enforcement costs from an economic perspective, are measured by opportunity cost in terms of foregone enforcement services that must be diverted to enforcing *Illex* regulations. The no action alternative would allow the current system to revert to an open access condition and could potentially introduce new enforcement burdens.

Distributive Effects - In 2001, 31 vessels landed *Illex*. However, there were 73 vessels permitted to participate in the directed *Illex* fishery that year. These vessels are capable of harvesting the total allowable harvest level. The *Illex* fishery is capital intensive and vessels that are not currently fitted to harvest and freeze large quantities of squid would be required to incur substantial capital investment requirements in order to participate in this fishery at profitable levels under open access conditions. Typically, the bulk of the *Illex* landings (greater than 99%) comes from vessels holding *Illex* moratorium permits, and only a very small fraction is attributed to vessels holding incidental catch permits.

Existing freezer trawlers operating in other fisheries (e.g., groundfish) may have the necessary equipment to participate in the *Illex* fishery under open access conditions. However, due to the fact that the are currently enough vessels participating or permitted to land the total harvest level, it is not anticipated that the economic incentive will be present to attract other vessels to take part in this fishery given recent resource abundance and total harvest levels. No distributive effects are likely to occur under this alternative. However, if a substantial number of the freezer trawlers operating in other fisheries enter the *Illex* fishery under open access conditions, some distributional effects may occur.

7.3.3.3 Extend the moratorium on entry to the *Illex* fishery without sunset provision (Alternative 4)

This measure would extend the moratorium on entry to the *Illex* fishery without a sunset provision (moratorium on entry to the *Illex* fishery would not expire unless terminated in a future Amendment).

Landings - The extension of the moratorium on entry to the *Illex* fishery without sunset provision will not affect the overall *Illex* landings.

Prices - Given that this allocation would not affect the amount of *Illex* landings, then it is assumed that it will not change the price of *Illex*.

Consumer Surplus - Assuming *Illex* prices will not be affected under the scenario constructed above, there will be no corresponding change in CS associated with this fishery.

Harvest Costs - Since is it not anticipated that the type and number of gear employed or methods to harvest *Illex* will change as a consequence of this alternative, then it would be expected that the harvest cost would remain relatively constant.

Producer Surplus - Assuming *Illex* prices will not be affected under the scenario constructed above, there will be no corresponding change in PS associated with this fishery.

Enforcement Costs - Under this management alternative enforcement costs are expected to be similar to those under the current system.

Distributive Effects - No distributive effects are identified under this alternative.

7.3.4 Summary of Impacts

None of these alternatives considered under this action will affect the quantity of *Illex* landed in the commercial fishery. Thus prices, consumer surplus and producer surplus are not expected to change because none of these measures affect the manner in which the *Illex* quota is derived or landings. Under Alternatives 1,2 and 4 enforcement costs are expected to be similar to those under the current system and no distributive effects are identified under these alternatives. Even though Alternative 3 (No action: allow the moratorium on entry to the *Illex* fishery to expire in 2004) is not expected to cause distributive effects based on recent conditions in the fishery, there is a possibility that these may occur if a substantial number of vessels enter the *Illex* fishery under open access conditions. It is also possible that Alternative 3 may introduce new enforcement burdens.

7.3.5 Review of Impacts Relative to the Regulatory Flexibility Analysis

7.3.5.1 Introduction and methods

The RFA requires the federal rulemaker to examine the impacts of proposed and existing rules on small businesses, small organizations, and small governmental jurisdictions. In reviewing the potential impacts of proposed regulations, the agency must either certify that the rule "will not, if promulgated, have a significant economic impact on a substantial number of small entities." The Small Business Administration (SBA) defines a small business in the commercial fishing and recreational fishing activity, as a firm with receipts (gross revenues) of up to $3.0 and $5.0 million, respectively. The proposed measures for Atlantic mackerel, *Illex* squid, *Loligo* squid, and butterfish could affect any vessel holding an active federal permit for these species as well as vessels that fish for some of these species in state waters. Data from the Northeast permit application database shows that 2,242 commercial vessels were holding Atlantic mackerel permits, 384 vessels were holding *Loligo*/butterfish moratorium permits, 72 vessels possessed *Illex* permits, and 1,828 vessels held incidental catch permits in 2002. All permitted vessels readily fall within the definition of small business.

Since all permit holders may not actually land any of the four species, the more immediate impact of the proposed action may be felt by the commercial vessels that are actively participating in these fisheries. An active participant was defined as being any vessel that reported having landed one or more pounds of any one of the four species in the Northeast dealer data during calendar year 2002. The dealer data covers activity by unique vessels that hold a Federal permit of any kind and provides summary data for vessels that fish exclusively in state waters. This means that an active vessel may be a vessel that holds a valid Federal Atlantic mackerel, squid, or butterfish permit, a vessel that holds a valid Federal permit but no Atlantic mackerel, squid, or butterfish permit; a vessel that holds a Federal permit other than Atlantic mackerel, squid, or butterfish permit and fishes for those species exclusively in state waters; or may be a vessel that holds no Federal permit of any kind. Of the four possibilities the number of vessels in the latter two categories cannot be estimated because the dealer data provides only summary information for state waters vessels and because the vessels in the last category do not have to report landings.

In the present RFA the primary unit of observation for purposes of performing the economic analysis is vessels that landed any *Illex* squid during calendar year 2002 irrespective of their permit status. Not all landings and revenues reported through the Federal dealer data can be attributed to a specific vessel. Vessels with no Federal permits are not subject to any Federal reporting requirements with which to corroborate the dealer reports. Similarly, dealers that buy exclusively from state waters only vessels and have no Federal permits, are also not subject to Federal reporting requirements. Thus, it is possible that some vessel activity cannot be tracked with the landings and revenue data that are available. Thus, these vessels cannot be included in the threshold analysis, unless each state were to report individual vessel activity through some additional reporting system - which currently does not exist. This problem has two consequences for performing threshold analyses. First, the stated number of entities subject to the regulation is a lower bound estimate, since vessels that operate strictly within state waters and sell exclusively to non-Federally permitted dealers cannot be counted. Second, the portion of activity by these uncounted vessels may cause the estimated economic impacts to be over- or underestimated.

The effects of actions were analyzed by employing quantitative approaches to the extent possible. In the current analysis, effects on profitability associated with the proposed management measures should be evaluated by looking at the impact the proposed measures on individual vessel costs and revenues. However, in the absence of cost data for individual vessels engaged in these fisheries, changes in gross revenues are used a proxy for profitability.

In addition, analyses were conducted to assess disproportionality issues. Specifically, disproportionality was assessed by evaluating if a regulation places a substantial number of small entities at a significant competitive disadvantage. Disproportionality is judged to occur when a proportionate affect on profits, costs, or net revenue is expected to occur for a substantial number of small entities. As noted above, gross revenue used as a proxy for profits due lack of cost date for individual vessels. In the current analysis none of the evaluated alternatives were judged to have possible disproportionate effects.

A description of important ports and communities to the Atlantic mackerel, *Loligo* and *Illex* squid and butterfish fisheries is presented in Appendix 1. Counties are typically selected as the unit of observation because a variety of secondary economic and demographic statistical data were available from several different sources.

7.3.5.2 Description of the alternatives

A detailed description of the alternatives evaluated in this document is presented in section 3.0 of the EIS. In addition, an overall discussion of the impacts associated with the evaluated alternatives is presented in section 6.0 of the EIS. A brief description of the alternatives is presented below.

7.3.5.3 Analysis of the impacts of the alternatives

7.3.5.3.1 Extend the moratorium on entry to the *Illex* fishery for an additional five years (Alternative 1) or for an additional two years (Alternative 2)

These measures would extend the *Illex* moratorium for an additional five and two years, respectively. These alternatives will allow for the moratorium on entry to the *Illex* fishery to continue until year 2009 and 2006, respectively. At those times, the moratorium on entry to the *Illex* fishery would will have to be reevaluated. Under these alternatives the fishery will continue to operate under a limited access system, averting potential problems that could develop if a substantial number of new participants were to enter the fishery under an open access system. These alternatives are not expected to affect the current structure of the vessels allowed to participate in this fishery. Therefore, this alternative is not expected to affect revenues or profits of the vessels that currently participate in the fishery.

7.3.5.3.2 No action (Alternative 3: allow the moratorium on entry to the *Illex* fishery to expire in 2004)

Under this action, the *Illex* moratorium would expire in July of 2004 and the fishery would revert to open access conditions. However, the elimination of the moratorium of entry to the *Illex* fishery will not affect the manner in which the total harvest level for this species is established. The *Illex* fishery is managed through annual specifications and management measures which are designed to assure that the target harvest level is not exceeded. Thus, overall *Illex* landings will not be affected.

In 2002, there were 72 vessels permitted to participate in the directed *Illex* fishery, however, only 50% of those vessels (36 vessels) landed any *Illex* in 2002. The *Illex* vessels currently permitted to participate in the fishery have the capability to harvest the total harvest level. In fact, in 1998, permitted vessels were able to land the total harvest level and the fishery was closed early that year. That year, more than 99% of the total *Illex* landings were made by 37 vessels or about 50% of the vessels holding *Illex* moratorium permits. The remaining 1% of the *Illex* landings were made by 71 vessels holding incidental catch permits.

Participation in the *Illex* fishery is capital intensive and vessels that are not currently fitted to harvest and freeze large quantities of squid would be required to incur substantial capital investment requirements in order to participate in this fishery at profitable levels under open access conditions. It is not possible to estimate how many additional new vessels (not currently active or permitted vessels) would venture to enter the *Illex* fishery under an open access condition. Nevertheless, taking into consideration that there are currently enough vessels participating or permitted to land the entire total harvest level, it is not expected that a significant number of vessels will invest the required capital to participate in this fishery under open access conditions if any.

However, existing large trawlers that operate in other fisheries (e.g., groundfish) may have the ability to enter the *Illex* fishery under open access conditions. It is not possible to estimate how many of these vessels will likely attempt to participate in the *Illex* fishery under open access conditions. However, if a substantial number of trawlers operating in other fisheries (e.g., groundfish) enter the *Illex* fishery under open access conditions, the revenues or profitability of the vessels currently participating in this fishery may decrease depending of factors such as: number of new participant vessels that may attempt to enter the fishery, vessel size and horse power, freezing capabilities, and crew experience.

Finally, it is important to not that while the overall *Illex* landings will not be affected under this alternative, the open access condition may introduce changes in the way the fishery currently operates. More specifically, it is possible that the open access condition may affect the current revenue structures of participants and/or create derby-style fishing practices which could potentially lead to an early closure. This situation may create market gluts and price instability in the fishery.

7.3.5.3.3 Extend the moratorium on entry to the *Illex* fishery without sunset provision (Alternative 4)

This measure would extend the moratorium on entry to the *Illex* fishery without a sunset provision (moratorium on entry to the *Illex* fishery would not expire unless terminated in a future Amendment). This alternative will allow for the moratorium on entry to the *Illex* fishery to continue indefinitely unless terminated and/or revised in a future Amendment. Therefore, the fishery will continue to operate under a limited access system adverting potential problems that could develop if a substantial number of new participants were to enter the fishery under an open access system.

This alternative is not expected to affect the current structure of the vessels allowed to participate in this fishery. Therefore, this alternative is not expected to affect revenues or profits of the vessels that currently participate in the fishery.

7.3.6 Summary of Impacts

None of these alternatives propose in this framework action would directly affect the quantity of *Illex* landed in the commercial fishery since the fishery is regulated via a hard quota system established in Amendments 5 na gd 8. Alternatives 1, 2 and 4 would allow the fishery to continue to operate under a limited access system averting potential problems that could develop if a substantial number of new participants were to enter the fishery under an open access system. Alternative 3 would eliminate the moratorium on entry to the *Illex* fishery. It is not possible to estimate how many additional vessels will enter the *Illex* fishery under an open access system. However, if a significant number of additional vessels enter the fishery as a consequence of Alternative 3, it is possible that the open access condition may affect the current revenue structures of participants and/or create derby-style fishing practices which could potentially lead to an early closure. This situation may create market gluts and price instability in the fishery.

7.3.7 Other Impacts

7.3.7.1 Social and Community Impacts

A description of the port and communities associated with these fisheries is presented in Appendix 1. Additional description of the social impacts associated with the alternatives analyzed in this document is presented in section 6.0 of the EIS.

7.4 OTHER APPLICABLE LAWS

7.4.1 RELATION OF RECOMMENDED MEASURES TO EXISTING APPLICABLE LAWS AND POLICIES

7.4.1.1 FMPs

This FMP is related to other plans to the extent that all fisheries of the northwest Atlantic are part of the same general geophysical, biological, social, and economic setting. U.S. fishermen usually are active in more than a single fishery. Thus regulations implemented to govern harvesting of one species or a group of related species may impact on other fisheries by causing transfers of fishing effort.

7.4.1.2 Treaties or International Agreements

No treaties or international agreements, other than GIFAs entered into pursuant to the MSFCMA, relate to this fishery.

7.4.1.3 Federal Law and Policies

7.4.1.3.1 Impacts on Protected Species Under the Endangered Species Act and Marine Mammal Protection Act

The numerous species which inhabit the management unit of this FMP that are afforded protection under the Endangered Species Act (ESA) of 1973 (i.e., for those designated as threatened or endangered) and/or the Marine Mammal Protection Act of 1972 (MMPA) are described in Section 6.0.

7.4.1.3.2 Executive Order 12898: Environmental Justice in Minority and Low-Income Populations and Indian Tribes

This Executive Order provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. " EO 12898 directs each Federal agency to analyze the environmental effects, including human health, economic, and social effects of Federal actions, including effects on minority populations, low-income populations, and Indian tribes, when such analysis is required by NEPA. Agencies are further directed to "identify potential effects and mitigation measures in consultation with affected communities, and improve the accessibility of meetings, crucial documents, and notices."

The proposed action under the preferred alternative maintains the status quo in terms of participation in the *Illex* fishery for an additional five years. Since the proposed action represents no change relative to the current level of participation in this fishery, no negative biological, economic or social effects are anticipated as a result (see section 6.0). Therefore, the proposed action under this framework is not expected to cause disproportionately high and adverse human health, environmental or economic effects on minority populations, low-income populations, or Indian tribes.

7.4.2 National Marine Sanctuaries

In addition to the issue of general habitat degradation, several habitats within the FMP's management unit are protected under the National Marine Sanctuaries Act of 1973. National marine sanctuaries are allowed to be established under the National Marine Sanctuaries Act of 1973. Currently, there are 11 designated marine sanctuaries that create a system that protects over 14,000 square miles (National Maine Sanctuary Program 1993).

There are two designated national marine sanctuaries in the area covered by the FMP: the Monitor National Marine Sanctuary off North Carolina, and the Stellwagen Bank National Marine Sanctuary off Massachusetts. There are currently five additional proposed sanctuaries, but only one, the Norfolk Canyon, is on the east coast. The Monitor National Marine Sanctuary was designated on January 30, 1975, under Title III of the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA). Implementing regulations (15 CFR 924) prohibit deploying any equipment in the Sanctuary, fishing activities which involve "anchoring in any manner, stopping, remaining, or drifting without power at any time" (924.3(a)), and trawling (924.3(h)). The Sanctuary is clearly designated on all National Ocean Service (NOS) charts by the caption "protected area." This minimizes the potential for damage to the Sanctuary by fishing operations. Correspondence for this sanctuary should be addressed to: Monitor, NMS, NOAA Building 1519, Fort Eustis, VA 23604.

NOAA/NOS issued a proposed rule on February 8, 1991 (56 FR 5282) proposing designation under MPRSA of the Stellwagen Bank National Marine Sanctuary, in Federal waters between Cape Cod and Cape Ann, Massachusetts. On November 4, 1992, the Sanctuary was Congressionally designated. Implementing regulations (15 CFR 940) became effective March 1994. Commercial fishing is not specifically regulated by the Stellwagen Bank regulations. The regulations do however call for consultation between Federal agencies and the Secretary of Commerce on proposed agency actions in the vicinity of the Sanctuary that "may affect" sanctuary resources. Correspondence for this sanctuary should be addressed to: Stellwagen Bank NMS, 14 Union Street, Plymouth, MA 02360.

Details on sanctuary regulations may be obtained from the Chief, Sanctuaries and Resources Division (SSMC4) Office of Ocean and Coastal Resource Management, NOAA, 1305 East-West Highway, Silver Spring, MD 20910.

7.4.3 Indian Treaty Fishing Rights

No Indian treaty fishing rights are known to exist in the fishery.

7.4.4 Oil, Gas, Mineral, and Deep Water Port Development

While Outer Continental Shelf (OCS) development plans may involve areas overlapping those contemplated for offshore fishery management, no major conflicts have been identified to date. The Councils, through involvement in the Intergovernmental Planning Program of the MMS, monitor OCS activities and have opportunity to comment and to advise MMS of the Councils' activities. Certainly, the potential for conflict exists if communication between interests is not maintained or appreciation of each other's efforts is lacking. Potential conflicts include, from a fishery management position: (1) exclusion areas, (2) adverse impacts to sensitive biologically important areas, (3) oil contamination, (4) substrate hazards to conventional fishing gear, and (5) competition for crews and harbor space. The Councils are unaware of pending deep water port plans which would directly impact offshore fishery management goals in the areas under consideration, and are unaware of potential effects of offshore FMPs upon future development of deep water port facilities.

7.4.5 Paper Work Reduction Act of 1995

The Paperwork Reduction Act (PRA) concerns the collection of information. The intent of the PRA is to minimize the federal paperwork burden for individuals, small business, state and local governments, and other persons as well as to maximize the usefulness of information collected by the federal government.

None of the evaluated alternatives will affect the existing reporting requirements previously approved under OMB Control Nos. 0648-0202 (Vessel permits), 0648-0212 (Vessel logbooks), and 0648-0229 (Dealer reporting).

The Council is not proposing measures under this regulatory action that require review under PRA. There are no changes to existing reporting requirements previously approved under OMB Control Nos. 0648-0202 (Vessel permits), 0648-0229 (Dealer reporting) and 0648-0212 (Vessel logbooks).

As stated above, this action does not implement new reporting or record keeping measures. There are no changes to existing reporting requirements. Currently, all Atlantic mackerel, squid and butterfish Federally-permitted dealers must submit weekly reports of fish purchases. The owner or operator of any vessel issued a vessel permit for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish must maintain on board the vessel, and submit, an accurate daily fishing log report for all fishing trips, regardless of species fished for or taken.

7.4.6 Impacts of the Plan Relative to Federalism

The amendment does not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under Executive Order 12612.

8.0 COASTAL ZONE MANAGEMENT ACT

The Council determined that this action is consistent to the maximum extent practicable with the enforceable provisions of the approved coastal management programs of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida. This determination was submitted for review by the responsible state agencies on September 15, 2003 under section 307 of the Coastal Zone Management Act. Concurrence in consistency was submitted by the responsible state agencies of New Hampshire, Connecticut, New Jersey, Pennsylvania, Delaware, Virginia, and Georgia. Because no response was received from Maine, Massachusetts, Rhode Island, New York, Maryland, North Carolina, South Carolina, and Florida, state concurrence in consistency is inferred.

9.0 COUNCIL REVIEW AND MONITORING OF THE FMP

The Council reviews the measures contained in this FMP on annually through the annual quota specification process.

10.0 LIST OF PREPARERS

This framework action document was prepared by the following members of the MAFMC staff - Dr. Christopher M. Moore, Richard J. Seagraves, Jose Montanez, James L. Armstrong, Dr. Thomas B. Hoff, and Kathy Collins. Dr. Bonnie McCay was the principal investigator for a team at Rutgers which provided the port and community descriptions presented in Appendix 1. Dr. James Kirkley of the Virginia Institute of Marine Science conducted the economic analyses presented in section 6.0.

11.0 AGENCIES AND ORGANIZATIONS CONSULTED DURING PREPARATION OF THE DEIS

In preparing this amendment, the Council consulted with the NMFS, the New England Fishery Management Council, the South Atlantic Fishery Management Council, the Fish and Wildlife Service, the Department of State, and the States of New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina through their membership on the Council and the following committees - MAFMC Atlantic Mackerel, Squid and Butterfish Committee, MAFMC Statistical and Science Committee, Mid-Atlantic EFH Technical Committee, Northeast Region Steering Committee, MAFMC Habitat Committee, and MAFMC Habitat Advisory Panel. In addition to the states that are members of this Council, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, South Carolina, Georgia and Florida were consulted through the Coastal Zone Management (CZM) Program consistency process. Of the States consulted, New Hampshire, Pennsylvania, Connecticut, Georgia, Delaware, New Jersey, and Virginia concurred with the Council determination that Framework 4 was consistent with their CZM Program. The remaining states within the management unit that were consulted did not respond.

12.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM THE DEIS WAS SENT

The DEIS was sent to the by the Council to NOAA Fisheries (NMFS), the New England Fishery Management Council, the South Atlantic Fishery Management Council, the US Fish and Wildlife Service, and is made available to the states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia and Florida. In addition, the DEIS will be sent to any individual that requests a copy.

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14.0 Tables and Figures

Table 1. *Illex* squid landings (mt) by state in 2002.

State	Landings (mt)	Pct of Total
RI	2,388	87.7%
NJ	222	8.2%
VA	94	3.5%
NC	17	0.6%
MA	2	0.1%
ME	0	0.0%
NH	0	0.0%
NY	0	0.0%
MD	0	0.0%
Total	2,723	100.0%

Source: Unpublished NMFS dealer reports.

Table 2. *Illex* squid landings (mt) by month in 2002.

Month	Landings (mt)	Pct of Total
1	3	0.1%
2	0	0.0%
3	5	0.2%
4	1	0.0%
5	10	0.4%
6	583	21.4%
7	222	8.2%
8	835	30.7%
9	553	20.3%
10	320	11.8%
11	153	5.6%
12	37	1.4%
Total	2,723	100.0%

Source: Unpublished NMFS dealer reports.

Table 3. *Illex* squid landings (mt) by gear category in 2002.

Gear Category	Landings (mt)	Pct of Total
TRAWL, OTTER, BOTTOM	2,722.84	99.9997%
GILL NET	0.01	0.0003%
Total	2,722.85	100.0%

Source: Unpublished NMFS dealer reports.

Table 4. *Illex* squid landings (mt) by port in 2002.

Port	Landings (mt)	Pct of Total
NORTH KINGSTOWN, RI	1,936	71.1%
POINT JUDITH, RI	451	16.6%
CAPE MAY, NJ	129	4.8%
ELIZABETH, NJ	93	3.4%
HAMPTON, VA	90	3.3%
Other	25	0.9%
Total	2,723	100.0%

Source: Unpublished NMFS dealer reports.

Table 5. Value of *Illex* squid landings by port compared to total value of all species landed by port in 2002 where *Illex* comprised >1% of total value and *Illex* value for the port is >$25,000.

Port	Vessels	Value All Species	Value Illex Only	Pct Value
NORTH KINGSTOWN, RI	2	6,411,123	1,033,980	16.1%
ELIZABETH, NJ	1	1,086,028	42,741	3.9%
POINT JUDITH, RI	9	30,892,670	219,680	0.7%
CAPE MAY, NJ	4	26,772,375	60,865	0.2%
HAMPTON, VA	2	16,421,022	29,667	0.2%

Source: Unpublished NMFS dealer reports.

Table 6. *Illex* squid moratorium vessel permit holders in 2002 by home port state.

Home Port State	No. Vessels	Pct of Total
NJ	15	20.8%
MA	15	20.8%
RI	11	15.3%
NY	8	11.1%
NC	9	12.5%
VA	5	6.9%
PA	5	6.9%
FL	1	1.4%
ME	1	1.4%
UN	1	1.4%
Total	72	100.0%

Source: Unpublished NMFS permit data.

Table 7. Atlantic mackerel, squid and butterfish dealer permit holders in 2002 by state.

State	Dealers	Pct of Total
MA	99	27.3%
NY	70	19.3%
NJ	39	10.8%
RI	39	10.8%
NC	31	8.6%
ME	28	7.7%
VA	23	6.4%
NH	7	1.9%
CT	5	1.4%
FL	4	1.1%
DE	3	0.8%
MD	3	0.8%
PA	3	0.8%
LA	2	0.6%
PR	2	0.6%
AL	1	0.3%
CA	1	0.3%
TX	1	0.3%
VI	1	0.3%
Total	362	100.0%

Source: Unpublished NMFS permit data.

Table 8. Federally permitted dealers who bought *Illex* squid in 2002 by state.

State	Dealers	Pct of Total
RI	5	26.3%
MA	3	15.8%
NC	3	15.8%
NJ	2	10.5%
VA	2	10.5%
MD	1	5.3%
ME	1	5.3%
NH	1	5.3%
NY	1	5.3%
Total	19	100.0%

Source: Unpublished NMFS dealer reports and permit data.

Table 9. Total landings (mt), value ($), vessels and trips for Atlantic mackerel, *Loligo, Illex*, squids and butterfish in 2002.

Species	Landings	Value	Vessels	Trips
MACKEREL, ATLANTIC	26,192	6,129,187	408	3,096
SQUID (LOLIGO)	16,280	22,997,923	426	13,844
SQUID (ILLEX)	2,723	1,404,501	36	94
BUTTERFISH	841	968,514	453	10,294

Source: Unpublished NMFS dealer reports.

Table 10. Total landings of Atlantic mackerel, Loligo, Illex and butterfish during 2002 by permit category.

	Permit Categories					
	Loligo / Butterfish Moratorium		Squid / Butterfish Incidental Catch		Atlantic Mackerel	
Species	Landings (mt)	Number of Vessels	Landings (mt)	Number of Vessels	Landings (mt)	Number of Vessels
MACKEREL, ATLANTIC	15,780	162	8,972	210	25,933	312
SQUID (LOLIGO)	15,717	267	3,687	206	14,163	305
SQUID (ILLEX)	2,721	26	2	13	2,721	24
BUTTERFISH	701	225	219	215	654	310
Total	31,497	429	12,659	416	40,097	617

Source: Unpublished NMFS dealer reports and permit data.

Table 11. Northeast fishery permits held by *Illex* moratorium permit holders in 2002.

Plan	Cat	Description	Total	Percent
SMB	5	ILLEX SQUID - MORATORIUM	72	100.0%
DOG	1	SPINY DOGFISH	71	98.6%
SCP	1	SCUP-COMMERCIAL MORATORIUM	69	95.8%
SMB	1	LOLIGO/BUTTERFSH-MORATORIUM	69	95.8%
BLU	1	BLUEFISH - COMMERCIAL	68	94.4%
BSB	1	BLACK SEA BASS MORATORIUM	68	94.4%
FLS	1	SUMMER FLOUNDER-COMMERCIAL	67	93.1%
SMB	4	ATLANTIC MACKEREL	65	90.3%
LO	1	AMERICAN LOBSTER - NON-TRAP	57	79.2%
TLF	D	TILEFISH - INCIDENTAL	50	69.4%
SCG	1	SEA SCALLOP - GENERAL	48	66.7%
SF	1	SURF CLAM	40	55.6%
OQ	6	OCEAN QUAHOG	39	54.2%
HER	2	ATLANTIC HERRING - NON-VMS	38	52.8%
MUL	B	NE MULTS - FLEET DAS	35	48.6%
RCB	A	RED CRAB - INCIDENTAL BYCATCH	28	38.9%
MNK	C	MONKFISH - CATEGORY C	27	37.5%
MNK	E	MONKFISH - INCIDENTAL CAT E	25	34.7%
HER	1	ATLANTIC HERRING - VMS	19	26.4%
MNK	D	MONKFISH - CATEGORY D	18	25.0%
LO	A23	AMER LOBSTER-TRAP-AREA2/3	16	22.2%
LO	A3	AMERICAN LOBSTER-TRAP-AREA3	15	20.8%
MUL	K	NE MULTS - OPEN ACCESS	14	19.4%
MUL	J	NE MULTS-SEA SCAL POS LIM	13	18.1%
SC	2	SCALLOP-LIM AC-FULL TIME	10	13.9%
LO	A2	AMERICAN LOBSTER-TRAP-AREA2	7	9.7%
MUL	A	NE MULTS - INDIVIDUAL DAS	7	9.7%
SC	3	SCALLOP-LIM AC-PART TIME	7	9.7%
LO	A4	AMERICAN LOBSTER-TRAP-AREA4	6	8.3%
LO	A5	AMERICAN LOBSTER-TRAP-AREA5	4	5.6%
BLU	2	BLUEFISH - CHARTER/PARTY	3	4.2%
LO	A6	AMERICAN LOBSTER-TRAP-AREA6	3	4.2%
MUL	E	NE MULTS - COMBINATION	3	4.2%
SMB	3	SQUID/BUTTERFSH-INCIDENTAL	3	4.2%
MNK	A	MONKFISH - CATEGORY A	2	2.8%
SC	8	SCALLOP-LIM AC PART/NET	2	2.8%
TLF	C	TILEFISH - PART TIME	2	2.8%
BSB	2	BLACK SEA BASS CHART/PARTY	1	1.4%
FLS	2	SUMMER FLOUNDER-CHART/PARTY	1	1.4%
LO	A1	AMERICAN LOBSTER-TRAP-AREA1	1	1.4%
LO	A5W	LOBSTER AREA5 TRAP WAIVER	1	1.4%
LO	AOC	AMER LOB-TRAP-OUTER CAPE	1	1.4%
MUL	G	NE MULTS-LG MESH FLEET DAS	1	1.4%
MUL	H	NE MULTS - HAND GEAR	1	1.4%
SC	5	SCALLOP-LIM AC-FULL/SML DRG	1	1.4%
SC	9	SCALLOP-LIM AC OCC/NET	1	1.4%
SCP	2	SCUP - CHARTER/PARTY	1	1.4%
SMB	2	SQUID/MACK/BUTT-CHART/PARTY	1	1.4%

Source: NMFS NERO Permit data.

Table 12. Landings (lbs) by species (1998 - 2002) for set of vessels that possessed an *Illex* moratorium permit in 2002. Table limited to species comprising 0.1% or greater of the total landings for the time series.

	1998		1999		2000		2001		2002		Grand Total	
SPECIES	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent	Pounds	Percent
HERRING, ATLANTIC	32,882,744	20.4%	12,912,431	11.5%	16,596,438	17.0%	37,534,791	26.7%	41,710,062	32.0%	141,636,466	22.1%
MACKEREL, ATLANTIC	22,440,414	13.9%	23,716,515	21.2%	11,201,276	11.4%	24,509,822	17.4%	28,819,378	22.1%	110,687,405	17.2%
SQUID (ILLEX)	46,024,508	28.5%	14,993,777	13.4%	18,126,096	18.5%	8,643,268	6.1%	5,991,240	4.6%	93,778,889	14.6%
MENHADEN	20,978,558	13.0%	17,993,592	16.1%	13,553,475	13.8%	23,415,775	16.6%	13,988,154	10.7%	89,929,554	14.0%
SQUID (LOLIGO)	16,933,290	10.5%	17,993,473	16.1%	13,857,515	14.2%	15,179,247	10.8%	15,046,207	11.5%	79,009,732	12.3%
CROAKER, ATLANTIC	2,751,099	1.7%	5,885,345	5.3%	5,330,063	5.4%	4,590,679	3.3%	5,345,708	4.1%	23,902,894	3.7%
HAKE, SILVER	5,480,086	3.4%	3,873,602	3.5%	3,249,312	3.3%	5,538,068	3.9%	3,540,523	2.7%	21,681,591	3.4%
BUTTERFISH	1,843,225	1.1%	2,496,751	2.2%	1,086,456	1.1%	6,945,841	4.9%	592,519	0.5%	12,964,792	2.0%
SCALLOP, SEA	516,321	0.3%	1,131,466	1.0%	1,915,356	2.0%	2,693,084	1.9%	2,904,155	2.2%	9,160,382	1.4%
FLOUNDER, YELLOWTAIL	714,564	0.4%	818,696	0.7%	2,162,711	2.2%	1,772,814	1.3%	1,704,715	1.3%	7,173,500	1.1%
FLOUNDER, SUMMER	1,194,278	0.7%	1,237,954	1.1%	1,559,042	1.6%	1,263,854	0.9%	1,466,381	1.1%	6,721,509	1.0%
COD	1,301,785	0.8%	1,062,298	0.9%	990,148	1.0%	1,210,392	0.9%	1,336,496	1.0%	5,901,119	0.9%
FLOUNDER, WINTER	836,979	0.5%	714,846	0.6%	1,007,770	1.0%	1,217,142	0.9%	1,023,801	0.8%	4,800,538	0.7%
SCUP	1,440,140	0.9%	775,260	0.7%	473,240	0.5%	746,163	0.5%	932,768	0.7%	4,367,571	0.7%
HADDOCK	257,845	0.2%	475,304	0.4%	858,755	0.9%	894,023	0.6%	1,635,556	1.3%	4,121,483	0.6%
ANGLER	819,670	0.5%	865,697	0.8%	817,291	0.8%	692,224	0.5%	492,016	0.4%	3,686,898	0.6%
WEAKFISH, SQUETEAGUE	1,128,276	0.7%	799,465	0.7%	559,754	0.6%	481,279	0.3%	656,539	0.5%	3,625,313	0.6%
HAKE, RED	459,832	0.3%	566,830	0.5%	453,003	0.5%	521,516	0.4%	329,009	0.3%	2,330,190	0.4%
SKATES	256,883	0.2%	286,941	0.3%	698,286	0.7%	530,640	0.4%	409,470	0.3%	2,182,220	0.3%
SEA BASS, BLACK	263,663	0.2%	274,351	0.2%	309,209	0.3%	481,407	0.3%	474,498	0.4%	1,803,128	0.3%
DOGFISH SPINY	252,775	0.2%	543,817	0.5%	961,642	1.0%	12,342	0.0%	8,125	0.0%	1,778,701	0.3%
POLLOCK	457,819	0.3%	401,232	0.4%	362,202	0.4%	212,277	0.2%	254,384	0.2%	1,687,914	0.3%
BLUEFISH	458,122	0.3%	318,457	0.3%	254,047	0.3%	294,909	0.2%	275,701	0.2%	1,601,236	0.2%
FLOUNDER, AM. PLAICE	206,657	0.1%	212,665	0.2%	241,954	0.2%	207,014	0.1%	211,061	0.2%	1,079,351	0.2%
HERRING (NK)	434,200	0.3%	399,132	0.4%	53,861	0.1%	158,060	0.1%	2,227	0.0%	1,047,480	0.2%
FLOUNDER, WITCH	159,033	0.1%	131,340	0.1%	200,972	0.2%	184,648	0.1%	264,349	0.2%	940,342	0.1%
SHRIMP (PENAEID)	20,914	0.0%	172,646	0.2%	273,383	0.3%	83,329	0.1%	191,958	0.1%	742,230	0.1%
HAKE, WHITE	156,302	0.1%	133,054	0.1%	168,890	0.2%	194,946	0.1%	76,782	0.1%	729,974	0.1%

Source NMFS Dealer Weighout data 1998-2002.

Table 13. Landed value ($) by species (1998 - 2002) for set of vessels that possessed an *Illex* moratorium permit in 2002. Table limited to species comprising 0.1% or greater of the total value for the time series.

	1998		1999		2000		2001		2002		Grand Total	
SPECIES	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent	Value	Percent
SQUID (LOLIGO)	14,306,565	29.0%	14,586,557	32.1%	9,325,634	22.1%	10,010,519	22.7%	10,393,097	23.0%	58,622,372	25.9%
SCALLOP, SEA	3,048,951	6.2%	5,831,686	12.8%	9,068,293	21.5%	9,609,478	21.8%	10,592,320	23.4%	38,150,728	16.9%
SQUID (ILLEX)	8,479,519	17.2%	3,470,482	7.6%	3,665,808	8.7%	1,841,976	4.2%	1,397,576	3.1%	18,855,361	8.3%
MACKEREL, ATLANTIC	3,699,036	7.5%	2,873,788	6.3%	1,514,262	3.6%	1,741,523	4.0%	3,435,778	7.6%	13,264,387	5.9%
HAKE, SILVER	2,307,745	4.7%	1,865,503	4.1%	1,336,399	3.2%	2,911,573	6.6%	1,842,025	4.1%	10,263,245	4.5%
HERRING, ATLANTIC	2,089,397	4.2%	661,328	1.5%	1,175,812	2.8%	2,650,154	6.0%	3,035,478	6.7%	9,612,169	4.2%
FLOUNDER, SUMMER	1,812,270	3.7%	1,938,823	4.3%	2,210,220	5.2%	1,671,017	3.8%	1,797,587	4.0%	9,429,917	4.2%
FLOUNDER, YELLOWTAIL	855,433	1.7%	955,044	2.1%	2,138,485	5.1%	1,711,962	3.9%	1,931,185	4.3%	7,592,109	3.4%
COD	1,499,346	3.0%	1,328,768	2.9%	1,267,806	3.0%	1,281,442	2.9%	1,556,984	3.4%	6,934,346	3.1%
ANGLER	1,227,661	2.5%	1,632,465	3.6%	1,888,802	4.5%	1,268,304	2.9%	673,286	1.5%	6,690,518	3.0%
MENHADEN	1,761,900	3.6%	1,336,235	2.9%	700,412	1.7%	1,286,390	2.9%	838,599	1.9%	5,923,536	2.6%
HADDOCK	389,252	0.8%	737,166	1.6%	1,287,343	3.0%	1,201,352	2.7%	2,168,934	4.8%	5,784,047	2.6%
FLOUNDER, WINTER	1,111,401	2.2%	946,404	2.1%	1,055,718	2.5%	1,098,246	2.5%	1,091,280	2.4%	5,303,049	2.3%
BUTTERFISH	1,128,777	2.3%	1,440,458	3.2%	389,238	0.9%	2,006,333	4.6%	243,333	0.5%	5,208,139	2.3%
SCUP	1,733,562	3.5%	932,881	2.1%	506,620	1.2%	509,184	1.2%	536,631	1.2%	4,218,878	1.9%
CROAKER, ATLANTIC	439,236	0.9%	950,004	2.1%	835,361	2.0%	623,433	1.4%	802,956	1.8%	3,650,990	1.6%
SEA BASS, BLACK	413,330	0.8%	449,319	1.0%	635,271	1.5%	550,454	1.2%	692,322	1.5%	2,740,696	1.2%
SHRIMP (PENAEID)	93,697	0.2%	642,504	1.4%	930,818	2.2%	343,236	0.8%	408,369	0.9%	2,418,624	1.1%
POLLOCK	341,842	0.7%	374,499	0.8%	322,076	0.8%	160,971	0.4%	214,291	0.5%	1,413,679	0.6%
TUNA, BLUEFIN	670,873	1.4%	723,916	1.6%		0.0%		0.0%		0.0%	1,394,789	0.6%
LOBSTER	358,354	0.7%	184,296	0.4%	279,552	0.7%	306,684	0.7%	159,103	0.4%	1,287,989	0.6%
FLOUNDER, AM. PLAICE	258,952	0.5%	246,062	0.5%	269,250	0.6%	206,224	0.5%	235,966	0.5%	1,216,454	0.5%
FLOUNDER, WITCH	210,501	0.4%	156,856	0.3%	222,039	0.5%	187,291	0.4%	317,471	0.7%	1,094,158	0.5%
WEAKFISH, SQUETEAGUE	268,756	0.5%	293,898	0.6%	171,368	0.4%	157,824	0.4%	175,654	0.4%	1,067,500	0.5%
HAKE, RED	130,863	0.3%	171,857	0.4%	112,454	0.3%	133,651	0.3%	117,830	0.3%	666,655	0.3%
SKATES	95,034	0.2%	100,304	0.2%	187,873	0.4%	100,791	0.2%	107,637	0.2%	591,639	0.3%
HAKE, WHITE	150,273	0.3%	113,128	0.2%	128,145	0.3%	104,509	0.2%	54,785	0.1%	550,840	0.2%
BLUEFISH	125,377	0.3%	115,336	0.3%	114,728	0.3%	81,174	0.2%	87,284	0.2%	523,899	0.2%
DOGFISH SPINY	32,128	0.1%	88,112	0.2%	188,706	0.4%	2,969	0.0%	2,604	0.0%	314,519	0.1%
BASS, STRIPED	27,833	0.1%	6,819	0.0%	63,329	0.1%	49,675	0.1%	26,319	0.1%	173,975	0.1%
SWORDFISH	36,634	0.1%	40,085	0.1%	43,643	0.1%	11,921	0.0%	18,433	0.0%	150,716	0.1%
TILEFISH	90,486	0.2%	26,139	0.1%	7,995	0.0%	20,103	0.0%	2,255	0.0%	146,978	0.1%

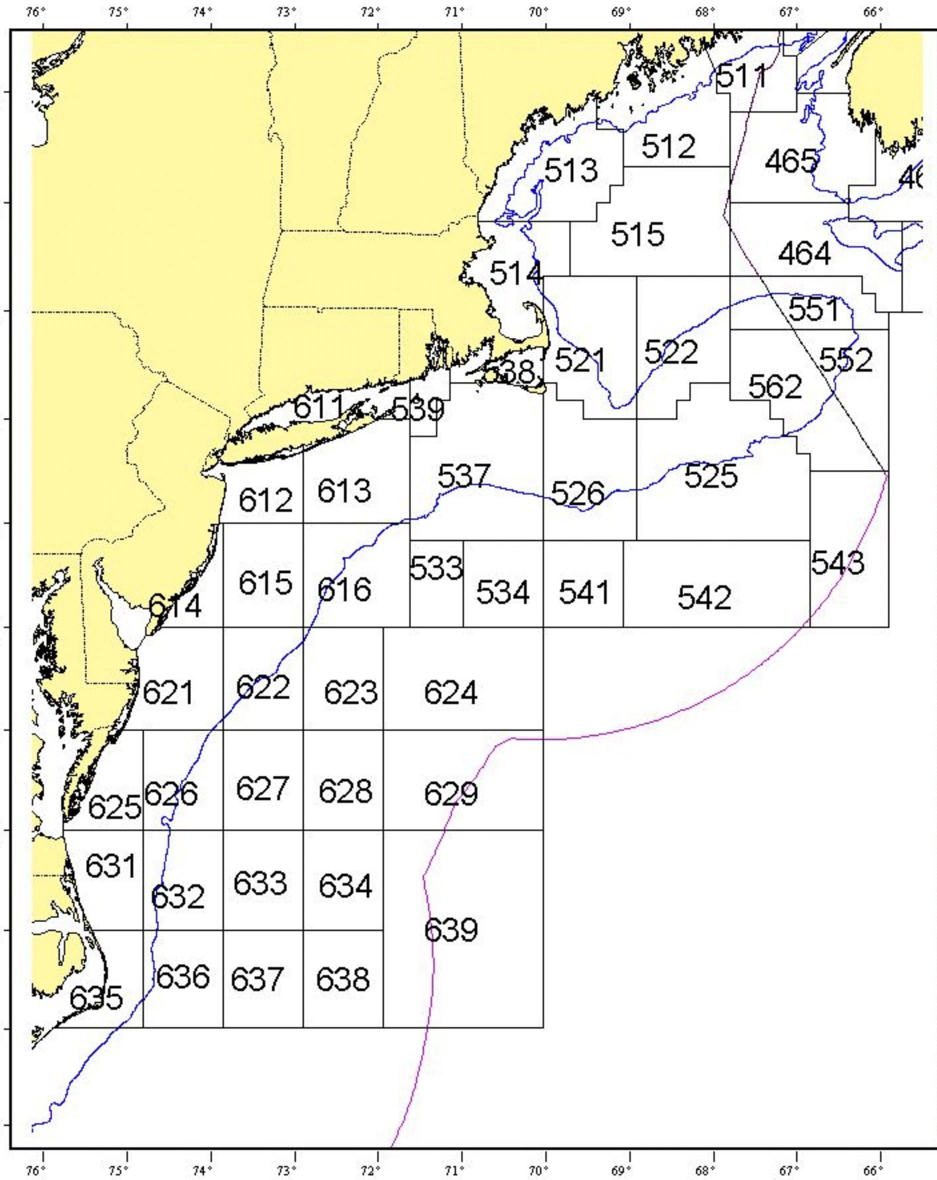
Source: NMFS Dealer Weighout data 1998 - 2002.

Table 14. NMFS statistical areas from which >1% of *Illex* squid landings were taken in 2002.

Statistical Area	Landings (mt)	Pct of Total
632	1,102	45.2%
626	790	32.4%
622	334	13.7%
616	77	3.2%
612	40	1.7%
623	40	1.6%
537	39	1.6%
Other	14	0.6%
Total	2,436	100.0%

Source: Vessel trip report data.

FIGURE1. NMFS NORTHEAST STATISTICAL AREAS.



APPENDIX 1

PORT AND COMMUNITY PROFILES

Appendix 1

Port and Community Profiles for the Atlantic Mackerel, Squid and Butterfish Fisheries

The following port and community profiles were excerpted from a report prepared for the Mid-Atlantic Council and submitted by Bonnie J. McCay on behalf of The Fisheries Project, Rutgers University, with the assistance of Kevin St. Martin, Brent Stoffle, Bryan Oles, Eleanor Bochenek, Teresa Johnson, Johnelle Lamarque, Giovani Graziosi, Barbara Jones, Judie Hope, and Kate Albert. The correct citation for this report is given under McCay *et al.* 2002 in the references listed above.

" According to the Sustainable Fisheries Act of 1996, "[t]he term "fishing community" means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community." Guidelines to the SFA indicate that by community is meant a recognized place, such as a village, town, or city. For the purposes of this social impact assessment, community is defined as a fishing port or a place where fish (and squid) are processed, although it is recognized that people involved in the fisheries may live and work elsewhere and that there are important social networks and cultural identities that transcend municipal boundaries.

Communities from Rhode Island to North Carolina are involved in the harvesting and processing of Loligo and Illex squid, Atlantic mackerel, and butterfish. The communities chosen for the profiles that follow are those with the greatest participation and dependency on the four species in the year 2000 (see Table 1).

Table 1: Major Fishing Ports, Squid, Atlantic Mackerel, and Butterfish (SMB) Fisheries, as Ranked by Total Value of Fish Landings, Value of SMB Landings, and Percent SMB Landings to Total Landings, 2000

PORT	**STATE**	**COUNTY**	**Rank:Total Value**	**Rank: SMB Value**	**Rank SMB/Total %**
New Bedford	MA	Bristol	1	9	12
Point Judith	RI	Washington	2	1	8
No. Kingstown	RI	Washington	7	2	2
Newport	RI	Newport	8	6	9
Stonington	CT	New London	9	11	10
Montauk	NY	Suffolk	5	5	6
Hampton Bays/ Shinnecock	NY	Suffolk	6	4	4
Greenport	NY	Suffolk	11	12	5
Freeport	NY	Nassau	10	7	3
Elizabeth	NJ	Union	12	10	1
Point Pleasant	NJ	Ocean	4	8	11
Cape May	NJ	Cape May	3	3	2

Source: National Marine Fisheries Service Weighout Data, 2000.

Profiles are provided for the ports listed in Table 1 as well as for Shinnecock, NY, Brooklyn, NY, Newark, NJ, Hampton, VA, and Wanchese, NC , which are included in the study because of their engagement in one or more of the SMB fisheries. Numerous other ports are involved in the squid, mackerel, and butterfish fisheries but at a lower level of participation and/or dependence; information on most of the major fishing communities of New England and the Mid-Atlantic regions can be found in "New England's Fishing Communities" (Hall-Arber et al. 2002) and "Fishing Ports of the Mid-Atlantic" (McCay and Cieri, 2000), both of which have contributed to these profiles, supplemented by more recent research.

The following profiles are organized from north to south, from Massachusetts to North Carolina; in most cases the county in which a port or other community is found is also briefly described, as an indicator of the larger socio-economic system.

Bristol County and New Bedford, Massachusetts

Bristol County, MA

According to the 2000 Census, Bristol County had a population of 534,678 (Table MA-RI). This was a 5.6% increase from 1990. Ninety-one percent of the county population was white and of the total population 24.6% were under 18 years of age and 14.1% were 65 years of age or over. In 1999, Bristol had a per capita income of $27,461. Based on a 1997 model based estimate, 11.9% were living below the poverty level. In 2000, the unemployment rate was 3.9% and seasonally the rate ranged from a high of7.2% to a low of 3.9%. In 1990, of those 16 years of age or older, 1.5% of the total number employed were engaged in the agriculture, forestry, and fisheries industry.

New Bedford, MA

New Bedford's census profile is that of a struggling, impoverished industrial city. According to the 2000 Census, New Bedford had a population of 93,768, a 6.2% decrease from 1990 (Table MA-RI). Seventeen percent of the population was minority, primarily Hispanic, and the median age was only 35.9 years. In 1990, New Bedford had a per capita income of $10,923 and of the total population 16.8% were classified as living below the poverty level. In 1990, the unemployment rate was 12.2%.

Of those 16 years of age or older, only 1.3% of the total number employed were engaged in the agriculture, forestry, and fisheries industry in 1990, suggesting that the fisheries are marginal to the community. However, more extensive research shows that between 5 and 8 percent of the people in the New Bedford metropolitan statistical area receive their livelihoods primarily from fishing. Even a conservative estimate, assuming two other individuals are supported by each fisherman and fishing-related worker employed, places the proportion of the population dependent on fishing between 11 and 18% (Hall-Arber et al. 2002).

Fisheries Infrastructure

New Bedford is a major deep-water port with a long history of commercial fishing (Hall-Arber et al. 2002). Fishing and allied industries still contribute one-fifth of the city's income. New Bedford remains one of the three premier fishing ports in New England and it is consistently numbered among the top U.S. ports for the value of its commercial fishery landings, number 1 in the year 2000. Its highly differentiated fishing infrastructure was developed early in its history and has continued to grow (Hall-Arber et al. 2002).

Of all major groundfishing ports in the eastern U.S., New Bedford and environs, including neighboring Fairhaven, has the most developed infrastructure for fishing, together with Portland, Maine and Chatham, MA (Hall-Arber et al. 2002). It has the most total capital invested in the fishing industry and the largest fleet of any port. According to one report (Hall-Arber et al. 2002), in the late 1990s there were a total of 1,131 crew manning 265 vessels. Of these, 82 are scallopers, typically with 7 member crews, and 183 were draggers with average crew size of four. In 2000 there were also 9 large ocean quahog vessels. There are also smaller lobstering and gill-net boats.

Estimates of the numbers of fishermen vary. Crew sizes on scallop and groundfish vessels have diminished in the past few years, partly due to regulations (e.g., scallop boats are restricted to 7 crewmembers). Consultants in a 1999 harbor planning process identified 2,600 jobs and $609 million in sales directly attributable to the core seafood industry. Another 500 jobs were indirectly related, as was about $44 million in sales (Hall-Arber et al. 2002.).

In addition to boat owners, captains, and crew, the full New Bedford/ Fairhaven fleet (neighboring Fairhaven is the home of many of the vessels) generates business for around 75 seafood processors and wholesale fish dealers and 200 other shoreside industries. Together, these businesses provide employment for around 6,000 to 8,000 additional workers (Hall-Arber et al. 2002).

Squid, Atlantic Mackerel, and Butterfish

New Bedford ranks 9th in terms of the value of squid, Atlantic mackerel, and butterfish landings, and 12th in terms of the proportion of total landings from these species (Table 1). They are part of a large suite of species caught by the draggers of New Bedford. The fishing grounds used are generally northeast of the areas considered as Essential Fish Habitat in this amendment to the FMP, with the consequence that there are few if any direct impacts of potential closures of EFH areas in the Mid-Atlantic, although this may change as groundfish regulations are stricter and more stringently applied. This port was not visited for the SIA but discussions with people in the industry indicate that there is currently little or no processing of these species in New Bedford; most facilities are just packing them. The 2000 weighout data indicate that 64 boats landed Loligo squid, 15% of the total boats landing in New Bedford that year.

Rhode Island's Fishing Ports and Communities

The following Rhode Island ports were determined to have a significant dependence on the species included in the FMP based on the value of the four species as a percent of the total value of all landings in the 2000 weigh-out data: North Kingstown, Point Judith, and Newport (Table 1). Newport and Point Judith, each having sizeable numbers of seagoing vessels, are located in the lower part of Narragansett Bay, as is North Kingstown, where there is an area called Quonset Point that hosts seafood processing and freezer trawlers.

Census data for 1990 and 2000 as well as other data are presented in Table MA-RI for the census units and counties. Newport is in Newport County, which has a total population of 85,433, in 2000, a 2% decline from 1990; Newport itself numbered 26,475 in 2000, a 6.2% decline. Newport has a sizeable minority population, primarily Black/African American (7.8%) and Hispanic (5.5%), a low median age (34.9 years) and high percentage of people living in poverty, based on a 1997 model (12.5%).

North Kingstown and Point Judith are in Washington County, population 123,546 in 2000, a 12.3% increase from 1990. North Kingstown's population was 26,326 in 2000, a 10.7% increase, and Point Judith's population (Narragansett census tract) was 16,361 in 2000, a 9.2% increase. These places have relatively small minority populations (Table MA-RI).

Newport and Point Judith were studied extensively by Hall-Arber et al. (2002). Newport is far less dependent on fishing than Point Judith is, based on fishing infrastructure and alternative activities. Point Judith ranked fifth and Newport 13th out of 36 New England ports in terms of fishing infrastructure differentiation (Hall-Arber et al. 2002: 39-40). However, they also ranked near the top of a scale of gentrification, Point Judith ranking 7 and Newport 5 out of 36 (Hall-Arber et al. 2002: 44). Rhode Island fishing communities are among the most "gentrified" in New England, many with long histories of tourism focusing on water sports, sailing, and summer "cottages." One consequence is that dockage (and other waterfront amenities) has become a problem in Newport and Point Judith due to competition for waterfront land and space, including areas for parking and gear. In Newport, commercial fishing activities have moved away from the tourist center, but they continue to be pressured to move farther away, competing with a highly active tourist trade and recreational boating sector (Hall-Arber et al. 2002: 45).

Point Judith remains one of the top fishing ports in the U.S. on the basis of quantity and value of landings. It is the most fisheries-dependent of Rhode Island's communities, with about 500 households directly involved in and another 400 indirectly dependent on the commercial fisheries (Hall-Arber et al. 2002: 80). Point Judith "fulfills the definition of a fishing community on the basis of central place theory. Fish are legally sold ex-vessel to a dealer, processor o r the public; fishing support services are provided; there are public facilities providing dockage; fishing people satisfy their daily and weekly social and/or economic needs here, and some fishermen and their representatives participate in fisheries resource management" (Hall-Arber et al. 2002: 78). In addition, "Despite changes," as one respondent put it, "there is still a distinct community of fishermen here." Fishermen comprise a social and occupational network: "People know each other." The small town atmosphere is punctuated by functions such as the Fishermen's Scholarship Fund's annual game feast where $6,000 was recently raised for the sons and daughters of fishermen" (Hall-Arber et al. 2002: 78).

The Blessing of the Fleet has become largely an activity of the recreational fishing community. There is little ethnic diversity in the fishing population, and many are relatively newcomers to fishing. Fishermen tend to live in small local communities of southern Rhode Island, within a 20-mile radius of the port; there is little residential housing near the port. The majority of the fish processing workers are ethnic minorities, often bussed in from the city of Providence, RI. There are numerous fisheries organizations in Point Judith (some serving the entire state) and fishing-related programs and services (Hall-Arber 2002: 83-84).

Newport, RI, has a long history of tourism and recreational boating, which started in the 1700s, but also a long and persistent engagement in commercial fishing historically based on floating fish traps but today divided between lobstering and a fleet of draggers and scallopers. Approximately 200 families are involved in the fisheries of Newport. The groundfish fleet has dramatically declined over the last 20 years, spurred by increasing property values that have restricted access to waterfront and other property, and the fisheries are minor compared with other economic and social activities (Hall-Arber 2002: 93-100). However, Newport remains a sizeable port. In 2000 90 boats landed fish and shellfish at Newport, according to the weighout data. There is no processing of squid, mackerel, or butterfish in Newport. The cultural importance of fishing to the community is evidenced in the museum at the Fishermen's Church Institute. Recreational fishing is mostly rod and reel fishing from shore for stripers.

North Kingstown is a large township with nine villages, one of which is maintained as a historic district (Wickford) (www.northkingstown.org, www.northkingstown.com). There is a charter boat company and about six marine-related businesses including marine repair, a mooring service, and a marina. The commercial fisheries are mainly found in the Quonset Point area, which was the site of a U.S. Naval Air Station, now a state airport, and a large industrial park, the Quonset Davisville Port and Commerce Park, the contested focus of plans for economic development including a container port (see www.sierraclubri.org/quonset).

Squid, Atlantic Mackerel, and Butterfish

Squid and butterfish have long been primary targets of fishermen from this area, together with whiting and scup--the diversified "small mesh" fishery of the Mid-Atlantic--and with the decline of groundfish in the northeast, these species have become even more important. According to the 2000 weigh-out data, 90 boats landed *Loligo* in Point Judith, or about 40% of all the boats that landed fish in Point Judith that year. Forty-two boats (47%) landed *Loligo* in Newport, and for North Kingstown, 7 boats landed *Loligo* in 2000, 20% of all the boats that year. Newport, North Kingstown and Pt. Judith land high volumes of *Illex*, *Loligo*, mackerel and butterfish, especially as groundfish landings in the area have declined. Loligo accounted for between 12 and 16% of the value of total landings in Point Judith, Newport and North Kingstown in 2000. Butterfish played a very small role in Point Judith and Newport, less than 2% of the total landings value, but in North Kingstown butterfish accounted for over 17% of the total value of landings.

Illex is important only in North Kingstown, where three vessels landed Illex in 2000; their catches accounted for 22% of the value of total landings in 2000. In North Kingstown a processor reported that 95% of his business is from *Loligo*, *Illex*, mackerel and butterfish and some percentage from Atlantic herring. This processor unpacks frozen fish and squid from the boats. Seven boats pack out at his facility; these boats have been unpacking at his facility for about 17 years. The dependency of North Kingston processing on these species has already been shown by the Gear Restricted Areas which went into effect in 2001. According to one processor, the GRAs reduced his business by 20-30%: "There are no other species to target if we can't catch these fish."

Most fish processing in Pt. Judith is done in a large industrial area, the location of six processing plants, including Town Dock, the former Point Judith Cooperative (now the Pt. Judith Fishermen's Company), South Pier Fish, and Sea Fresh Corporation (Hall-Arber et al. 2002: 79). In recent years the processors have shifted their focus away from groundfish (fluke, yellowtail flounder, cod, whiting, and other species) and toward squid, herring, and mackerel (Ibid). A processor from Pt. Judith interviewed in 2002 noted that their busy season is during the winter and slow season is in the summer with *Loligo* being his primary product for processing. He used to process a lot of butterfish, but because of the down turn in the Japanese market, there is less demand for butterfish. He derives 50% of his revenue from *Loligo*. He buys product from 20-22 boats. Most of the boats have landed at his dock for many years; only a few move around to other docks. Another Pt. Judith processor indicated that *Loligo* and butterfish are important to his business, but not *Illex* and mackerel. If he could obtain more volume of butterfish he could sell it. Thirteen boats land at his facility. He has bought product from the same boats for 20 years.

Connecticut's Fishing Ports and Communities

Connecticut's coast has been transformed by the expansion of metropolitan populations. "Most fishermen in Connecticut are embedded as fishing 'clusters' within their communities, and as such do not make up a significant economic component of local economies. The decline in the fishery is directly related to the loss of fishing community as a definite space and place dominated by a population sharing traditions of fishing. Nevertheless, fishing persists as enclaves,.... The historic loss of the core fishing population has proceeded simultaneously with an intense gentrification process that has converted fishing neighborhoods and dock space into expensive tourist weekend and summer homes surrounded by gentrified shops, restaurants, and marinas" (Hall-Arber et al. 2002: 52).

East Haven and Stonington, CT

East Haven numbered 28, 189 in 2000, a 7% increase from 1990 (Table CT). It is within New Haven County, and differs from it in having a much smaller minority population but also lower per capita incomes. The percent of those aged 16 and older employed in agriculture, forestry, and fisheries was only 0.3% in 1990. The importance of coastal tourism is indicated by the fact that of the vacant housing units, 30% have seasonal, recreational, or occasional uses.

Only Stonington persists as a port with an established and distinct dock space for fisheries, "the home port of Connecticut's last remaining commercial fishing fleet" (www.stonington.ct/harborplan.html). Stonington itself is a large township, made up of the Borough of Stonington and the villages of Mystic, Old Mystic, Pawcatuck, and Wequetequock. Stonington's population was 17,906 in 2000, a 6% increase from 1990. It has a very small minority population, and a relatively high median age, 41.7 years (Table CT). The per capita income was higher than that of New London County.

Tourism is the major emphasis for development of the Stoninigton area, building on the proven popularity of Old Mystic and the Mystic Aquarium (www.munic.state.ct.us/Stonington). The fishing community is an enclave within one borough, and its ties to the town and borough are not very strong. For example, no fishermen now live on the main street of Stonington, which consists of gift shops and fashionable year round and summer residences. However, the commercial fleet survives in part because of political support from the town, which has reserved the Town Dock for commercial operations (www.stonington.ct/harborplan.html). In other Connecticut ports, fishing boats must compete with recreational marinas and dockside tourist facilities as well as rising property values (Hall-Arber et al. 2002: 51). In Stonington there appears to be strong recognition of the economic and symbolic value of the commercial fisheries.

Stonington's fishing fleet is split between day boats and offshore draggers; the latter target scallops, squid, fluke, butterfish, shrimp, monkfish, and whiting (Hall-Arber et al. 2002: 56). Lobstering is important (although affected by the lobster disease problems of Long Island Sound), and conch has emerged as a niche fishery here as in other ports of the region. The commercial dock, the Town Dock, is maintained under a lease from the town and is reserved for fishing-related activities. Two packing houses handle fish and shellfish, and the Southern New England Fishermen and Lobstermen Association (SNEFLA) helps lower costs of ice, fuel, gear, and supplies (Hall-Arber et al. 2002: 57). Members of SNEFLA are from Connecticut, Rhode Island, and Massachusetts; it began in 1931 to help with common problems such as the hijacking of trucked shipments of fish to the urban markets (Hall-Arber et al. 2002: 58). Members are allotted tie-up space at the Stonington Pier and have attempted to join the fishermen's health care plan initiated by the Massachusetts Fishermen's Partnership. Stonington ranked fairly high in terms of fishing infrastructure differentiation (10 out of 36), which includes the presence oor absence of icehouses, boat insurance, dockside diesel fuel, local trucking, a fishermen's supply house, monuments, and so forth (Hall-Arber et al. 2002: 38-39). Surprisingly, it ranked fairly low in the gentrification ranking of New England ports, 20 out or 36 (Ibid: 44). Comparable information is not available for East Haven.

There are very few fishermen living in the central part of Stonington, the historic "village" or Borough, but the Portuguese Holy Ghost Society and the Feast of the Holy Ghost persist as a social nexus, through the church, even though few Portuguese speakers are now in the fisheries.. The Portuguese first came to Stonington industry from the Azores or Cape Verde Islands in the 1700s as participants in the sealing and whaling, and Portuguese ethnicity remains associated with Stonington (Hall-Arber et al. 2002). The SNEFLA hosts an annual Blessing of the Fleet after a requiem mass for fishermen who lost their lives at sea:

"St. Mary's Church is home to a tall pastel statue of St. Peter, the patron saint of fishermen. Every July the statue makes its way in a parade from St. Mary's Church down Water Street to the docks and up Main Street to the Holy Ghost Hall. The parade is a somewhat solemn occasion. It follows a requiem mass in honor of the fishermen who have lost their lives at sea. A pickup truck drags a decorated dory in back of it. The truck is followed by a car carrying several grieving widows of local fishermen. The wives are in mourning and are dressed in black, respectfully indicating their loss to the solemn-faced spectators who are watching the truck pass. The fishing draggers moored at the Stonington dock are loaded with visitors and passengers and then the procession of draggers heads out to the inner breakwater. The bishop rides on the first fishing boat along with the fisherman's widow. As the draggers pass the first fishing boat, the bishop blesses each boat with holy water and prayers are said requesting a safe and prosperous fishing season. The draggers then form a circle so all can view the honored widow as she throws the wreath overboard in honor of those fishermen who have lost their lives at sea." (Www.clemclay.com/thevillage.index.html).

Squid, Atlantic Mackerel, and Butterfish

The ports of East Haven and Stonington, CT, have small commercial fisheries that are engaged in fishing for the species of this FMP. For example, eleven out of the 17 boats in East Haven landed butterfish in 2000, and this species accounted for almost 5% of the total value in the port. Its landings of butterfish were roughly comparable in value to those of Point Pleasant, NJ, Freeport, NY, and Newport, RI. East Haven and Stonington also saw landings of *Illex* squid, at a low level but ranking 7th and 8th of the top 10. Stonington's catches of *Loligo* squid brought it into the top 10 for Loligo, comparable to the landings of Point Pleasant, NJ, in 2000.

New York's Fishing Ports and Communities

New York fishing ports, like those of Rhode Island and northern New Jersey, are on the boundary of the New England and the Mid-Atlantic ecological and institutional systems, and the diversity of species as well as fisheries agencies and laws involved is very high. In addition, the fisheries have a premium on adaptability, because of changes in the distribution and abundance of different species as well as market changes. Commercial fishing ports in New York State are concentrated on Long Island, which extends from Brooklyn, a borough of New York City, to the far eastern ports of Montauk (on the South Fork) and Greenport (on the North Fork). There are also small, but historically and culturally important, fisheries for migratory species on the Hudson River and other rivers (McCay and Cieri 2000).

New York's commercial fisheries are difficult to characterize in relation to NMFS weigh-out data and other information because they are quite widely dispersed. There are many well-known ports but large quantities of fish and shellfish are landed elsewhere. In addition, state waters (to 3 nautical miles) are extremely important. New York State's data on those fisheries do not include NMFS port codes. Consequently, the category "Other New York" in the NMFS weigh-out data is very large, accounting for 35% of the value and 23% of the pounds landed in 1998. Many of the fisheries of Long Island and Long Island Sound, particularly for lobsters, are represented in this category and not assigned to particular ports. The category also includes surf clamming and other fisheries that take place exclusively in state waters (McCay and Cieri 2000).

Of the four species included in the FMP, *Loligo* or long-finned squid figures most prominently in weigh-out data for the fishing ports on Long Island, followed by butterfish. *Loligo* accounted for 12% of the total value of commercial landings, as reported in weigh-out data for the year 2000.

Butterfish accounted for 1% of the total value. Atlantic mackerel and *Illex*, or short-finned squid, accounted for less than 1% of the total value of fish landed in New York in 2000.

The following ports were determined to have a significant dependence on the species included in the FMP based on the value of the four species as a percent of the total value of all landings in the 2000 weigh-out data: Brooklyn, Freeport, Greenport, Hampton Bays, and Montauk. The value of the four species in each of these ports was between 20% and 50% of the total catch value in each port. Visits were made to each of these ports and interviews were conducted with fishermen, dock personnel, processing plant managers, and community representatives. Additional information for the following port profiles is derived from "Fishing Ports of the Mid-Atlantic" (McCay and Cieri 2000).

Suffolk County, NY

Suffolk County is the eastern half of Long Island and encompasses major fishing ports that include Hampton Bays/Shinnecock, Montauk, and Greenport, as well as numerous smaller ports that were not included in this analysis. The fisheries of Suffolk County are highly diverse and also highly dispersed, such that much of what is landed is recorded as "other" rather than assigned to a specific port. Although Suffolk County is being rapidly developed, it produces the largest agricultural revenue of the counties in New York. Table (NY) presents 1990 and 2000 census data for the county and the county's ports that are included in this analysis.

Montauk, NY

Montauk, the largest fishing port in New York, is situated near the eastern tip of the South Fork of Long Island. A sign near the bay front marinas and docks welcomes visitors to Montauk: "The Fishing Capital of the World". The region's economy is heavily dependent on commercial and recreational fishing. Many of the local businesses provide services to the fishing industry. One informant estimated that there are approximately 300 fishing families in the area. According to the 1990 U.S. Census, there were approximately 290 residents who reported "fishing" as their occupation. Also of note is the 14.02% increase in the number of Hispanic residents since 1990 (Table NY). A large number of the dock workers in Montauk are Hispanic. Seasonal tourism is also extremely important to the local economy. The median house value in 1990 was $238,600, reflecting the high cost of housing in the vicinity. Informants working in the fishing industry who were interviewed for this study cite high housing costs as a challenge.

Fishing Infrastructure

The commercial fishing docks in Montauk are clustered at the northern end of the South Fork,in Montauk Harbor. Commercial dock space is limited in the area. Commercial fishing boats are docked in three primary locations, including a town dock next to the Coast Guard Station on the East side of the harbor, another town dock located near one of the packing businesses and the fish markets on the West side of the harbor, and a packing business located near the East side of the harbor's inlet. There are two primary businesses that pack commercial landings and a third that buys small quantities for both its retail market and for wholesale to restaurants. According to an informant at one of the docks, a packing business that used to operate recently moved out of the commercial packing business and now caters to recreational fishermen. In addition to the commercial docks in Montauk Harbor, there are a number of marinas dedicated to recreational fishing boats and pleasure craft. Numerous party and charter boats in Montauk Harbor cater to tourists and seasonal visitors.

Fishing Overview

According to NMFS weigh-out data for 1998, otter-trawls accounted for 80% of the pounds landed and 60% of the value in Montauk. *Loligo* squid (20% of the value) and silver hake (16% of the value) were the two most important finfish caught in 1998. Butterfish accounted for 2% of the value, and small amounts of *Illex* and Atlantic mackerel were also reported. Bottom longlining is traditionally important in Montauk. It accounted for 21% of the value in 1998, mainly derived from tilefish, swordfish and tunas. Montauk is the leading tilefish port in the U.S., but this fishery has declined greatly. In 1998 and 1999 some of the Montauk-based tilefish boats landed their catches in Rhode Island. Nonetheless, tilefish accounted for 21% of the value of landings in this port in 1998. There were 90 species landed at Montauk. The methods used to harvest fish and shellfish are diverse, including pound nets or fish weirs, box traps, haul seines, and spears, along with the more usual pots, lines, and trawl nets (McCay and Cieri 2000).

Squid, Atlantic Mackerel, and Butterfish

In 2000, 42 boats landed *Loligo* in Montauk, which was 21.6% of all the boats that landed catch in Montauk in that year. *Loligo* accounted for 18.9% of the value of total landings in Montauk in 2000. Thirty-eight boats, or 19.6% of all boats that packed in Montauk, landed butterfish in 2000.

Most of the fish and squid included in the plan are landed at one commercial packing facility in Montauk. Of the four species, *Loligo* has been the most significant for this facility. Six fishermen own this business, each of whom have been fishing for over 30 years. This packing facility is one of the only year-round labor employers in Montauk with the exception of a few resorts. During the winter when most other businesses are shut down, the dockworkers at this facility are putting in long hours to handle the large landings of *Loligo* and whiting. The business employs between six and 10 dockworkers, a secretary, and a manager. Ninety percent of the dockworkers are Hispanic. All of the employees live in Montauk or East Hampton.

According to the manager, 13 trawlers pack with the facility. In addition, 20 to 30 "pinhookers", or hand line boats, use the dock. The activity at the dock slows in the summer for the trawlers, but picks up for the small pinhookers. The business also relies on the charter boat businesses for buying fuel, bait, and ice. The majority of the business's revenue is generated through the packing and shipping of fish to dealers at Fulton Market, and processing plants in New Jersey and New York.

The commercial draggers that land *Loligo* and butterfish at this dock engage in a mixed-trawl fishery. In other words, the fishermen target a diversity of species that include *Loligo*, whiting, butterfish, mackerel, scup, flounder, and fluke, among others, depending on the boat size, season, and regulations. A number of the draggers that land here also engage in the groundfish fishery during the summer months. Diversification and adaptability are considered essential among those engaged in Montauk's mixed trawl fishing. One boat owner said that he maintains 17 permits on his vessel to allow him the option of moving into different fisheries as circumstances demand. *Loligo* are harvested all year long, but the winter months and early spring (December - April) are often the most productive times. *Loligo* are often harvested between 80 and 120 fathoms when they are offshore, but are also caught in shallow inshore water when they are spawning (Georgianna et al. 2001).

A number of the boat owners who pack *Loligo* at this dock explained the history of their involvement in the fishery. About fifteen years ago, management began to encourage fishermen who engaged in groundfish fishing to focus more of their fishing effort on the abundant stocks of underutilized, low value fish like *Loligo*, butterfish, mackerel, and whiting. Low interest government loans were provided for the purchase of the necessary boats and equipment.

Fishermen who took advantage of this opportunity were subsequently allotted fewer days at sea (DAS) in the multi-species groundfish plan of the New England Fishery Management Council. They now feel vulnerable to further cutbacks in DAS that have resulted from the May 2002 settlement of a lawsuit brought by environmental groups against the NMFS. The fishermen interviewed also expressed grave concern about the possibility that the new ruling will force fishermen from New England to move into their mixed-trawl fishery. They noted that current regulations are already having a negative impact on their operations. In 2000, the packing facility experienced a 66% decline in income between November and December due to the closure of area 6A, the Gear Restricted Area (GRA) designated to protect scup. The company had to let 2 employees go because of this decline, and the manager believes that it had an even greater impact on fishermen. Other regulations have limited the profitability of *Loligo* fishing including the 2500-pound trip limit that is triggered when 80% of the quota has been landed. One captain who had just returned from a trip that netted approximately 60,000 pounds of *Loligo* said that the 2500-pound trip limit does not allow him to even consider going out for *Loligo*. *Loligo* fishermen in Montauk feel especially frustrated by the fact that management decisions for an animal with a one-year lifespan are being based on 3-year-old data. Most expressed support for "real time management" of *Loligo*.

Fishing Community/Relations

Informants note that Montauk has a rich historical connection to commercial fishing that is very important to the village's identity. The manager of one of the commercial packing docks is also a member of the East Hampton Town Board's Fishing Committee. This committee represents the interests of those who are dependent on the fishing industry of the area for the development of the new Comprehensive Plan. The Fishing Committee recently reported to the board that commercial fishing contributes an estimated 34 million dollars ex-vessel to the town, 90% of which comes from Montauk. The East Hampton Comprehensive Plan, which is set to be ratified in the coming year, acknowledges that, "fishing is East Hampton's largest and most historically significant industry." The committee has submitted a number of recommendations for inclusion in the Comprehensive Plan that promote and encourage the development of businesses that are critical for the support of commercial fishing. In general, the municipal government has been supportive of the fishing industry. However, informants note that local ordinances and zoning laws make expansion of commercial fishing areas difficult (McCay and Cieri 2000).

Other fishermen interviewed for the study indicated that Montauk has few multigenerational fishing families. Most of the commercial fishermen in Montauk are first generation who moved into the area from other coastal towns on Long Island. One fisherman contrasted the single generation fishermen of Montauk with the multigenerational families of baymen in neighboring Amagansett. While there are few multigenerational fishing families in Montauk, there are many fishing families in Montauk. One informant in the industry estimated that there are at least 300 fishing families in the region. In addition, the fishermen and industry representatives who were interviewed expressed a very strong sense of solidarity and pride in their community. They also expressed an awareness of how dependent the local society and economy is on fishing. One fisherman cited a NOAA-funded study on the region reporting that the community of Montauk is highly dependent on commercial fishing. Another fisherman pointed out the businesses that rely on his fishing operation. He and his crew spend approximately $40,000 each year at the local supermarket for supplying the voyages, and at least $2000 per week on ice alone. In addition, there are a host of ancillary businesses across the state and across the country that depend on the fishing industry of Montauk.

Shinnecock/Hampton Bays, NY

Shinnecock/Hampton Bays is the second most important commercial port in New York in terms of the value of total landings. Hampton Bays is located at the western end of the South Fork on the Southern shore of Long Island. It is located just between East Quogue to the west and Southampton Village and Shinnecock Hills on the east. Its boundary extends to Great Peconic Bay on the north, and to the Atlantic Ocean on the south. The Shinnecock Inlet provides access to the Atlantic Ocean. The area surrounding the commercial fishing docks is considered to be "Shinnecock." The separate villages of the area consolidated under the name of Hampton Bays in 1922, in order to take advantage of the increasing tourism to the region (http://www.hamptonbaysonline.com/external/historical_history.cfm#intro). Hampton Bays is significantly dependent on its commercial fishing fleet. According to 1990 census data, 3.63% of the residents of Hampton Bays, and 5.59% of the residents in Shinnecock were employed in agriculture, forestry, and fisheries, relatively high percentages for the urban-industrial northeast/Mid-Atlantic region. The area is also dependent on seasonal tourism as evidenced by 2000 U.S. Census data (Table NY). In 2000, 29.06% of the housing units in Hampton Bays were vacant, and of these 84.28% were used for seasonal, recreational, or occasional use.

Fishing Infrastructure

The offshore commercial fishing fleet is concentrated on the bay side of an isolated barrier island, to the west of Shinnecock Inlet. According to a fisheries management official, Shinnecock Inlet has a tendency to silt over, which can completely curtail ocean fishing. The official said that when the inlet silts over now, Shinnecock/Hampton Bays plummets in importance as far as landings go, whereas it usually vies with Montauk as the most important port on Long Island. The Shinnecock informant said that the last time the inlet closed up the federal government dredged the inlet very quickly. Pressure from the commercial fishing industry expedited the process (McCay and Cieri 2000).

The commercial docks are located on an isolated stretch of road, far removed from residential neighborhoods and beachfront rental property. They are bounded on the east and west by county parklands. The nearest building is a public beach access facility located a few hundred yards to the west of the dock area.

There are one municipal dock, two privately owned facilities for packing catch that have limited docking space, and a fishing cooperative that operates as a packing facility and a dock. According to data gathered in 1999 by key informants, there are 24 slips at the Municipal Dock but only 18 are being used by vessels, the other 6 being in a state of disrepair. The fishermen lease their slips from the town. The dock was created as the result of lobbying by one of the fishermen about 12 years ago and was financed by federal, state and local money. Since that time, the town and the county have been fighting over who owns it and should administer it (McCay and Cieri 2000). The manager of one of the commercial packing facilities indicated that dock space is severely limited. He and other fishermen have made numerous attempts to convince the county of the need for expanding the municipal dock but have not been successful.

Next to the municipal dock is a fish packing facility that also has four slips for commercial boats. The business sells ice and fuel to fishermen. According to one informant, eleven boats pack with this company. Next to this business is a fishing cooperative that packs out between 13 and 15 boats. The coop buys fuel, ice and other supplies in bulk, which is necessary in order to keep members' costs down. Most of the fish that's brought into the coop is sold to Fulton Fish Market, though some of it goes to local buyers. The business on the other side of the coop packs commercial landings and also provides slips for recreational/pleasure boats. The owner of this operation also runs a restaurant on the premises. There is a large fillet operation with a retail market in Shinnecock/Hampton Bays. Shinnecock/Hampton Bays has also been a surf clamming port but demand for clams from New York State waters has been low (McCay and Cieri 2000). Many of the marine supplies for the commercial fleet come from a well-known business in nearby Riverhead, Long Island, which services other ports in the eastern end of Long Island as well.

Fishing Overview

Codes for both Shinnecock (or Shinnecock Hills) and Hampton Bays are used in the NMFS weigh-out data. These are combined in this analysis because both refer to the same fishing port.

Shinnecock/Hampton Bays is primarily a dragger fishing port. Otter trawl landings accounted for 84% of the poundage and 74% of the value in 1998. Silver hake (whiting) and *Loligo* squid made up over 70% of these landings. Loligo accounted for 23% of the landings by weight and 27% by value in 1998. Butterfish, Atlantic mackerel, and Illex squid were much less important. Draggers landed 66 other species, reflecting the diversity of the region’s fisheries. Gillnets were second in importance, accounting for 12% of the value of landings in 1998. They too had diverse landings, totaling 39 species, led by bluefish, monkfish, and skates. Bottom longlines were used for tilefish and pelagic longlines for swordfish and tunas. There is also a diverse assemblage of inshore techniques, including haul seines, pound-nets, pots (for crab, fish, eel, conch, and both inshore and offshore lobster), fyke-nets, and the shellfish techniques of shovels, rakes, and "by hand" (McCay and Cieri 2000).

Squid, Atlantic Mackerel, and Butterfish

Loligo and butterfish are important to the trawler fishing fleet that operates out of Shinnecock/Hampton Bays. There were approximately 30 draggers working out of Shinnecock/Hampton Bays in 1999: 10 in the 45' to 60' range; 16 in the 60' to 65' range; 4 boats between 80' and 90'; and, 4 boats over 90' in length (McCay and Cieri 2000). In 2000, 64 boats (many from other ports) landed *Loligo*, which was 66% of all the boats that landed catch in Shinnecock/Hampton Bays in that year. Forty-nine boats, or 50.5% of all boats that packed in

Shinnecock/Hampton Bays, landed butterfish in 2000. Mackerel, though less important in overall value, was landed by 35 boats, or 36% of the boats that landed catch in Shinnecock/Hampton Bays in 2000. *Illex* is infrequently landed at this port due to the highly perishable nature of *Illex* and the need to transport it in boats set up for RSW (refrigerated sea water). The commercial draggers that land *Loligo* and butterfish at the three packing facilities engage in a mixed-trawl fishery. Like the draggers in Montauk, the fishermen target a diversity of species depending on the boat size, season, and regulations. A number of the draggers that land here also engage in the groundfish fishery during the summer months.

Loligo makes up a large part of the catch that is landed in Shinnecock. *Loligo* accounted for 39.2% of the value of the total landings in Shinnecock/Hampton Bays in 2000. During the summer of 2000, *Loligo* was being caught in unusually large numbers just off the beach of Shinnecock. Fishermen from Montauk and Rhode Island landed their catch in Shinnecock rather than steaming home. The local packing facilities did very well as did the fishermen. Compared to the lucrative summer of 2000, squid fishing in the summer of 2001 was not profitable. One local fisherman explained that his operation took a serious financial hit when the 2500 lb trip limit was instated. This fisherman lost his crew members due to the drop in income. He explained that it is difficult to find good crew, especially when the boat is not making money. He retained only one original crew member and the rest went “to bang nails," or work in construction, a common alternative to fishing.

Fishing Community/Relations

Inshore fishing has a long history in Shinnecock/Hampton Bays. Offshore commercial fishing started late relative to other places on Long Island due to the time needed to stabilize the Shinnecock Inlet in the 1950s (McCay and Cieri 2000). Most of the boat owners/operators and crew members live in Shinnecock/Hampton Bays. According to one informant, there are a number of fishing families that have historical roots in the area. This is primarily the case for baymen, but a number of offshore draggers also have roots in the area and strong family ties to the industry. However, like Montauk, a number of fishermen are first generation who came to the area from towns further west on Long Island. Many of the dockworkers in the area are immigrants from Central and South America.

Overall, the relationship between the fishermen and the municipality has been positive. According to one informant, the town has been supportive of the local fishing industry. However, fishermen have lobbied unsuccessfully for an expanded municipal dock and the area remains difficult if not impossible to develop for the commercial industry. Commercial fishermen in the area have also organized efforts designed to convince the federal government to assist in dredging the Shinnecock Inlet (McCay and Cieri 2000).

Greenport, NY

Greenport is the largest fishing port on the North Fork of Long Island. The village was a prominent whaling port in the early to mid 1800s and later became an important port for menhaden or "bunker" fishing and processing between the mid 1800s and the mid 1900s. Oystering was also an important industry up until the mid 1900s. At one point there were 14 oyster processing companies in the port (http://www.greenport.cc/ourhist.htm). Today, commercial fishing is still important in Greenport, but the economy has increasingly become geared to the tourist trade. A sign that greets visitors who come across the North Ferry from Shelter Island welcomes people to Greenport: "Shopping Hub of the North Fork." Despite the growing tourist trade, the town has demonstrated a commitment to maintaining Greenport's "working waterfront."

Fishing Infrastructure

The number of commercial fishing boats in Greenport has declined over the past several decades. In 1999, one informant estimated that there were 5 large offshore vessels, one medium-sized dragger, two small 40' draggers, 3 trap vessels (with pound nets), approximately 4 lobstermen, 4 or 5 people who do conch potting, 4 or 5 gill netters and 25 or so baymen (McCay and Cieri 2000). Two large scallop boats owned by a company in Cape May, NJ use Greenport's docks for repairs, but they land their catch in New Bedford and New Jersey.

The municipal Railroad Dock, located next to the North Ferry on Peconic Bay, is the primary commercial dock used by the large boats. The village leases the space from the train company and charges fees for tying up at the dock and for the use of water and electricity. The village has also provided a municipal dock for baymen located in Stirling Harbor. There is one packing facility located in Stirling Harbor that usually packs 2-3 small draggers and a number of small handline, trap, and gillnet boats. They also pack an occasional longliner. This facility also runs a retail fish market. The business sells some of the product landed at the fish market, while the rest is typically sent to Fulton Fish Market on consignment. They provide their own ice and cartons and pay for the shipping. A whiting exporter recently moved out of the area and relocated in Massachusetts. Greenport used to have another packing and processing facility, but this went out of business some 15 years ago. Greenport is also home to a shipyard and a welding company that gets business from commercial boats that come from other areas. The one marine supply shop in Greenport no longer operates as a supply shop. The owners now use the business for commercial rental space and as a freezer facility for the storage of bait for area lobstermen.

Fishing Overview

Otter trawling accounted for 95.6% of the total poundage and 92.5% of the total value landed in Greenport and nearby Mattituck in 1998. Species harvested were led by silver hake (46.1% of total value) and *Loligo* (27.2% of total value), but also included butterfish, summer and winter flounder, scup, striped bass, monkfish, and other species. Pound-net fishing, haul-seining, gill-netting, handlining, pelagic longlining, lobster and conch pot fishing, and raking for clams and dredging for bay scallops also accounted for landings in 1998. (McCay and Cieri 2000).

Squid, Atlantic Mackerel, and Butterfish

Loligo and butterfish are important to the draggers that operate out of Greenport. In 2000, 11 boats landed *Loligo*, which was 61% of all the boats that landed in Greenport that year. *Loligo* accounted for 16.1 % of the total value of catch landed in Greenport in 2000. Eleven boats, again, landed butterfish in 2000. Butterfish accounted for 11.8 % of the total value of landings in Greenport in 2000. Very small quantities of mackerel and *Illex* were landed in Greenport. The smaller draggers of Greenport engage in a mixed trawl fishery, targeting a diversity of species, depending on seasons and regulations. In addition to dragging, the fishermen of Greenport engage in a diversity of additional fishing activities such as clamming, pound-netting, trapping, and gillnetting. The diversity of activities has allowed the fishermen to adapt to the changing natural and regulatory environments. One fisherman from Greenport explained that he used to do more squid fishing, but that the recent Scup GRAs made it difficult to make squid fishing profitable. He stayed with groundfishing all last winter, landing his catch away from Greenport, in places like New Bedford. The recent groundfish ruling, which is going to reduce his operations by 40%, will drive him to do more squid fishing than he has done recently. According to this informant, the other draggers who pack out of Greenport already rely heavily on *Loligo*. Regulations and state-by-state quotas are a concern to local fishermen because reduced limits have forced them to fish in different waters and pack their catch in different ports (McCay and Cieri 2000). One fisherman noted that area closures, if they occur, will be "another nail in the coffin" of the industry.

Fishing Community/Relations

The Village of Greenport is said to be "fisherman friendly," and is generally more supportive of the fishing industry than other communities according to informants. Greenport projects an image of being a seaport community through its tourism literature and waterfront revitalization efforts. The village features a maritime museum and also hosts a maritime festival. One example of the village's commitment to commercial fishing involves a local fish processing plant. Condominium residents located near the plant complained about noise and smells associated with the plant's operation. The village board upheld the plant's right to operate as it saw fit because it had been there for 100 years while the condominiums had just been built. The board said that while the plant must comply with health regulations, it could operate in the middle of the night if it had to in order to ship fish. The board had previously changed zoning so that no new condominiums could be built in the commercial waterfront district. A second development already existed and was allowed to stay (McCay and Cieri 2000). Greenport's waterfront revitalization program, which is the first in the state, includes a clause protecting the commercial docks. The "Waterfront Commercial" zoning areas allow most uses related to commercial fishing, often to the exclusion of other uses (McCay and Cieri 2000).

Despite the village's commitment to the fishing industry, one informant pointed to the reduced number of boats and the loss of fishing infrastructure as signs of the decline of Greenport's fishing industry. According to one fisherman, the reason for the decline is associated with the over regulation of fish stocks, restrictive quotas, and New York State's apparent lack of commitment to commercial fishermen.

Freeport, NY

Commercial fishing activity in Freeport, Nassau County, is concentrated in two areas - along a revitalized waterfront area known as "Nautical Mile," and in Point Lookout, a small beach town on the south side of Jones Inlet, across from Freeport. Freeport began promoting itself as the "Boating and Fishing Capital of the East" in the 1940s (http: www.lihistory.com/spectown/hist001k.htm). Commercial fishing has been declining in the area over the last several decades as tourism has expanded. According to one fisherman, "Nautical Mile" was once the homeport of 15 draggers. There are only four draggers that operate from small docks in this vicinity now, as well as a small number of lobster, clamming, and potting boats. A strip of restaurants, marinas, fish markets and small businesses that rely on tourism now dominates the waterfront. The canal that provides access to the bay is packed tightly with party boats, charter boats, gambling boats, and numerous pleasure craft. Unlike port towns located further east on Long Island, Freeport is much less reliant on seasonal tourism. In 2000, only 2.28% of the housing units were vacant, and of these only 14.6% were used for seasonal, recreational, or occasional use (Table NY).

Fishing Infrastructure

The following profile on Point Lookout comes from data gathered in 1999 (McCay and Cieri 2000). The main commercial fishing business in Point Lookout is family-run and consists of a wholesale fish market, retail fish market, clam bar and restaurant. The restaurant was started in part because a developer was going to build residential units right out to the waterfront on the land next to the business' dock. Not long ago there was a boatyard across the street where there are now only parking lots and private homes. The business has freezer space for 15-20,000 lb. of product. According to one informant who was interviewed in 1999, the business runs two of its own boats while other owner/ operators sell exclusively to it. Each boat has four crewmembers and multi-species permits. The business also buys from five local gillnetters. The business has a network of over 100 local restaurants that it wholesales to; the rest of its wholesale product goes to Fulton's Fish Market. Between the four phases of the business they employ 30-35 people at any one time, 10 of those on the fish dock. All the dock's crew and employees live within a couple of miles of the dock. According to one informant at the business, there used to be fourteen trawlers tied up in Pt. Lookout and that the operation used to do a lot of out-of-state business. Now all their sales are local. However, another observer reports that out-of-state boats still land there. In addition to this operation, there is a surf clam processing plant on the same road that has been in the seafood business since the beginning of this century. It primarily handles surf clams caught in New York state waters as well as other shellfish. Several surf clam boats also work out of Freeport (McCay and Cieri 2000).

In the town of Freeport, three fish docks are located along the waterfront of the "Nautical Mile" on Woodcleft Road. One of the docks also runs a seafood restaurant and retail market. One dragger ties up and unpacks here. A separate commercial docking and packing facility is associated with another fish market. There are 2 draggers and a number of lobster boats that dock and pack with this operation. The commercial infrastructure is literally surrounded by pleasure boats, party and charter boats, gambling boats and a host of tourist related businesses.

Fishing Overview

According to NMFS weigh-out data (which do not include all landings by port, including surfclams, which are important to Freeport), Freeport and neighboring Point Lookout (included in the Freeport port code) are almost entirely dependent on otter trawl landings. In 1998, otter trawling accounted for over 89% of the poundage, and 87% of the value. The primary species landed included *Loligo* (39.3% of total value) and silver hake (16.2% of total value), with smaller amounts of scup, weakfish, bluefish, butterfish, summer flounder, other flounders, and Atlantic mackerel. Gillnet, small handline, pot, pound-net and bay shellfisheries were also associated with these ports in the weigh-out data. These data are misleading in that surfclams were not reported by port in 1998.

Squid, Atlantic Mackerel, and Butterfish

Loligo is important to the draggers that operate out of Freeport, as is butterfish to a smaller degree. In 2000, 18 of the 43 boats that landed catch in Freeport landed *Loligo*. *Loligo* accounted for 45.5 % of the total value of landings in Freeport in 2000. Twelve boats, or 27.9% of all boats that packed in Freeport, landed butterfish in 2000. Butterfish accounted for 2.8% of the total value of landings in 2000. Very small quantities of mackerel were landed in Freeport.

The smaller draggers of Freeport engage in a mixed trawl fishery, targeting a diversity of species, depending on seasons and regulations. They are day boats for the most part, leaving in the early morning and returning by day's end. One fisherman who owns a 60' dragger said that he fishes for *Loligo* full-time from mid-May into August. He explained that regulations, including highly restrictive trip limits, prevent him from fishing for fluke when he is most capable of catching them. *Loligo* fishing has become a necessity. From January 1 to May 1 they can catch a limit of 500 lbs of fluke, but this is when the fish are offshore. The limit gets cut down precisely when the fish come inshore which prevents him from profiting because he has a smaller, inshore boat. This forces him to concentrate on *Loligo*.

Fishing Community/Relations

According to interviews conducted in 1999 the relationship between fishermen and the local community are strained (McCay and Cieri 2000). One informant explained that the town of Freeport was opposed to the idea of having a cooperative commercial fishing dock despite lobbying efforts on the part of local fishermen. He thinks they are developing the area for tourists and pleasure boaters, squeezing the commercial fishermen off the docks. According to him, the town views the fishing operations as an eyesore and an impediment to the development and revitalization of the waterfront. He thinks that the commercial fishermen are being pushed out. In June of 1999, major upgrades were being made to the road that ran directly in front of the commercial operations. According to the informant, the new sidewalk took away their parking. The relationship between the fishing industry and the town of Point Lookout is reportedly much less problematic. According to one informant, relationships with the community have been good and there has been no pressure to force them off the docks to this point. He added that he "pounds the people with pro-commercial fishing propaganda" (McCay and Cieri 2000).

Brooklyn, NY

Commercial fish landings in New York City's boroughs have declined markedly over the years. Landings for Brooklyn amounted to less than 30,000 pounds in 1998, mainly from otter-trawling and sink gillnets. The principal species, out of 17 landed, were butterfish, bluefish, weakfish, and *Loligo* squid. Sport fishing at Sheepshead Bay and other sites has become more important than commercial fishing in recent years. Table (NY) presents 1990 and 2000 census data for Brooklyn.

Loligo accounted for 28.5% of the total value of landings in Brooklyn in 2000. Fifty percent of the boats that landed catch in Brooklyn landed *Loligo*. There is a major *Loligo* processing plant in Brooklyn. This facility employs 50 full-time employees, including 40 processing personnel, and 10 secretarial and managing personnel. The number of processing personnel increases by 15 to 20 workers in the winter when more *Loligo* is being caught. Fifty percent of the company's processing personnel are Hispanic and 20% are female. For the most part, the employees are long standing Brooklyn residents who grew up in the area. According to one of the operation's managers, it is difficult to find employees, but they have a stable workforce with very little turnover. Nearly 100% of the business is based on the processing of *Loligo*. The *Loligo* is trucked in fresh from Cape May, Montauk, and Shinnecock. It is cleaned and packaged into 2.5-pound boxes that are made ready for sale. The product is shipped all over the U.S. but Long Island is the biggest market. The company buys *Loligo* from 10 to 15 boats on a consistent basis. He has been buying from the same boats for 10-12 years and although there has been some flux, the same boats have been fishing for squid through the years. According to the informant, the business is extremely important to the local Brooklyn area. The company makes a point of dealing with local businesses for supplies, trucking, and storage.

<u>New Jersey's Fishing Ports and Communities</u>

New Jersey is the most densely populated and one of the most industrialized and urbanized states in the nation. Although small in area, it also has a long coastline, about 100 miles, as well as two major tidal rivers, the Hudson and Delaware, and numerous estuaries inside its barrier islands and embayments. Much like New York, Connecticut, Rhode Island, and Massachusetts, its fisheries are found in both urban and rural settings and are often embedded in communities with very different orientations, whether industrial or tourist.

The major ports in New Jersey for the Squid, Atlantic Mackerel, and butterfish fisheries are Elizabeth, Point Pleasant, and Cape May (Table 1). Cape May ranked 3rd overall for fisheries value and 3rd for SMB in the northeast in 2000. It ranked 7th for dependence on these species.

Point Pleasant ranked 4th in 2000 in terms of fisheries value; it ranked 8th for the value of SMB, and 11th in dependence on SMB fisheries that year. Elizabeth is an old industrial port city; its commercial fishing activities area very small, the catches going to a processing plant in the city of Newark, NJ. However, the value of Elizabeth s SMB fisheries ranks 12th, and it holds the top spot in the northeast for dependence on these fisheries (Table 1). The port of Belford also has significant landings of these species, and the recreational fisheries of Atlantic Highlands, Brielle, Cape May, and other ports are at times significantly involved in the Atlantic mackerel fisheries, but these are not discussed below (see McCay and Cieri 2000 for more information).

Union and Essex Counties, NJ

A major Squid, Atlantic Mackerel, and butterfish processing facility is located in the city of Newark, NJ, Essex County, and some of the raw materials processed there are landed in the nearby port town of Elizabeth, NJ, Union County. Although the quantities landed in Elizabeth are small relative to landings at other ports, the processing facility is an important part of the industry and heavily dependent on the species covered by this FMP.

Union County, the site of the port of Elizabeth, is small in area, densely populated, highly urbanized and bounded on the east by the Newark Bay and Arthur Kill. Essex County is just to its north, dominated by the large city of Newark, the container port of Newark Bay, and Newark International Airport. Both are urban areas with high proportions of minority populations and large pockets of unemployment and poverty (Table NJ-1). In 2000 over 35% identified themselves as other than “white” in Union County, and over 63% in Essex County. Fisheries are extremely minor in terms of employment: in 1990 0.2% were in the occupational category of agriculture, fisheries, and forestry. However, unemployment is very high, especially in Newark, making the provision of any jobs there very important.

Elizabeth, NJ

The city of Elizabeth is located along New Jersey's northern waterfront, on Arthur Kill between New Jersey and Staten Island, New York. Elizabeth is one of New Jersey s oldest cities. It has gone through a long period of urban decline, recently checked by the creation of regional shopping centers on its periphery. In 2000 the population was 120,568, a 9.6% increase since 1990. In 2000 fifty percent of the population were Hispanic, 20% black (Table NJ-1). Twenty-five percent of the houses were vacant, and 19% of the family households were headed by females. The people of Elizabeth match the county's percentages for high school graduates. However, the percentage of people with bachelor’s degrees, 7.5%, is less than the county level.

Newark, NJ

The city of Newark had a population of 273, 546 in 2000, a slight decline from 1990 (Table NJ-1). The white population was only 26.5% of the total. Fifty-five percent identified wholly or in part as black or African-American, and over 29% indicated Hispanic or Latino. The median age was 30.8, and 29% of the households were female-headed. In 1997 26% were living in poverty (compared with 16% in Elizabeth and 9.3% for the state as a whole).

Fishing Infrastructure

Although the fishery of Elizabeth is very small relative to that of other ports, it is particularly dependent on Loligo and Illex squid. *Loligo* accounted for 70% and *Illex* 21% of the value of total landings in Elizabeth in 2000. The squid and fishes offloaded in Elizabeth are processed at a plant in the city of Newark, NJ.

The owner of the Newark plant and one vessel that offloads in Elizabeth indicated that about 98% of his company's business comes from squid, primarily *Loligo*. He was the first one to start processing Loligo squid in this region, in 1977. In addition to the catch of his own vessel, he buys squid from 12 to15 docks in Rhode Island, Long Island, New Jersey and Virginia. The plant employs 8 skilled, 7 semi-skilled, and 105 unskilled workers who clean and pack mostly squid. The semi-skilled team captains and the unskilled line workers are almost entirely women, foreign-born, and speakers of Spanish or Portuguese, who are paid on a wage basis.

Ocean County, NJ

Ocean County is a long, large county the coast of which is dominated by seasonal tourism and commuter and retirement housing, shopping, and services. The commercial and recreational fisheries of Ocean County have very long histories of being ensconced in complex communities. A century ago, the barrier beach communities of Ocean and neighboring Monmouth County were referred to as the Riviera of the Atlantic because of the early development of elegant hotels and homes along the beaches, which the fishing communities supplied. Today Ocean County is more often called The St. Petersburg of the Northeast (Sokolic, 2001), referring to the fact that it has the largest retirement communities in the State. Several important fishing centers are found in Ocean County, particularly Point Pleasant, at the Monmouth County boundary, Barnegat Light, on one of the long barrier islands, and small bayman places such as Forked River and Cedar Creek. Sport fishing is done from every coastal community, especially those surrounding Barnegat Bay and Toms River. Major charter and party boat fleets are concentrated in Point Pleasant and Barnegat Light, where there is ready access to deep-draft inlets to the sea.

The total population in Ocean County was 510,916 in 2000 (Table NJ-2). This was an 8.6 percent increase from 1990. Ocean County has grown rapidly from coastal tourism, retirement community development, and general suburban expansion within the NY-NJ Metropolitan Area. In 1990, only 20.4% of the population was rural, and less than 1% lived on a farm. The population is ethnically diverse: In 2000, the white population was only 65.9% of the total. Twenty two percent were 65 years of age or older, and the median age was 41 years, making it second in New Jersey only to Cape May County, where the median age was 42.3 years.

In 1999, Ocean County had a per capita personal income of $27,694. Based on a 1997 model based estimate, 7.8% of the population was classified as living in poverty, compared with 9.3% for the State as a whole. In 2000, 3.9% of the population was unemployed. In 1990, of the employed persons 16 years of age and older, 1.5% were in the agriculture, forestry, and fishery industries sector.

Point Pleasant, NJ

Point Pleasant comprises the municipality of Point Pleasant Beach and Point Pleasant borough, located at the mouth of the Manasquan Inlet, where Ocean County borders on Monmouth County. The town's economy is geared toward the summer tourist and recreational business, as shown by the fact that according to the 2000 census, 26.6% of the vacant housing units in Point Pleasant Beach were used for seasonal, recreational, or occasional use (the figure for Point Pleasant borough, the more residential part of the town, was 6.4%).

The fisheries are concentrated in an area known as Channel Drive in Point Pleasant Beach, a sandy strip on which are found restaurants, a fisherman's supply store, small marinas, charter and party boat docks, and two large commercial fishing docks as well as several smaller ones. Although tourism is the major business, the town recognizes and builds on its commercial and recreational fisheries. For example, the web-site www.pointpleasant.com features a photograph of a memorial to fishermen who lost their lives at sea, as well as advertisements for local party boats.

According to the 2000 Census for Point Pleasant Beach, the population was 5,314, a small (3.95%) increase from 1990 (Table NJ-2). Point Pleasant borough was much larger in 2000 with 19,306 persons, a 6.21% increase from 1990. There are very few minority residents. In 2000, 95.9% and 97.8% of the population in Point Pleasant Beach and Point Pleasant borough were white, respectively. Mirroring the county as a whole, the median ages are high: 39.4 years for the borough, and 42.6 years for the beach.

Per capita incomes for 1999 were considerably lower in Point Pleasant than in the county as a whole (about $28,000 for the county, $19,000 for the borough and $16,500 for the beach) (Table NJ-2). In 1990, 1.45% and 3.0% of the persons 16 years of age or older were in the agriculture, forestry, and fisheries industries sector in Point Pleasant Borough and Point Pleasant Beach, respectively, an indicator of the importance of fishing. However, interviews conducted in 2002 indicate that most of the fishermen do not live in Point Pleasant Beach or Point Pleasant Borough but rather are spread among many other towns of coastal New Jersey.

Fisheries Infrastructure

Point Pleasant is primarily an ocean fishing port, with a long history involving ocean pound-nets and otter trawl and gillnet fisheries, as well as sportfishing, focusing on the nearshore wrecks and the offshore canyons of the New York Bight. In terms of landings, the commercial fisheries of Point Pleasant rank third in New Jersey to those of the Cape May-Wildwood area and Atlantic City.

Like so many ports of the Mid-Atlantic region, the port of Point Pleasant Beach is inlet-dependent. Ocean-going fishers must pass through the often dangerous Manasquan Inlet, a challenge shared with the recreational fishing community including the party and charter boat businesses of Point Pleasant and neighboring Brielle, in Monmouth County. This is a highly developed coastal region. Currently, there is a wholesale finfish packing dock and seafood retail store at Point Pleasant run by a fishermen's cooperative. Another dock is primarily used for offloading surfclams and ocean quahogs although finfish may be handled there as well. A dock once used for pelagic tunas and swordfish is now being used by a lobster boat.

As elsewhere in the Mid-Atlantic, the fisheries of Point Pleasant Beach are very diverse. Two stand out in terms of volume and value: otter trawls and gillnetting, the latter particularly important for spiny dogfish as well as bluefish, weakfish, and other species. However, sea scallop dredging has been very important, as are surfclamming/ocean quahogging and offshore lobstering. According to the 1998 landings (McCay and Cieri, 2000), the most valuable species was angler or monkfish, which was partly incident to the scallop fishery but also caught by specialized gill-netters both local and migrating from other ports in the northeast and mid-Atlantic. Sea scallops were next in terms of ex-vessel value , followed by *Loligo* squid, a major focus of the local dragger fishery in the last decade. Also important were summer flounder, also a traditional fishery of the area but sharply cut back by regulations; lobster; spiny dogfish (like monkfish, caught by gill-netters as well as other fishers), and silver hake, or whiting. Whiting was one of the mainstays of this port from the 1970s through the 1980s but its availability and abundance have since declined. In terms of pounds landed, menhaden (purse-seined) and surfclams and ocean quahogs were the leading species in 1998, having come to replace the traditional otter trawl finfish fishery in importance over the past decade. The total landings value for 1998 was over 16 million dollars, indicating the high value of the fisheries to the local economy and community.

Two of the fishing properties in Point Pleasant are owned by a Cape May seafood business. Each of these docks had been used for finfish until about 10 years ago. They are now used for offloading and trucking surfclams and ocean quahogs. From 6 to 10 boats, most homeported in Atlantic City or Cape May, land clams and quahogs here. There are 15 crew at the docks and up to about 50 on the boats, many of whom commute from South Jersey or even other states to the south. In 2000 a small hand-shucking plant for surfclams began business and continues in 2002 at a site that had been a surfclam processing facility in the 1960s and early 1970s.

A fishermen's dock and marketing cooperative owns two other waterfront properties, one for storing and working on gear and some dockage, the other including the coop's offices, gear storage, ice-making, packing house, and a retail market with a small restaurant (which serves both local fishermen and tourists alike). The cooperative mostly depends on its sixteen or so members, who have switched from older, wooden-hulled vessels to larger steel-hulled boats. They are outfitted for bottom otter trawling in a mixed-species, diversified fishery. The vessels usually have a two or three man crew, including the captain, who are paid shares of the profits. They are all hired locally. Although there are families with several generations in the fisheries, in recent years crewmembers are not often related to the captain or owner. Members of the cooperative are typically first-, second-, or third-generation immigrants from Northern and Mediterranean Europe and other places. A few women have crewed on these boats. The boats are all owner-operated. They tend to fish in areas of Hudson Canyon and "the Mudhole," an area between the Hudson Canyon and the mouth of the Hudson River.

Most of the draggermen at the cooperative consider themselves *Loligo* squid and whiting specialists, but different species are targeted at different times, depending on the conditions of the ocean, the market, and the preferences of the captain. Squid landings began to overtake silver hake landings in this fleet in 1992 and by the latter 1990s accounted for over 50% of the landed value of Point Pleasant trawlers. At first *Loligo* was a by-catch while silver hake fishing in the Gully. Then it was targeted by most of the captains. As one captain stated, "You can't help but target squid sometimes, there is so much out there." Squid is sold to processors in Cape May, Newark, and elsewhere in the region. The cooperative is at a disadvantage in marketing squid because members lack freezer boats or refrigerated sea water boats, and thus do not receive the same price that boats so equipped receive.

Declining catches and restricted fisheries, especially the scup GRAs [gear restricted areas] during the winter along the continental shelf, have hurt this fishing community severely. It is estimated that the GRAs have reduced the landings by 30 to 35% for the local cooperative (mostly for *Loligo* squid). Some boats have left the fishery or are for sale. Existing operations have difficulty investing in major improvements, either to the waterfront properties or to the vessels. However, even in the face of these difficulties, members of the cooperative banded together in order to raise enough money to make the required dock repairs, approximately one million dollars. It is this investment that the fishermen feel is necessary in order to compete and have an appropriate facility. Their fear is that with increased restrictions on what, where and when they can fish their profit margin will be so small that it will be impossible to meet the financial obligations.

Point Pleasant Beach also has a sizeable charter/party boat fleet which, like the neighboring one of Brielle, is well known for diverse fishing opportunities, including overnight and two-day offshore canyon trips and nearshore, bottom-fishing and wreck fishing. The Channel Drive area also hosts a recreational marina, a fisherman's supply company, and popular seafood restaurants. Nearby is a popular amusement park and beach and a U.S. Coast Guard station.

Squid, Atlantic Mackerel, Butterfish Fishery

In Point Pleasant, *Loligo* squid are more important than *Illex*, butterfish, or Atlantic mackerel. All but one of the members of the cooperative fish for *Loligo* during the winter months. According to the manager, *Loligo* squid makes up about 25% of the annual catch (value) for the draggers. However, while out targeting squid it is common to find large schools of butterfish and occasional Atlantic mackerel, especially in the areas around the head of the Hudson Canyon and the Hudson Canyon itself.

Point Pleasant's fisheries have declined. In 2001, 81 boats landed in Point Pleasant, down from

123 in 2000 and 142 in 1997, and the total value of fish landed declined by 63% from 2000. In 2001, *Loligo* represented only 3.4% of the total value landed in Point Pleasant (which was dominated by surfclam and ocean quahog landings). In contrast, Loligo landings represented 9% of the total value of landings in 1994. In 2000 and 2001, Illex, butterfish, and mackerel contributed very little to the total value in Point Pleasant, even though they are recognized as important, especially to the recreational fisheries.

SMB and the Recreational Fisheries

Recreational fishermen use Atlantic mackerel in three ways: food, fun, and bait. As a food first generation Italians and other Mediterranean people enjoy it smoked, Asians eat it fresh (not smoked) and Polish people are said to can it. As a fun species, party boat captains report that it is a fun fish to catch because of the fight it puts up. As a bait, it is said to be a good all around bait, but especially good for sharks and marlin.

Atlantic mackerel is an important target for the party boat fishery in Point Pleasant (and elsewhere in the region). For many of the party boat fishermen and some of the charter boat fishermen Atlantic mackerel is a " fill in" or a "get you through" fish because it appears at times when other sport fish are usually not available. Normally there are two discrete seasons, winter and spring, as Atlantic mackerel migrate up and down the coast, and these seasons tend to last from two to three weeks. The winter season is between late November and the beginning of January and the spring season is between mid-March and May. However, the winter and spring of 2002 saw Atlantic mackerel throughout the entire time period. Fishermen interviewed suggested that this was due to the warm air and sea temperatures. For some recreational fishermen, Atlantic mackerel makes up 12 to 15% of their annual trips, a significant contribution if not as important as bluefish, fluke or sea bass.

Recreational fishermen do not target squid, but there is little doubt about the importance of squid as bait, especially for the party boats going after fluke and sea bass. Most bait and tackle shops sell squid as a universal bait. Any reduction in the availability of squid for bait would diminish access to high quality bait for party, charter, and private boats, as well as shore and pier anglers.

Butterfish is not targeted by the recreational fishermen, but again there is little doubt to its importance in the recreational fishing industry as a high quality bait. It is considered to be such a good bait because once frozen and then used it holds its firmness and makes a good presentation in the water. Party boat captains say that butterfish is tremendously important for tuna fishing as well as bluefish. Considering the importance of both tuna and bluefish to the recreational fisheries of Point Pleasant and the larger region, a reduction in availability of butterfish would create a similar problem to that of squid. Charter and party boat captains are afraid that if they can no longer obtain such high quality bait, they will lose customers who otherwise are willing to pay large sums of money to run offshore to fish for tuna: why pay a large sum only to be "skunked" for want of high quality butterfish?

Fishing Community/Relations

The fishing community of Point Pleasant has received support of various kinds, including zoning for water-dependent uses which helps moderate the pace of gentrification of the waterfront. Although few fishermen live close to the docks, they use local supermarkets, convenience stores, and bars.

The fishing community of Point Pleasant was hard struck by the January 1999 tragedies in the surfclam and ocean quahog fishery. The Adriatic, the Beth Dee Bob, and the Ellie B, all working out of Point Pleasant, went down during storms that month, as well as another vessel, the Cape Fear, formerly based in New Jersey, up in Buzzards Bay, Massachusetts. Ten lives were lost. In the aftermath, members of the fishing community, led by the dock managers at the surfclam/ocean quahog dock, began the work of designing and funding a fishermen's memorial with support from the larger community. It was built by a local sculptor and set in a small park alongside the Manasquan inlet. The wall around it has the names of fishermen of this part of the coast who lost their lives at sea as well as the ship's bell of one of the vessels lost in January 1999. It is telling of the nature of Mid-Atlantic fisheries that both recreational and commercial fishermen are remembered on the memorial.

Cape May County, NJ

Cape May County, and the municipalities of Cape May and Lower Township, are major centers of the Squid, Atlantic Mackerel, and butterfish fisheries. Cape May County encompasses a large peninsula at the southern end of New Jersey, bounded by the Atlantic Ocean at one side and the Delaware Bay at the other. Its beaches have long been the focus of summer tourism, principally from the Philadelphia region, and in recent years the once rural county has also become the site of commuter and vacation home housing developments. However, both commercial and recreational fishing remain critical mainstays of the year-round economy of places like Cape May and Wildwood within the county.

In 2000 the population was 102,326, a 7.6% percent increase from 1990 (Table NJ-2). The minority population is very small, less than 8%. In 2000, the median age for Cape May County of 42.3 years was the oldest of any New Jersey county, bespeaking its increasing popularity as a retirement center. In 1999, Cape May County had a per capita income of $29,455. Based on a 1997 model based estimate, 11% of the population was classified as living in poverty. Unemployment tends to be higher in Cape May County than in most other parts of the state. In 2000, 8.6% of the civilian labor force was unemployed. Of the individuals in the labor force in 1990, 7.5% of the civilian labor force was unemployed . In 2000, 2.1% of the population were in the agriculture, forestry, and fisheries industries sector, an indicator of the importance of fishing (but also farming) in this area.

Cape May and Lower Township, NJ

The area popularly thought of as Cape May, at the very tip of the peninsula, is a popular tourist destination, famous for its Victorian architecture and the high quality of its “bed-and-breakfast” inns and restaurants. It is treated in the census separately from the area where much of the fishing activity takes place, Lower Township, which is more diversified. However, both are part of the effective community of the fisheries. Cape May's 2000 population was 4,034, actually a 14% decline from 1990, and that of Lower Township was 22,945, a 10% increase from 1990 (Table NJ-2). Both are predominantly "white" in race/ethnicity. The median age for Lower Township, of 42 years, is identical to that of the larger county, which is known to be a haven for retirees from the Pennsylvania/New Jersey region. Per capita incomes are lower and poverty levels higher in Lower Township than in Cape May (Table NJ-2). In 1990, 1.6% of the population of Cape May 16 years of age or older, and 3% of the equivalent population in Lower Township, was in the agriculture, forestry, and fisheries industries sector.

Fisheries Infrastructure

Commercial and recreational fishing docks are found in Cape May but the majority are clustered in Lower Township along Ocean Drive, a road that leaves the main highway and crosses the marshes toward Wildwood. Another major dock is found at Schellenger's Landing, just over a large bridge that connects the mainland with the center of Cape May and its beaches.

Cape May is one of the largest commercial ports on the Atlantic seaboard. When combined with neighboring Wildwood (the fishing port is often referred to as "Cape May/Wildwood"), its 1998 landings exceeded 93 million lbs., worth over $29 million. Finfishing, squid fishing, and scalloping have been very important. It is a highly diversified port (McCay and Cieri 2000).

In 1998 otter-trawl equipped draggers accounted for 69% of Cape May's landings and 70% of its value. As elsewhere in the Mid-Atlantic region, they are highly diversified, and some in Cape May are also used for scalloping. Cape May has a long history of combined or alternating fin-fishing and scalloping. Squid is very important: In 1998 17% of Cape May's landed value came from Illex squid and another 22% from Loligo squid (McCay and Cieri 2000). Much of the squid is processed locally as is Atlantic mackerel, caught with draggers and midwater pair trawls. Summer flounder has been a major species but regulations have severely reduced catches. Scup is another dragger-caught species of historic importance in Cape May. Cape May is also the home of one of the very few vessels allowed to use purse seines for bluefin tuna in U.S. waters; this vessel lands its catch in Gloucester, MA. The only purse seine landings in Cape May in 1998 were for menhaden, using smaller vessels. Fishing for large pelagics is also done with longlines and troll lines (McCay and Cierri 2000).

A city planner interviewed in 1999 estimated that 500 people work in the fishing, processing, fresh fish market and restaurant enterprises of Lower Township and Cape May (McCay and Cieri 2000). However, "gentrification" has taken hold in Cape May as in many other coastal communities of the northeast and the mid-Atlantic. Despite being the most important commercial fishing port in New Jersey, commercial fishing businesses and uses of the waterfront are considered by planners and business people as lower priority than recreational and resort-oriented uses. Private recreational boating and fishing marinas are said to be a powerful political force in the township. Cape May has a substantial recreational fishery, both for-hire and private boat. Whale watching and dinner cruises have emerged as a profitable alternative or adjunct to recreational fishing charters (McCay et al 2002).

Schellenger s Landing is the most visible center of fishing in the Cape May area. Although most obviously a large restaurant and fish market, it is zoned "marine general business" with allowance for expansion of the marine industrial character. There is also a marine railway nearby.. Other marine-related businesses in and around the landing include two recreational marinas, two marine suppliers, two bait and tackle shops, a whale research center, and a "marlin and tuna club." Also there are a pizza shop, a motel, a bar, a wildlife art gallery, an antique store, two restaurants, and a gasoline station. Some cater to people in the fishing industry and some do not. Further expansion of the fishing industry, commercial or recreational, is limited by the high cost of land near the waterfront (McCay et al 2002).

Lower Township has three "marine development" zones located along Ocean Drive, towards Wildwood, at Two Mile Landing and at Shaw Island and Cresse Island adjacent to Wildwood Crest. Recreational boats currently use these areas. Across from Shaw Island is a new development, where 325 new slips are being built. A complex on a saltwater creek includes a marina, bait and tackle, marine supply, and charter boats. The marina itself is small, about 28 slips. Access to this particular area is now difficult for large vessels because of silting due to a canal built between Cape May and the mainland (McCay et al 2002).

Ocean Drive is the location of several important commercial fishing businesses. One commercial fishing business in the Ocean Drive area owns a surf clam/ocean quahog vessel (currently at Point Pleasant) as well as a freezer trawler and seven "wet" boats and 2 refrigerated seawater (RSW) vessels. According to its owner, at this facility there are 15 shore employees, approximately 20 seasonal packers, and about 45 crew on the boats.(McCay et al 2002).

There are two other large commercial fishery companies on Ocean Drive, both of which are largely involved with finfish. One has a long history as a processor, wholesaler, and exporter. In 1999 14 vessels landed their catch here full-time, including a couple of freezer trawlers. Crew sizes are 3-5 men, and 8-9 for the freezer trawlers. There were 75 to 80 shoreside employees. In 1999 about 40% were Hispanic, 40% white, and 20% African-American, Asian, and other. They lived in the Cape May and Cumberland County region; many of the Hispanics came from the agricultural town of Bridgeton (McCay and Cieri 2000). The second large firm has a retail store as well as packinghouse and processing facility. There were 15 boats in 1999. About 20 people worked on the dock and in the retail store, and in 1999 at the time of a visit to the facility, about 35-40 people were processing squid. Five or so were Black-Americans. The rest were identified as Vietnamese, who came daily to work from Philadelphia through a labor contractor. Since then this firm has filed for Chapter 11 bankruptcy (McCay et al 2002).

Squid, Atlantic Mackerel, and Butterfish

Squid, Atlantic mackerel, and butterfish are important products for the first commercial packing and processing facility mentioned above, which is the only year-round industry in Cape May. Their primary business is with these "underutilized" species, and they handle large volumes. Decline in stocks of groundfish, whiting and summer flounder over the years has increased the importance of squid and mackerel to this business. The plant workers are primarily Hispanic and live in nearby Wildwood as well as the inland towns of Bridgeton and Vineland, and the office staff live within 20 mile radius of the facility. Many of the plant workers come through a labor contractor; the others are long-standing employees. The only competition for workers is from the tourist industry during the summer. He stated that seafood is the number two employer in Cape May. He derives all of his business from Loligo, Illex, mackerel and butterfish with Loligo and Illex comprising about 50% of his business. The only species that is important is Atlantic herring and is not part of this plan. He handles both fresh and frozen product from fishing boats and processes squid. About 90% of his product comes from the port of Cape May. A total of 15 boats land fish at his facility and the boats have been selling to his facility for generations.

In 2000, 51 boats landed Loligo in Cape May, which was 36.2% of all the boats that landed catch in Cape may in that year. Loligo accounted for 6.1% of the value of total landings in Cape May in 2000. However, Cape May lands scallops that are a high value product. Loligo is an important fishery during the winter months for Cape May draggers. As a result of the GRAs particularly the southern GRA (January-March 15 closure), fishermen and processor reported losing from 10-30% of their income. Fishermen were forced to fish for less valuable species such as scup or spend more time searching and steaming for Loligo in non-traditional grounds.

Ten boats landed Illex in Cape May during the 2000 fishing season and these were 7% of all the boats that landed catch in Cape May. According to the fishermen, 2000 was not a good fishing season for Illex. The Illex remained further east and were unavailable for capture in their gear. As a result, fewer boats participated in the 2000 fishery. Illex is primarily a June through September fishery for Cape May vessels. In Cape May in 2000, 15 boats landed mackerel out of 141 boats. Mackerel are not a high value product, but this fish did account for 7% of the value of total landings in Cape May in 2000. Fishermen stated that only larger vessels with the capacity to land high volume of mackerel participate in the fishery because they are only the boats who can make money on this species.

Fishing Community/Relations

Although Cape May portrays itself as a Victorian seaside resort with "gingerbread" homes and inns, it also includes emblems of the fisheries. A pamphlet "This Week in Cape May" lists a 45-minute Fisherman's Wharf Tour that is scheduled to occur four times in May and June at the above-mentioned dock and fish packing plant. The tours are sponsored by the Mid-Atlantic Center for the Arts. There is a bronze plaque for fishermen lost at sea in a central pedestrian mall. A fisherman's memorial at the end of Missouri Avene portrays a woman and a child looking out to sea. A fishermen's wives organization, now defunct, played a major role in creating this memorial. The inscription says,

Dedicated to the fishermen lost at sea - 1988
He hushed the storm to a gentle breeze,
And the billows of the sea were stilled .

Many of the captains of fishing vessels in Cape May indicated that they are from multigenerational fishing families. However, a few are first generation fishermen. Most of the captains as well as the crew live in Cape May County and many grew up in communities in or around Cape May.

A Seafood Festival in Cape May had been moribund for a while until it was taken over by the Chamber of Commerce in the mid-1990s. When asked whether the commercial fishers in the area had been involved in organizing or supporting the seafood festival, a representative of the Chamber of Commerce said that there is a "non-existent relationship between us and them. We tried, they tried, but it never worked out" (McCay and Cieri 2000).

One of the seafood companies has been very successful in marrying seaside tourism and the commercial fisheries (the Lobster Dock at Schellenger's Landing), but the other companies tend to keep their businesses separate from the larger community. As one of the managers said in an interview in the spring of 2002, "It's not like New England; people do not think of this as a fishing community even though fishing provides a lot of the jobs."

Hampton, Virginia

"Hampton Roads" is the fishing region at the mouth of the Chesapeake Bay which sees most of the EEZ fishing activity in Virginia. It is largely within the Metropolitan Statistical Area of Norfolk-Virginia Beach-Newport News. The "Hampton Roads" ports have close connections with Wanchese, North Carolina. They are within a major tourist region, anchored by Chincoteague, Williamsburg, and Virginia Beach. The military is also a large presence, as are numerous heavy and high tech industries. Chincoteague is also one of several ports where local seafood businesses depend on migratory fishing vessels from other regions, such as North Carolina or Massachusetts, for landings. The port of Hampton is the focus of this report; closely associated with Wanchese, in North Carolina, it has a recent history of significant engagement in the squid fisheries, including Illex, even though since 1998 these have been very minor due to shifts in the availability of the squid populations.

Hampton generally has a poor minority population, and fisheries are a very small part of the total employment mix (Table VA-NC). In 1990, less than 1% of the employed persons 16 years of age and older were in the agriculture, forestry, and fishery industries sector. The total population was 146,437 in 2000, a 9.5% increase from 1990. In 2000, the white population was 49.5% of the total, while Blacks and Hispanics made up much of the rest of the population. According to the 2000 census, the median age in Hampton is very young, 34 years. In 1999, Hampton had a per capita personal income of $22,250. Based on a 1997 model based estimate, 14.6% of the population were classified as living in poverty.

Hampton, like Newport News and nearby Seaford, is an important sea scalloping port. However, species diversity of the fisheries is extremely high. In 1998 there were 79 species landed, for all gear types, in Hampton and Seaford, combined (weighout data for these two ports were combined to preserve business confidentiality). Fourteen had either poundage or value at or above 2% in 1998, led by sea scallops, summer flounder, *Illex* squid, Atlantic croaker, blue crab, and angler (McCay and Cieri 2000). The value of the landings in 1998 was approximately 13 million dollars, showing that despite little appearance of fisheries in census data, the fisheries are significant contributors to the local economy. The species of this FMP are particularly important to the otter trawl fleet of Hampton. In 1998 the otter trawl fleet of Hampton took Illex and Loligo squid, black sea bass; Atlantic mackerel; Atlantic croaker, and angler. Some draggers were also used for scallops, although most scallops were caught with dredges. A small amount of pelagic longlining was also done from Hampton, for sharks and tuna. Gill-netting, crab potting, and bay clamming were also important activities.

The fisheries have declined. In 1993 there were 192 boats landing one or more of the species of this FMP in Hampton, according to weighout data, but in 2001 only 43 boats landed there. The total value of all landings in Hampton in 2001 was about $8.8 million, down from $13 million in 1998. Both *Loligo* and *Illex* squid landings have declined to less than 1% of the total value of landings in Hampton. *Illex* have not been available to this fleet since the end of 1997, according to leading fishermen in the area. In 1997, mackerel landings accounted for 1.3% of the total value of landings in Hampton, but in 2001, mackerel and butterfish landings were negligible.

Dare County and Wanchese, North Carolina[1]

Squid, Atlantic mackerel, and butterfish are currently not very important to the fisheries of North Carolina, except as bait for other fisheries. In this report, Dare County and Wanchese are the foci. Wanchese-based fishermen often use Hampton, VA, and more northern ports.

[1]Commercial fisheries data are kept on a county basis rather than port basis by the North Carolina Division of Marine Fisheries, the source of the data used, and that many of the data are confidential, due to there being only one or two dealers involved.

Wanchese is the site of the primary landing facilities for the ocean-going trawlers of North Carolina. In the early 1990s 30 to 40 vessels offloaded at 6 fish houses in Wanchese (North Carolina Division of Marine Fisheries 1993: 4). Beaufort-Morehead City was the 2nd largest port, with 5-6 fish houses serving 10 to15 full-time trawlers. At that time there were 26 to 32 other otter-trawl draggers fishing out of both Oregon and Ocracoke Inlets and packing out of ports of Lowland, Vandemere, Bayboro, Englehard, Pamlico Beach and Oriental.

Dare County, NC

In 2000 the population of Dare County was 29,967, a 32% increase from its 1990 level. It is almost entirely rural. About 95% of the population was white, 2,7% were Black/African American, and 2.2% identified as Hispanic or Latino (Table VA-NC). The median age of the county's population was 40.4 years. In 2000, 74.5% of all housing units were owned and 52.4% were vacant. Of the vacant housing units, 50.1% were for seasonal, recreational or occasional use, reflecting the importance of tourism in the rapid development of North Carolina's Outer Banks.

In 1990, 5.35% of the civilian labor force were employed in agriculture, forestry, and fisheries, a very high percentage for the northeast and mid-Atlantic regions. There were 30 white male vessel captains or officers, as well as 391 male and 49 female fishers, living in Dare County, according to the Census Bureau. According to Diaby (1999: 35), the fishing incomes of Dare County in 1997 ($29,296) were considerably higher than all wages combined ($17,989), bespeaking the importance of fishing.

Profile of Dare County Fisheries

Dare County saw over 36.6 million pounds and 23.5 million dollars from fish and shellfish (and turtle) landings in 1998. Fishing centers include Wanchese, Hatteras, and Mann's Harbor. Fluke (15%) was second to crabs (40%) in terms of value, but a much wider range of products were significant than in other North Carolina counties because of the importance of ocean as well as estuarine fisheries. These included bluefish, dogfish, squid, weakfish, anglerfish, king mackerel, sharks, and tuna. The fisheries range from estuarine fisheries (crab-pots, pound-nets, turtle pots, fyke nets, etc.) to offshore longlining (McCay and Cieri 2000).

Since 1998, North Carolina s commercial and recreational fishermen have been affected by new fishery regulations (such as for dogfish and monkfish) as well as what is believed by fishermen to be a climatic shift causing a warming of the ocean and changing some of the migratory patterns of certain species. For example, while 1998 was a good year for squid landings, the three years after 1998 have been disappointing: the three years combined are not equal to 1998 (North Carolina Division of Marine Fisheries 2001).

Wanchese, NC

Wanchese is a small village on the Outer Banks that is heavily dependent on the fisheries. It is on the northern part of North Carolina's coast, not far from the Virginia border, and on the southern end of Roanoke Island, which is where English efforts to settle North America began–and failed. In 1990 the village, together with neighboring Nags Head and Roanoke Island, had only 1,374 residents, and in 2000 there were 1,527, an increase of 11% (Table VA-NC). The resident population is almost entirely "white," and the median age is 37.2, lower than that of the county as a whole. The per capita income in 1999 was very low, $10,830, and only 67% of those 25 years of age or older had completed high school. Tourism is much less important here than elsewhere on the Outer Banks: only 7% of the vacant housing units were used for seasonal, recreational, or occasional purposes.

In 1990, 20% of the community's workers were employed in "agriculture, forestry and fishing," the highest of all mid-Atlantic and northeast coastal communities. According to local residents interviewed in the spring of 2002, this level of dependency continues and may have increased. It is rooted in a history of commercial fishing that goes back to the 19th century (Wilson and McCay 1998). Today the village still revolves around fishing but has expanded to include processing plants and boat building (which began in 1992). Though traditionally a commercial fishing community, recent growth in tourism and recreational fishing has sparked competition between the new and the old for a restricted resource. However, residents interviewed in 2002 indicated that at least half, if not more, of the labor force of Wanchese and environs is engaged in fishing and boat building.

One of the major ethnic shifts, as reported by fishermen interviewed in 2002, is the increased numbers of Hispanic people working in the fish houses and plants, some of whom have reportedly settled in the Wanchese area. Hispanics have also come to Wanchese to work in the developing boat building industry, reportedly from the agricultural sector.

In 2001, a total of 116 boats landed in Wanchese. The number of boats landing in Wanchese increased dramatically from 1996-1997, from 45 to 95 boats. The number of boats landing in Wanchese continued to increase until 2000, to 119 boats. In 2001, the total value of all fisheries landed was over $8 million, and *Loligo*, *Illex*, butterfish, and Atlantic mackerel landings represented less than one percent of that value, altogether, in contrast with 1998 when *Illex* itself represented 1.2% of the total value.

Fishing Community/Relations

Fishing related associations include the Oregon Inlet Users Association and the North Carolina Fisheries Association. The former is involved with supporting the plans for jetties at Oregon Inlet; they are responsible for organizing both the Wanchese Seafood Festival and the Blessing of the Fleet. The latter is a trade organization of seafood dealers and commercial fishermen from the state; two members of the 18 member Board of Directors are from Wanchese.

APPENDIX 2
GLOSSARY OF TERMS

A

A - See annual mortality.

ABC - See allowable biological catch.

AP - See advisory panel.

Absolute Abundance - The total number of a kind of fish in the population. This is rarely known, but usually estimated from relative abundance, although other methods may be used.

Abundance - See relative abundance and absolute abundance.

Advisory Panel (AP) - A group of people appointed by a fisheries management agency to review information and give advice. Members are usually not scientists, but most are familiar with the fishing industry or a particular fishery.

Age Frequency or Age Structure - A breakdown of the different age groups of a kind of fish in a population or sample.

Allocation - Distribution of the opportunity to fish among user groups or individuals. The share a user group gets is sometimes based on historic harvest amounts.

Allowable Biological Catch (ABC) - A term used by a management agency which refers to the range of allowable catch for a species or species group. It is set each year by a scientific group created by the management agency. The agency then takes the ABC estimate and sets the annual total allowable catch (TAC).

Anadromous - Fish that migrate from saltwater to fresh water to spawn.

Angler - A person catching fish or shellfish with no intent to sell. This includes people releasing the catch.

Annual Mortality (A) - The percentage of fish dying in one year due to both fishing and natural causes.

Aquaculture - The raising of fish or shellfish under some controls. Ponds, pens, tanks or other containers may be used. Feed is often used. A hatchery is also aquaculture but the fish are released before harvest size is reached.

Artisanal Fishery - Commercial fishing using traditional or small scale gear and boats.

Availability - Describes whether a certain kind of fish of a certain size can be caught by a type of gear in an area.

B

Bag Limit - The number and/or size of a species that a person can legally take in a day or trip. This may or may not be the same as a possession limit.

Benthic - Refers to animals and fish that live on or in the water bottom.

Billfishes - The family of fish that includes marlins, sailfish and spearfish.

Biomass - The total weight or volume of a species in a given area.

Bony Fishes - Fish that have a bony skeleton and belong to the class Osteichthyes. Basically, this is all fish except for sharks, rays, skates, hagfish and lampreys.

Bycatch - The harvest of fish or shellfish other than the species for which the fishing gear was set. Examples are blue crabs caught in the shrimp trawls or sharks caught on a tuna longline. Bycatch is also often called incidental catch. Some bycatch is kept for sale.

C

C/E - See catch per unit of effort.

CPUE - See catch per unit of effort.

Catadromous - Fish that migrate from fresh water to saltwater to spawn.

Catch - The total number or poundage of fish captured from an area over some period of time. This includes fish that are caught but released or discarded instead of being landed. The catch may take place in an area different from where the fish are landed. Note: Catch, harvest and landings are different terms with different definitions.

Catch Curve - A breakdown of different age groups of fish, showing the decrease in numbers of fish caught as the fish become older and less numerous or less available. Catch curves are often used to estimate total mortality.

Catch Per Unit of Effort (CPUE;C/E) - The number of fish caught by an amount of effort. Typically, effort is a combination of gear type, gear size, and length of time gear is used. Catch per unit of effort is often used as a measurement of relative abundance for a particular fish.

Catch Stream - The catch statistics for a kind or stock of fish over a period of time.

Catchability Coefficient (q) - The part of a stock that is caught by a defined unit of effort.

Charter Boat - A boat available for hire, normally by a group of people for a short period of time. A charter boat is usually hired by anglers.

Coastal Migratory Pelagic Fishes - Several species of fish that live in open waters near the coast, grouped together by the Gulf of Mexico Fishery Management Council and South Atlantic Fishery Management Council for management purposes. This includes king and Spanish mackerel, cobia, dolphin and little tunny.

Cohort - A group of fish spawned during a given period, usually within a year.

Cohort Analysis - See virtual population analysis.

Commercial Fishery - A term related to the whole process of catching and marketing fish and shellfish for sale. *It refers to and includes fisheries resources, fishermen, and related business directly or indirectly involved in harvesting, processing, or sales.

Common Property Resource - A term that indicates a resource owned by the public. It can be fish in public waters, trees on public land, and the air. The government regulates the use of a common property resource to ensure its future benefits.

Compensatory Growth - An increase in growth rate shown by fish when their populations fall below certain levels. This may be caused by less competition for food and living space.

Compensatory Survival - A decrease in the rate of natural mortality (natural deaths) that some fish show when their populations fall below a certain level. This may be caused by less competition for food and living space.

Condition - A mathematical measurement of the degree of plumpness or general health of a fish or group of fish.

Confidence Interval - The probability, based on statistics, that a number will be between an upper and lower limit.

***Controlled Access** - See limited entry.

Council - Indicates a regional fishery management group. The Fishery Conservation and Management Act of 1976 as amended created the regional councils. For example, the Gulf of Mexico Fishery Management Council develops fishery policies designed to manage those species most often found in Gulf federal waters.

Crustacean - A group of freshwater and saltwater animals having no backbone, with jointed legs and a hard shell made of chitin. Includes shrimp, crabs, lobsters, and crayfish.

Cumulative Frequency Distribution - A chart showing the number of animals that fall into certain categories, for example, the number of fish caught that are less than one pound, less than three pounds, and more than three pounds. A cumulative frequency distribution shows the number in a category, plus the number in previous categories.

D

Demersal - Describes fish and animals that live near water bottoms. Examples are flounder and croaker.

Directed Fishery - Fishing that is directed at a certain species or group of species. This applies to both sport fishing and commercial fishing.

Disappearance (Z') - Measures the rate of decline in numbers of fish caught as fish become less numerous or less available. Disappearance is most often calculated from catch curves.

E

EEZ - See exclusive economic zone.

EIS - See environmental impact statement.

ESO - See economics and statistics office.

Economic Efficiency - In commercial fishing, the point at which the added cost of producing a unit of fish is equal to what buyers pay. Producing fewer fish would bring the cost lower than what buyers are paying. Producing more fish would raise the cost higher than what buyers are paying. Harvesting at the point of economic efficiency produces the maximum economic yield. See maximum economic yield and economic rent.

Economic Overfishing - A level of fish harvesting that is higher than that of economic efficiency; harvesting more fish than necessary to have maximum profits for the fishery.

Economic Rent - The total amount of profit that could be earned from a fishery owned by an individual. Individual ownership maximizes profit, but an open entry policy usually results in so many fishermen that profit higher than opportunity cost is zero. See maximum economic yield.

Economics and Statistics Office (ESO) - A unit of the National Marine Fisheries Service (NMFS) found in the regional director's office. This unit does some of the analysis required for developing fishery policy and management plans

Effort - The amount of time and fishing power used to harvest fish. Fishing power includes gear size, boat size, and horsepower.

Elasmobranch - Describes a group of fish without a hard bony skeleton, including sharks, skates, and rays.

Electrophoresis - A method of determining the genetic differences or similarities between individual fish or groups of fish by using tissue samples.

Environmental Impact Statement (EIS) - An analysis of the expected impacts of a fisheries management plan (or some other proposed action) on the environment.

Escapement - The percentage of fish in a particular fishery that escape from an inshore habitat and move offshore, where they eventually spawn.

Euryhaline - Fish that live in a wide range of salinities.

Ex-vessel - Refers to activities that occur when a commercial fishing boat lands or unloads a catch. For example, the price received by a captain for the catch is an ex-vessel price.

Exclusive Economic Zone (EEZ) - All waters from the seaward boundary of coastal states out to 200 natural miles. This was formerly called the Fishery Conservation Zone.

F

F - See fishing mortality.

Fmax - The level of fishing mortality (rate of removal by fishing) that produces the greatest yield from the fishery.

FCMA - See Fishery Conservation and Management Act

FCZ - See fishery conservation zone.

FMC - See fishery management council.

FMP - See fishery management plan.

Fecundity - A measurement of the egg-producing ability of a fish. Fecundity may change with the age and size of the fish.

Fishery Conservation and Management Act - The federal law that created the regional councils and is the federal government's basis for fisheries management in the EEZ. Also known as the Magnuson Act after a chief sponsor, Senator Warren Magnuson of Washington.

Fishery - All the activities involved in catching a species of fish or a group of species.

Fishery Conservation Zone (FCZ) - The area from the seaward limit of state waters out to 200 miles. The term is used less often now than the current term, exclusive economic zone.

Fishery Dependent Data - Data collected on a fish or fishery from sport fishermen, commercial fishermen, and seafood dealers.

Fishery Independent Data - Data collected on a fish by scientists who catch the fish themselves, rather than depending on fishermen and seafood dealers.

Fishery Management Council (FMC) - See council

Fishery Management Plan (FMP) - A plan to achieve specified management goals for a fishery. It includes data, analyses, and management measures for a fishery.

Fishing Effort - See effort.

Fishing Mortality (F) - A measurement of the rate of removal of fish from a population by fishing. Fishing mortality can be reported as either annual or instantaneous. Annual mortality is the percentage of fish dying in one year. Instantaneous is that percentage of fish dying at any one time. The acceptable rates of fishing mortality may vary from species to species.

Fork Length - The length of a fish as measured from the tip of its snout to the fork in the tail.

G

GLM - See general linear model.

GSI - See gonosomatic index.

General Linear Model (GLM) - A mathematical formula that relates one biological factor to another. Once a mathematical relationship is established, scientists use the formula to predict one factor over another.

Gonosomatic Index (GSI) - The ratio of the weight of a fish's eggs or sperm to its body weight. This is used to determine the spawning time of a species of fish.

Groundfish - A species or group of fish that lives most of its life on or near the sea bottom.

Growth - Usually an individual fish's increase in length or weight with time. Also may refer to the increase in numbers of fish in a population with time.

Growth Model - A mathematical formula that describes the increase in length or weight of an individual fish with time.

Growth Overfishing - When fishing pressure on smaller fish is too heavy to allow the fishery to produce its maximum poundage. Growth overfishing, by itself, does not affect the ability of a fish population to replace itself.

H

Harvest - The total number or poundage of fish caught and kept from an area over a period of time. Note that landings, catch, and harvest are different.

Head Boat - A fishing boat that takes recreational fishermen out for a fee per person. Different from a charter boat in that people on a head boat pay individual fees as opposed to renting the boat.

Histogram - A method of showing data in a graph. The data appears as bars running up and down (vertical) or sideways (horizontal).

I

ITQ - See individual transferable quota.

Incidental Catch - See bycatch.

Individual Transferable Quota - A form of limited entry that gives private property rights to fishermen by assigning a fixed share of the catch to each fisherman.

Industrial Fishery - A fishery for species not directly used for human food. An example is menhaden.

Instantaneous Mortality - See fishing mortality, natural mortality, and total mortality.

Intrinsic Rate of Increase (z) - The change in the amount of harvestable stock. It is estimated by recruitment increases plus growth minus natural mortality.

Isopleth - A method of showing data on a graph which is commonly used in determining yield-per-recruit.

J

Juvenile - A young fish or animal that has not reached sexual maturity.

L

Landings - The number or poundage of fish unloaded at a dock by commercial fishermen or brought to shore by recreational fishermen for personal use. Landings are reported at the points at which fish are brought to shore. Note that landings, catch, and harvest define different things.

Latent Species - A species of fish that has the potential to support a directed fishery.

Length Frequency - A breakdown of the different lengths of a kind of fish in a population or sample.

Length-Weight Relationship - Mathematical formula for the weight of a fish in terms of its length. When only one is known, the scientist can use this formula to determine the other.

Limited Entry - A program that changes a common property resource like fish into private property for individual fishermen. License limitation and the individual transferable quota (ITQ) are two forms of limited entry.

M

mm - See millimeter.

M - See natural mortality.

MEY - See maximum economic yield.

MRFSS - See marine recreational fishery statistics survey.

Magnuson Act - See Fishery Conservation and Management Act.

Mariculture - The raising of marine finfish or shellfish under some controls. Ponds, pens, tanks, or other containers may be used, and feed is often used. A hatchery is also mariculture but the fish are released before harvest size is reached.

Marine Mammal - Animals that live in marine waters and breathe air directly. These include porpoises, whales and seals.

Marine Recreational Fishery Statistics Survey (MRFSS) - An annual survey by the National Marine Fisheries Service (NMFS) to estimate the number, catch, and effort of recreational fishermen. It serves as a basis for many parts of fisheries management plans.

Mark-Recapture - The tagging and releasing of fish to be recaptured later in their life cycles. These studies are used to study fish movement, migration, mortality, and growth, and to estimate population size.

Maximum Economic Yield (MEY) - This is the total amount of profit that could be earned from a fishery if it were owned by an individual. An open entry policy usually results in so many fishermen that profit higher than opportunity cost is zero. See economic rent.

Maximum Sustainable Yield (MSY) - The largest average catch that can be taken continuously (sustained) from a stock under average environmental conditions. This is often used as a management goal.

Mean - Another word for the average of a set of numbers. Simply add up the individual numbers and then divide by the number of items.

Meristics - A series of measurements on a fish, such as scale counts, which are used to separate different populations or races of fish.

Millimeter (mm) - Metric measurement of length 1/25 of an inch long.

Model - In fisheries science, a description of something that cannot be directly observed. Often a set of equations and data used to make estimates.

Mollusk - A group of freshwater and saltwater animals with no skeleton and usually one or two hard shells made of calcium carbonate. Includes the oyster, clam, mussel, snail, conch, scallop, squid, and octopus.

Morphometrics - The physical features of fish, for example, coloration. Morphometric differences are sometimes used to identify separate fish populations.

Multiplier - A number used to multiply a dollar amount to get an estimate of economic impact. It is a way of identifying impacts beyond the original expenditure. It can also be used with respect to income and employment.

N

NMFS - See National Marine Fisheries Service

National Marine Fisheries Service (NMFS) - A federal agency - with scientists, research vessels, and a data collection system - responsible for managing the nation's saltwater fish. It oversees the actions of the Councils under the Fishery Conservation and Management Act.

National Standards - The Fishery Conservation and Management Act requires that a fishery management plan and its regulations meet seven standards. The seven standards were developed to identify the nation's interest in fish management.

Natural Mortality (M) - A measurement of the rate of removal of fish from a population from natural causes. Natural morality can be reported as either annual or instantaneous. Annual mortality is the percentage of this fish dying in one year. Instantaneous is the percentage of fish dying at any one time. The rates of natural mortality may vary from species to species.

Nursery - The part of a fish's or animal's habitat where the young grow up.

O

OY - See advisory panel.

P

Pelagic - Refers to fish and animals that live in the open sea, away from the sea bottom.

Population Dynamics - The study of fish populations and how fishing mortality, growth, recruitment, and natural morality affect them.

Possession Limit - The number and/or size of a species that a person can legally have at any one time. Refers to commercial and recreational fishermen. A possession limit generally does not apply to the wholesale market level and beyond.

Predator - A species that feeds on other species. The species being eaten is the prey.

Predator-Prey Relationship - The interaction between a species that eats (predator) another species (prey). The stages of each species' life cycle and the degree of interaction are important factors.

Prey - A species being fed upon by other species. The species eating the other is the predator.

Primary Productivity - A measurement of plant production that is the start of the food chain. Much primary productivity in marine or aquatic systems is made up of phytoplankton, which are tiny one-celled algae that float freely in the water.

Pulse Fishing - Harvesting a stock of fish, then moving on to other stocks or waiting until the original stock recovers.

Put and Take Fishery - The placing of hatchery-raised fish in waters to be caught by fishermen. There are few marine fisheries that fit this description. Most cases are found in inland streams and lakes.

Q

q - See catchability coefficient.

Quota - The maximum number of fish that can be legally landed in a time period. It can apply to the total fishery or an individual fisherman's share under the ITQ system. Could also include reference to size of fish.

R

RD - See regional director.

RIR - See regulatory impact review.

Recreational Fishery - Harvesting fish for personal use, fun, and challenge. Recreational fishing does not include sale of catch. *The term refers to and includes the fishery resources, fishermen, and businesses providing needed good and services.

Recruit - An individual fish that has moved into a certain class, such as the spawning class or fishing-size class.

Recruitment - A measure of the number of fish that enter a class during some time period, such as the spawning class or fishing-size class.

Recuitment Overfishing - When fishing pressure is too heavy to allow a fish population to replace itself.

*Added by Wallace et al.

Reef Fish Complex - A term used by the Gulf of Mexico Fishery Management Council to describe the many species of fish found around natural reefs, artificial reefs, ledges, and mud lumps. Snapper, grouper, and tilefish are examples.

Regional Director (RD) - The person in charge of the National Marine Fisheries Service (NMFS) for a given region.

Regression Analysis - A statistical method to estimate any trend that might exist among important factors. An example in fisheries management is the link between catch and other factors like fishing effort and natural mortality.

Regulatory Impact Review (RIR) - The part of a federal fishery management plan that describes impacts resulting from the plan.

Relative Abundance - An index of fish population abundance used to compare fish populations from year to year. This does not measure the actual numbers of fish, but shows changes in the population over time.

Rent - See economic rent.

S

s - See survival rate.

SAFE - See stock assessment and fishery evaluation report.

SEFC - See Southeast Fisheries Center.

SPR - See spawning potential ratio.

SSBR - See spawning stock biomass per recruit.

SSC - See scientific and statistical advisory committee.

Scattergram - A graph that shows how factors relate to each other. This is visual, not statistical, and is used when it is necessary to compare two factors, like fish age and size.

Scientific Assessment Panel - A group of biologists, economists, and sociologists put together by a federal fishery management council to review scientific data on the condition of a stock of fish and the interests of the fishermen and seafood processors who use the stock. Panel members generally come from universities and state and federal fisheries agencies.

Scientific and Statistical Advisory Committee - A group of scientific and technical people giving advice to a council.

Secretarial Management Plan - A term used to describe a plan developed by the Secretary of the U.S. Department of Commerce in response to an emergency, a council's failure to act, *or for highly migratory species.

Selectivity - The ability of a type of gear to catch a certain size or kind of fish, compared with its ability to catch other sizes or kinds.

Simulation - An analysis that shows the production and harvest of fish using a group of equations to represent the fishery. It can be used to predict events in the fishery if certain factors changed.

Size Distribution - A breakdown of the number of fish of various sizes in a sample or catch. The sizes can be in length or weight. This is mot often shown on a chart.

***Shellfish** - General term for crustaceans and mollusks.

Slot Limit - A limit on the size of fish that may be kept. Allows a harvester to keep fish under a minimum size and over a maximum size, but not those in between the minimum and maximum. *Can also refer to size limits that allow a harvester to keep only fish that fall between a minimum and maximum size.

Social Impacts - The changes in people, families, and communities resulting from a fishery management decision.

Socioeconomics - A word used to identify the importance of factors other than biology in fishery management decisions. For example, if management results in more fishing income, it is important to know how the income is distributed between small and large boats or part-time and full-time fishermen.

Southeast Fisheries Center (SEFC) - Headquarters for the scientific staff of the National Marine Fisheries Service (NMFS) in the South Atlantic and Gulf of Mexico states. The center is located in Miami, Florida, with smaller laboratories at several other locations.

Spawner-Recruit Relationship - The concept that the number of young fish (recruits) entering a population is related to the number of parent fish (spawners).

Spawning Potential Ration (SPR) - *The number of eggs that could be produced by an average recruit in a fished stock divided by the number of eggs that could be produced by an average recruit in an unfished stock. SPR can also be expressed at the spawning stock biomass per recruit (SSBR) of a fished stock divided by the SSBR of the stock before it was fished.

Spawning Stock Biomass - The total weight of the fish in a stock that are old enough to spawn.

Spawning Stock Biomass Per Recruit (SSBR) - *The spawning stock biomass divided by the number of recruits to the stock or how much spawning biomass an average recruit would be expected to produce.

Species - A group of similar fish that can freely interbreed.

Sport Fishery - See recreational fishery.

Standard Length - The length of a fish as measured from the tip of the snout to the hidden base of the tail fin rays.

Standing Stock - See biomass.

Stock - A grouping of fish usually based on genetic relationship, geographic distribution, and movement patterns. *Also a manageed unit of fish.

Stock Assessment Group - A group of scientists, skilled in the study of fish population dynamics put together by a federal fishery management council to review the scientific data on the condition of a stock of fish. The scientists generally come from universities and state and federal fisheries agencies.

Stock Assessment and Fishery Evaluation Report (SAFE) - A report that provides a summary of the most recent biological condition of a stock of fish and the economic and social condition of the recreational fishermen, commercial fishermen, and seafood processors who use the fish. The report provides information to the federal fishery management councils for determining the harvest levels.

Stock-Recruit Relationship - See spawner-recruit relationship.

Stressed Area - An area in which there is special concern regarding harvest, perhaps because the fish are small or because harvesters are in conflict.

Surplus Production Model - A model that estimates the catch in a given year and the change in stock size. The stock size could increase or decrease depending on new recruits and natural mortality. A surplus production model estimates the natural increase in fish weight or the sustainable yield.

Survival Rate(s) - The number of fish alive after a specified time, divided by the number alive at the beginning of the period.

T

TAC - See total allowable catch.

TIP - See trip interview program.

Territorial Sea - The area from average low-water mark on the shore out to three miles for the states of Louisiana, Alabama, and Mississippi, and out to nine miles for Texas and the west coast of Florida. The shore is not always the baseline from which the three miles are measured. In such cases, the outer limit can extend further than three miles from the shore.

Total Allowable Catch (TAC) - The annual recommended catch for a species or species group. The regional council sets the TAC from the range of the allowable biological catch.

Total Length - The length of a fish as measured from the tip of the snout to the tip of the tail.

Total Mortality (Z) - A measurement of the rate of removal of fish from a population by both fishing and natural causes. Total mortality can be reported as either annual or instantaneous. Annual mortality is the percentage of fish dying in one year. Instantaneous mortality is that percentage of fish dying at any one time. The rate of total mortality may vary from species to species.

Trip Interview Program (TIP) - *A cooperative state-federal commercial fishery dependent sampling activity conducted in the Southeast region of NMFS, concentrating on size and age information for stock assessments of federal, interstate, and state managed species. TIP also provides information on the species composition, quantity, and price for market categories, and catch-per-unit effort for individual trips that are sampled.

U

Underutilized Species - A species of fish that has potential for large additional harvest.

Unit Stock - A population of fish grouped together for assessment purposes which may or may not include all the fish in a stock.

V

VPA - See virtual population analysis.

Virgin Stock - A stock of fish with no commercial or recreational harvest. A virgin stock changes only in relation to environmental factors and its own growth, recruitment, and natural mortality.

Virtual Population Analysis (VPA) - A type of analysis that uses the number of fish caught at various ages or lengths and an estimate of natural mortality to estimate fishing mortality in a cohort. It also provides an estimate of the number of fish in a cohort at various ages.

Y

Year-Class - The fish spawned and hatched in a given year, a "generation" of fish.

Yield - The production from a fishery in terms of numbers or weight.

Yield Per Recruit - A model that estimates yield in terms of weight, but more often as a percentage of the maximum yield, for various combinations of natural mortality, fishing mortality and time exposed to the fishery.

Z

z - See intrinsic rate of increase.

Z - See total mortality.

Z' - See disappearance.

APPENDIX 3
NOTICE OF INTENT TO PREPARE AN EIS

Dated: July 14, 2003.

Bruce C. Morehead,

Acting Director, Office of Sustainable Fisheries, National Marine Fisheries Service.

[FR Doc. 03–18342 Filed 7–17–03; 8:45 am]

BILLING CODE 3510–22–S

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 648

[I.D. 070703A]

Fisheries of the Northeastern United States; Atlantic Mackerel, Squid, and Butterfish Fishery

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of intent (NOI) to prepare an environmental impact statement (EIS); request for comments.

SUMMARY: The Mid-Atlantic Fishery Management Council (Council) announces its intention to prepare, in cooperation with NMFS, an EIS in accordance with the National Environmental Policy Act to assess potential effects on the human environment of alternative measures for managing the Atlantic mackerel, squid, and butterfish fisheries pursuant to the Magnuson-Stevens Fishery Conservation and Management Act. The Council intends to develop Framework 4 to the Atlantic Mackerel, Squid and Butterfish Fishery Management Plan (FMP) to address the issue of expiration of the moratorium on entry to the commercial *Illex* squid fishery. This notification announces a public process for determining the impact on the human environment of measures proposed in Framework 4 relating to possible extension or expiration of the *Illex* moratorium. The intended effect of this notification is to alert the interested public of the development of the Draft EIS (DEIS) for this framework action and to provide for public participation.

DATES: Written comments on the intent to prepare an EIS must be received no later than 5 p.m., local time, on August 18, 2003.

ADDRESSES: Written comments on the intent to prepare the EIS and requests for other information related to the development of Framework 4 should be directed to Mr. Daniel T. Furlong, Mid-Atlantic Fishery Management Council, Room 2115 Federal Building, 300 S. New St., Dover, DE 19904. Comments may also be sent via facsimile (FAX) to (302) 674–5399. Comments will not be accepted if submitted by e-mail or Internet.

FOR FURTHER INFORMATION CONTACT: Daniel T. Furlong, Executive Director, 302–674–2331.

SUPPLEMENTARY INFORMATION: Prior to the 1980s, the fishery for *Illex illecebrosus*, (short finned squid) in the U.S. Exclusive Economic Zone (EEZ) was prosecuted primarily by foreign distant water fleets. With the implementation of the Atlantic Mackerel, Squid, and Butterfish FMP in 1982 and its subsequent amendments, the fishery became increasingly utilized by the domestic fishery. While the domestic fishery was undergoing development, new biological data became available which indicated that Illex is an annual species that resulted in smaller (or lower) revised estimates of the sustainable yield for the species.

In the 1990s, the simultaneous growth of the domestic squid fisheries and reduction in the estimate of sustainable yield resulted in the *Illex* fishery moving toward full capitalization and exploitation. As a result, a limited entry program became necessary and was implemented by a final rule for Amendment 5 to the FMP (62 FR 28638, May 27, 1997). However, due to concerns that capacity might be insufficient to fully exploit the annual quota for this fishery, a 5-year sunset provision was placed on the Illex moratorium when it was implemented in Amendment 5. Due to this sunset provision, the moratorium on entry to the *Illex* fishery was set to expire in July 2002, but was extended for one year by a final rule that implemented Framework 2 to the FMP (67 FR 44392, July 2, 2002). An additional one-year extension of the moratorium was implemented by a final rule that implemented Framework 3 (68 FR 31988, May 29, 2003). The Council is currently developing a DEIS through the development of Amendment 9 to the FMP. In addition to the limited access issue in the *Illex* fishery, the Council is also addressing a number of complex issues in Amendment 9 including those related to gear impacts on essential fish habitat, bycatch reduction, permitting of the Northwest Atlantic Fisheries Organization vessels to transit the U.S. EEZ, and the definition of overfishing for *Loligo* squid. The original NOI to develop a DEIS for Amendment 9 was published on November 29, 2001, (66 FR 56574) and the Council held the initial scoping meeting on December 12, 2001, in Atlantic City, NJ. The Council continued the development of Amendment 9 in 2002–2003 and submitted the DEIS for NMFS approval for public hearings in April 2003. NMFS identified a number of deficiencies in the DEIS for Amendment 9 at the March 19, 2003, Council meeting held in New York City, NY. As a result of those deficiencies, the Council was unable to adopt the DEIS for Amendment 9. At its June 25, 2003, meeting in Philadelphia, PA, the Council concluded that delays in development of the DEIS for Amendment 9 could result in a hiatus in the *Illex* limited access program if the moratorium for the *Illex* fishery expired before the final rule for Amendment 9 is implemented. Therefore, the Council decided to develop Framework 4, the sole purpose of which is to extend the moratorium on entry to the *Illex* fishery while the Council addresses this issue in Amendment 9 to the FMP. The Council concluded that new public scoping meetings are not necessary for this DEIS because this issue was considered during the original December 12, 2001, scoping meeting based on the original NOI. Applicable comments from that meeting will be considered along with the written comments received on this notification in the preparation of the DEIS for Framework 4.

The Council is considering the following alternatives for this framework action: (1) Extend the moratorium on entry to the *Illex* fishery for an additional 5 years (preferred alternative), (2) extend the moratorium on entry to the *Illex* fishery for an additional 2 years, (3) no action, and (4) extend the moratorium on entry to the *Illex* fishery without a sunset provision.

Authority: 16 U.S.C. 1801 *et seq.*

Dated: July 14, 2003.

John H. Dunnigan,

Director, Office of Sustainable Fisheries, National Marine Fisheries Service.

[FR Doc. 03–18343 Filed 7–17–03; 8:45 am]

BILLING CODE 3510–22–S

APPENDIX 4
NOTICE OF AVAILABILITY FOR FRAMEWORK 4 DEIS

Ends: October 27, 2003, Contact: Thomas Puchlerz (907) 228–6281.

EIS No. 030428, DRAFT EIS, NOA, Framework Adjustment 4 to the Atlantic Mackeral, Squid, and Bullfish Fishery Management Plan, Extension of the Moratorium for the Illex Fishery, Mid-Atlantic Fishery Management Council, Comment Period Ends: November 10, 2003, Contact: George H. Darcy (301) 713–1622.

This document is available on the Internet at: *http://www.mafmc.org/mid-atlantic/publications/pubs-draft.htm.*

Amended Notices

EIS No. 020386, DRAFT EIS, COE, PR, Port of The Americas Project, Development of a Deep-Draft Terminal at the Port of Ponce to Receive Post-Panamax Ships, COE Section 10 and 404 Permits, Municipalities of Guayanilla-Penuelas and Ponce, Puerto Rico, Contact: Edwin E. Muniz (787) 289–7034.

Revision of FR Notice Published on 9/20/2002: Officially Withdrawn by the Preparing Agency by letter Dated 12/5/2002.

Dated: September 23, 2003.

Joseph C. Montgomery,

Director, NEPA Compliance Division, Office of Federal Activities.

[FR Doc. 03–24400 Filed 9–25–03; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

[OPP–1003–0112; FRL–7328–3]

The Association of American Pesticide Control Officials, State FIFRA Issues Research and Evaluation Group, Working Committee on Water Quality and Pesticide Disposal, and Pesticide Operations and Management Working Committee; Notice of Public Meeting

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notices.

SUMMARY: The Association of American Pesticide Control Officials (AAPCO)/State FIFRA Issues Research and Evaluation Group (SFIREG) Working Committees on Water Quality and Pesticide Disposal (WC/WQ and PD) and Pesticide Operations & Management Working Committee (POM) will hold a 2–day meeting, beginning on October 27, 2003, and ending October 28, 2003. This notice announces the location and times for the meeting and sets forth the tentative agenda topics.

DATES: The meeting will be held on Monday, October 27, 2003, from 8:30 a.m. until 5 p.m. and October 28, 2003, from 8:30 a.m. until 5 p.m.

ADDRESSES: The meeting will be held at Days Inn Crystal City, 2000 Jefferson Davis Highway, Arlington, VA 22202.

FOR FURTHER INFORMATION CONTACT: Georgia McDuffie, Field and External Affairs Division (7506C), Office of Pesticide Programs, Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460–0001; telephone number: (703) 605–0195; fax number: (703) 308–1850; e-mail address: *mcduffie.georgia@epa.gov.* or

Philip H. Gray, SFIREG Executive Secretary, P.O. Box 1249, Hardwick, VT 05843–1249; telephone number: (802) 472–6956; fax (802) 472–6957; e-mail address: *aapco@plainfield.bypass.com.*

SUPPLEMENTARY INFORMATION:

I. General Information

A. Does this Action Apply to Me?

You may be potentially affected by this action if you are interested in SFIREG's information exchange relationship with EPA regarding important issues related to human health, environmental exposure to pesticides, and insight into EPA's decision-making process are invited and encouraged to attend the meetings and participate as appropriate. If you have any questions regarding the applicability of this action to a particular entity, consult the person listed under **FOR FURTHER INFORMATION CONTACT.**

B. How Can I Get Copies of this Document and Other Related Information?

1. *Docket.* EPA has established an official public docket for this action under docket ID number OPP–2003–0112. The official public docket consists of the documents specifically referenced in this action, any public comments received, and other information related to this action. Although, a part of the official docket, the public docket does not include Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. The official public docket is the collection of materials that is available for public viewing at the Public Information and Records Integrity Branch (PIRIB), Rm. 119, Crystal Mall #2, 1921 Jefferson Davis Hwy., Arlington, VA. This docket facility is open from 8:30 a.m. to 4 p.m., Monday through Friday, excluding legal holidays. The docket telephone number is (703) 305–5805.

2. *Electronic access.* You may access this **Federal Register** document electronically through the EPA Internet under the "**Federal Register**" listings at *http://www.epa.gov/fedrgstr/.*

An electronic version of the public docket is available through EPA's electronic public docket and comment system, EPA Dockets. You may use EPA Dockets at *http://www.epa.gov/edocket/* to view public comments, access the index listing of the contents of the official public docket, and to access those documents in the public docket that are available electronically. Although, not all docket materials may be available electronically, you may still access any of the publicly available docket materials through the docket facility identified in Unit I.B.1. Once in the system, select "search," then key in the appropriate docket ID number.

II. Tentative Agenda

This unit provides tentative agenda topics for the 2–day meeting.

1. WQ/PD issue team report.
2. National pesticide stewardship alliance conference report/label review manual and label language recommendations/discussions.
3. Clean air act presentation/recommendations and restrictions for burning.
4. CCA update(s) and risk assessment results/registration of alternatives active ingredient uses/disposal issues for old/new products.
6. Lab director's issue paper.
7. Method development and methods availability as registration criteria.
8. Office of General Council presentation re: CBI criteria and definitions.
9. Registration/cancellation policy and decisions (front end/back end issues).
10. Registration authority review/matrix - joint team creation.
11. Who, what, and why of the Pesticide Program Dialogue Committee and the mosquito labeling experience.
12. How to expand upon and utilize the Pesticide Program Dialogue Committee or other groups (the marketing and expansion/extension of SFIREG).
3. Atrazine eco-monitoring and mitigation issues/reregistration eligibility decisions, use of label language and best management practices to implement reregistration eligibility decision.
14. AAPCO annual meeting/SFIREG Report.
15. EPA briefing/state issues discussion. Endangered species status. Status and Results of Clean Water Act/FIFRA Guidance Policy. OW and OPP Working Group Activities/Progress.

APPENDIX 5
COMMENTS RECEIVED

No written comments were received from the public concerning Framework 4. The Council received one letter commenting on Framework Adjustment 4 from the U.S. Environmental Protection Agency (EPA), Region III. Specific comments are as follows:

Comment 1: Framework 4 seeks to extend the moratorium on entry into the *Illex* fishery for a period of up to five years while the EIS for Amendment 9 is completed. Amendment 9 considers the *Illex* moratorium expiration issue along with a number of other complex management issues. The EPA suggested that the 2009 expiration date under Framework 4 be used as a fallback until Amendment 9 is completed.

Response 1: The Council agrees with EPA suggestion that Framework 4 act as a bridging mechanism to allow for maintenance of the *Illex* moratorium until the expiration issue can be resolved permanently in Amendment 9. This position is explicitly stated throughout the FEIS. The Council has already developed a draft of Amendment 9 which includes measures which address the *Illex* moratorium expiration issue. The intent of the Council is to have any measures implemented under Amendment 9 supercede actions taken under Framework 4 which relate to the *Illex* moratorium expiration.

Comment 2: The List of Acronyms, although a valuable addition, is generic in nature. It would be helpful if terms associated with the DEIS were defined.

Response 2: Comment noted. Acronyms part of Glossary. Better placed at back of document.

Comment 3: The Executive Summary should mention *Illex* squid and *Loligo* squid first, the follow by *Illex* and *Loligo* as common names.

Response 3: Comment noted. Edits added.

Comment 4: The Introduction should include a brief discussion of the development of the *Illex* fishery moratorium.

Response 4: Comment noted. See page 6 of FEIS.

Comment 5: The description of alternatives should indicate the rationale for considering moratorium extensions of five years versus two years versus indefinitely.

Response 5: Comment noted. See Response 1.

Comment 6: Alternative 1 - It is unclear why a five-year extension is offered.

Response 6: Comment noted. See Response 1.

Comment 7: Alternative 2 - A two-year extension would seem adequate time to complete Amendment 9.

Response 7: Comment noted. See Response 1.

Comment 8: Alternative 3 - The no action alternative would not be favorable.

Response 8: Comment noted. No response required.

Comment 9: Alternative 4 - This alternative (extending the moratorium indefinitely) was rejected because it was considered to be beyond the scope of a framework action. Given that Amendment 9 would supercede the Framework Adjustment 4 time frame, Framework Adjustment 4 would seem reasonable and feasible.

Response 9: Comment noted. See page 13 of FEIS.

Comment 10: The Effects on Essential Fish Habitat section should be expanded.

Response 10: Comment noted. See pages 15 and 81 of FEIS.

Comment 11: The cumulative impacts analysis should be expanded.

Response 11: Comment noted. See pages 89-90 of FEIS.

11/25/03

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

NOV 07 2003

RECEIVED NOV 12 2003 MID-ATLANTIC FISHERY COUNCIL

Mr. Daniel Furlong
Executive Director
Mid-Atlantic Fishery Management Council
Federal Building/room 2115-16
300 South New Street
Dover, Delaware 20230

SUBJ: EPA NEPA Comments on the NOAA Draft Environmental Impact Statement for Framework Adjustment 4 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan; CEQ No. 030428

Dear Mr. Furlong:

The U. S. Environmental Protection Agency (EPA) has reviewed the referenced National Oceanic and Atmospheric Administration's (NOAA) Draft Environmental Impact Statement (DEIS) in accordance with EPA's responsibilities under Section 309 of the Clean Air Act and Section 102 (2)(C) of the National Environmental Policy Act (NEPA). This DEIS provides NEPA documentation for Amendment 4 of the Fishery Management Plan (FMP) for the Atlantic Mackerel, Squid (*Illex*) and Butterfish. This document was prepared by the Mid-Atlantic Fishery Management Council, in cooperation with the National Marine Fisheries Service.

As outlined in this letter, EPA is seeking clarification and additional information on the impacts of the proposed FMP Amendment. We expect that this information will be provided to enable EPA to fully assess the projects impacts. EPA is therefore rating the subject EIS as "EC-2", Environmental Concerns-Insufficient Information. EPA's major issues are summarized below, and our detailed comments are enclosed.

Framework Adjustment 4 proposes to extend the existing moratorium on entering the commercial *Illex* squid fishery. Like most fisheries today, this fishery is overcapitalized. Although moratorium permit holders have been inactive recently (only 15% of vessels with *Illex* moratorium permits produced *Illex* landings in 2001: pg. 56), the fishery in terms of its vessel and permit capacity still has the potential to land about twice the tonnage as the 2002 sustainable yield (24,000 mt). In addition, recent data indicate that the sustainable yield is less than previously calculated. Given that the current moratorium is to expire in July 2004, Adjustment 4 would extend the moratorium for various time frames – either five years (Alt. 1 - preferred alternative), two years (Alt. 2) or indefinitely (Alt. 4). In contrast, the No Action (Alt. 3) would allow the moratorium to expire in 2004.

The extension is reportedly needed to avoid moratorium expiration before NOAA completes its EIS for Amendment 9 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (FMP), since this EIS is experiencing some delays. Amendment 9 is to not only address the *Illex* fishery entry issue, but also other FMP management issues. If the moratorium is allowed to expire before Amendment 9 and its final rule are implemented, the fishery could further expand and be further overcapitalized.

In essence, Framework Adjustment 4 seeks to maintain the status quo (if Alt.1, 2 or 4 is selected) until Amendment 9 and its final rule are completed. However, it should be emphasized that under the extension or under the expiration of the moratorium, the *Illex* fishery could still become more active (i.e., if more moratorium permits are utilized (become active) or if more fishers are allowed entry). Increased activity could result in additional bottom trawl impacts on marine bottom habitat (Essential Fish Habitat: EFH) and other operational and capacity impacts above current levels. However, only with the extension of the moratorium would maintenance of the capacity of the fishery (number of fishers) be ensured at status quo levels.

EPA has no objections to the NOAA/NMFS selection of a five-year extension (2009 sunset) to the current moratorium on entering the commercial *Illex* squid fishery as recommended by the Council. However, we suggest that the 2009 date only be used as a fallback such that efforts are made to complete Amendment 9 well before 2009. This would prevent the data and conditions used in the draft DEIS (April 2003) for Amendment 9 from being dated and allow management issues associated with the overall Atlantic Mackerel, Squid, and Butterfish FMP be implemented earlier. Also, we suggest that Amendment 9 address ways to reduce the capacity of the *Illex* fishery since it is overcapitalized. We also recommend that Amendment 9 evaluate a permanent moratorium and a cut in the total allowable catch if data indicates there is a continued decline in the fishery.

Thank you for the opportunity to review this document. If you have any questions or would like to discuss these comments further, please contact Barbara Okorn at (215)814-3330.

Sincerely,

William Arguto, Leader
NEPA/Federal Facility Team

Specific Comments

- **List of Acronyms** - A List of Acronyms should preferably be included in the front of the Final EIS (FEIS) for the benefit of the public (e.g., F, FMP, SAW, SFA, EEZ). Subsequent NOAA EISs should include such a list. We note and appreciate that a glossary was included as Appendix 2. This glossary, although a valuable addition, is generic in nature such that specific terms associated with this DEIS may not be included (e.g., annual fishery - pg. 9, 70; sunset provision - pg. 1, annual species). It would be helpful if some of these terms were defined in the text.

- **Executive Summary (pg. 1)** - Since *Illex* and *Loligo* squid apparently do not have common names, we suggest that their first mention in the Executive Summary and Introduction indicate that these genera relate to squid (as opposed to mackerel or butterfish, for those public reviewers that are not taxonomists). That is, it would be less confusing if the terms "*Illex* squid" and "*Loligo* squid" were used at first mention, followed by simply *Illex* and *Loligo* used as common names much like mackerel and butterfish. We note that page 1 of the introduction already uses *Illex* instead of *Illex* squid, although *Illex* squid is used in the cover letter.

- **Introduction (pg. 6)** - The introduction should include a brief discussion of why the moratorium for entry into the *Illex* fishery was adopted and explain if the moratorium is having the desired effect. If not, other alternatives, such as closing the fishery or rescinding existing moratorium permits should be explored.

- **Alternatives (pg. 12)** - This description of the alternatives should indicate the rationale for considering moratorium extensions of five years versus two years versus indefinitely (no sunset provision). We also offer the following comments on the presented alternatives:

* *Alt 1* - It is somewhat unclear why a five-year extension is offered and recommended as the preferred alternative by the Mid-Atlantic Fishery Management Council (Council). Although Amendment 9 would address complex issues, we note (pg. 10) that the DEIS for Adjustment 4 indicates that a draft DEIS for Amendment 9 was already provided to NOAA/NMFS for approval in April 2003. Although the draft DEIS was not adopted and there apparently will be delays in EIS issuance, a five-year extension beyond the moratorium expiration date of 2004 (i.e., a 2009 sunset) seems excessive. On the other hand, five years should ensure that the moratorium status quo would continue until Amendment 9 and its final rule are completed and implemented. More importantly, we understand that an earlier implementation of Amendment 9 and its final rule would supercede the Adjustment 4 time frame (pg. 12).

* *Alt 2* - A two-year extension (2006 sunset) would seem to be adequate time to complete Amendment 9 and its final rule considering the status of the DEIS (draft in April 2003). Compared to Alternative 1, Alternative 2 could also have the advantage of expediting the completion of Amendment 9 and its final rule in order to meet the 2006 date. If, however,

Amendment 9 and its final rule are not completed before 2006, Alternative 2 would have the administrative disadvantage of requiring another Framework Adjustment (#5) to extend the moratorium again.

* *Alt 3* - The no action alternative would not be favorable unless Amendment 9 and its final rule could be completed by July 2004 when the current *Illex* moratorium expires.

* *Alt 4* - This alternative proposes to extend the moratorium indefinitely (no sunset). The DEIS indicates that this alternative was "...rejected because it was considered to be beyond the scope of a framework action" (pg. 1). However, given that completion of Amendment 9 would supercede any Adjustment 4 time frame, Alternative 4 would also seem reasonable and feasible.

- **Section 6.1** - Effects on Essential Fish Habitat. An attempt should be made to estimate the effects on Essential Fish Habitat caused by the *Ilex* fishery. Otter trawls used in the fishery disturb and destroy benthic habitats, particularly cobble and gravel substrates that are the essential habitat for juvenile cod and haddock. The NOAA Workshop of Effects of Fishing Gear on Marine Habitat of the Northeastern United States, October 23-25 2001 contains a conceptual habitat impact model for fishing gear. The proceedings of that meeting and a description of the model are available on line at: http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0201/. This estimate of disturbance should also be used in the cumulative impact section of the EIS.

- **Section 6.1** - Cumulative Impacts. A cumulative impact analysis should attempt to integrate and predict the effect of the action being described (whether to reinstate the moratorium to entry into the *Illex* , and for how long) and other reasonably foreseeable actions on the resources in question. In this case, the resources directly effected are the squid population, the fishermen, and the benthic habitat. Although the DEIS does describe the possible cumulative effects to the fishermen, it does not describe the cumulative effect of the *Illex* fishery, other *Illex* mortality (such as by catch in other fisheries) and other fishing gear affects to the population, or the essential fish habitat of *Illex* populations. There is also no cumulative impact analysis of what the *Illex* fishery does to the essential fish habitat of other fish populations.