2007 Atlantic Mackerel, Squid and Butterfish Specifications
Environmental Assessment
Regulatory Impact Review
Final Regulatory Flexibility Analysis
EFH Assessment

August 2006 - Initial Submission
Ocotober 2006 – Final Submission

Prepared by the

Mid-Atlantic Fishery Management Council

In cooperation with the

National Marine Fisheries Service

1.0 Executive Summary

The Mid-Atlantic Fishery Management Council (Council) manages the Atlantic mackerel, squid, and butterfish fisheries pursuant to the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSFCMA), as amended by the Sustainable Fisheries Act (SFA) through the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (FMP). The FMP outlines the requirements of the Council to set annual specifications for the Atlantic mackerel, squid and butterfish fisheries according to national standards specified in the SFA. These fisheries are managed through annual quotas which are based principally on National Standard One which requires that fishing mortality rates not exceed guidelines intended to prevent overfishing. The Council made 2007 recommendations for specifications at its June 2006 meeting and herein submits them to the Regional Administrator, Northeast Region, National Marine Fisheries Service (Regional Administrator). The purpose of this document is to examine the impacts to the environment that would result from the implementation of the 2007 management measures recommended for the Atlantic mackerel, squid and butterfish fisheries. The environmental impacts of the proposed measures were analyzed and the anticipated level of significance of these impacts is discussed in accordance with the National Environmental Policy Act (NEPA) and National Oceanic and Atmospheric Administration Order (NAO) 216-6 formatting requirements for an EA. Because none of the preferred action alternatives are associated with significant impacts to the biological, social or economic, or physical environment, a "Finding of No Significant Impact" has been made.

The proposed specification of Allowable Biological Catch (ABC) under the preferred alternative for Atlantic mackerel for 2007 represents a significant reduction compared to previous specifications and reflects the results of the recently updated stock assessment for Atlantic mackerel which recommended significant reductions in the biological reference points for this stock. However, the proposed specifications of IOY, DAH, DAP, JVP and TALFF for 2007 for Atlantic mackerel represent the status quo. As such, no biological, economic, social, habitat or protected resource impacts are anticipated as a result of the proposed action compared to the fishery as it was prosecuted under the 2006 specifications. The proposed action is consistent with FMP overfishing definition and is based on the most recent stock assessment information. This action is expected to yield positive social and economic benefits by maintaining the sustainability of the resource but should have no consequential impacts on valued ecological components (i.e., biological components including protected resources and physical components including habitat). By lowering the specification of ABC to 186,000 mt, the Council is consistent with both the current overfishing definition and recent stock assessment which downwardly revised the estimate of both F_{msy} and F_{target} for the Northwest Atlantic mackerel stock. This action should protect the stock from overfishing) and allow for long term sustainable use of the resource. Under the preferred alternative the IOY will be specified at 115,000 mt but this amount could be increased up to the ABC level (186,000 mt) during the fishing year through an inseason adjustment by the Regional Administrator.

The proposed specifications for 2007 under the preferred alternative for *Illex* squid represent the 2006 status quo. As such, no biological, economic, social, habitat or protected resource impacts are anticipated as a result of the proposed action compared to the fishery as it was prosecuted under the 2006 specifications. The proposed action is consistent with FMP overfishing definition and is based on the most recent stock assessment information. This action is expected to yield positive social and economic benefits by maintaining the sustainability of the resource but should have no consequential impacts on valued ecological components (i.e., biological components including protected resources and physical components including habitat).

For butterfish, the proposed specifications under the preferred alternative for 2007 represent the 2006 status quo. The preferred alternative would maintain the annual quota at 1,681 mt to achieve the target fishing mortality rate specified in the FMP based on the most recent stock assessment for the species. These measures should result in positive impacts to the butterfish stock by preventing overfishing and improving the chances that the stock will rebuild. The proposed action for butterfish could constrain landings which could have negative economic and social impacts in the near term. However, in the long term the net economic benefits will be positive as the stock is rebuilt and future yields increase. The anticipated impacts on the environment of each alternative are summarized in Table ES-1 below.

The specifications for *Loligo* squid under all three alternatives would be Max OY =26,000 mt, ABC, IOY, DAH, and DAP = 17,000 mt and JVP and TALFF = 0 mt with up to 3% of the ABC could be set-aside for scientific research. In terms of the annual quota, these specifications represent the 2006 status quo. The proposed action is consistent with FMP overfishing definition and is based on the most recent stock assessment information. The alternatives differ primarily in the seasonal allocation of the quota. This action is expected to yield positive social and economic benefits by maintaining the sustainability of the resource but should have no consequential impacts on valued ecological components (i.e., biological components including protected resources and physical components including habitat). The preferred alternative includes a trimester seasonal allocation of the annual quota which should enable NMFS to improve the efficacy of quota monitoring in this fishery. The preferred alternative also includes a provision which would allow *Illex* vessels to retain up to 10,000 pounds of *Loligo* during August if the directed *Loligo* fishery is closed. This measure will allow *Illex* vessels to retain *Loligo* taken incidentally in the directed *Illex* fishery and is intended to reduce regulatory discards. This measure could result in reduced quota in period three depending on the length of the *Loligo* closure in quota period 2 and the level of incidental take in the *Illex* fishery. In addition, the preferred alternative would limit incidental permit holders from landing no more than the trip limit specified in one calendar day which will help prevent quota overages in the *Loligo* fishery.

Table ES-1. Qualitative summary of the expected impacts of various quota specifications considered for 2006 compared to the status quo. A plus sign (+) signifies an expected positive impact, minus sign (-) signifies an expected negative impact and a zero (0) is used for null impact.

Environmental Dimension					
	Managed Resource	Non-target Species	Human Communities	Protected Resources	Essential Fish Habitat
Alternative 1 - Atlantic mackerel (preferred alternative); ABC=186,000 mt, IOY=115,000 mt, DAP=100,000 mt JVP and TALFF=0 mt	+	0	0	0	0
Alternative 2 - Atlantic mackerel (status quo); ABC=335,000 mt, IOY=115,000 mt; JVP and TALFF =0 mt	-	0/-	0/+	0/-	0/-
Alternative 3 - Atlantic mackerel; ABC=204,000 mt, IOY=115,000 mt; JVP and TALFF=0 mt	0/+	0	0	0	0
Alternative 1 - *Illex* (status quo and preferred alternative); DAH=24,000 mt	0	0	0	0	0
Alternative 2 - *Illex*; DAH=30,000 mt	-	-	0/+	-	-
Alternative 3 - *Illex*; DAH=19,000 mt	0	0	-	0	0
Alternative 1 - butterfish (status quo and preferred); DAH=1,681 mt	0	0	0	0	0
Alternative 2 - butterfish; DAH=5,900 mt	-	-	+	0/-	0/-
Alternative 3 - butterfish; DAH=9,131 mt	-	-	+	0/-	0/-
Alternative 1 - *Loligo* (preferred); DAH=17,000, trimester seasonal allocation with quota period 2 divided into two month periods; 10,000 lb *Loligo* per trip for *Illex* vessels if directed *Loligo* fishery is closed in August; limit incidental catch vessels to one landing per calendar day	0	0	0/+	0	0
Alternative 2 - *Loligo*; DAH=17,000, trimester seasonal allocation; 10,000 lb *Loligo* per trip for *Illex* vessels during August *Loligo* closures; limit incidental catch vessels to one landing per calendar day	0	0	0/+	0	0
Alternative 3 - *Loligo* (status quo); DAH=17,000; quarterly seasonal allocation	0	0	0	0	0

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2.0 LIST OF ACRONYMS

ASMFC	Atlantic States Marine Fisheries Commission or Commission
B	Biomass
CEQ	Council on Environmental Quality
DAH	Domestic Annual Harvest
DAP	Domestic Annual Processing
DPS	Distinct Population Segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
E.O.	Executive Order
ESA	Endangered Species Act of 1973
F	Fishing Mortality Rate
FR	Federal Register
FMP	Fishery Management Plan
GRA	Gear Restricted Area
HPTRP	Harbor Porpoise Take Reduction Plan
IRFA	Initial Regulatory Flexibility Analysis
IOY	Initial Optimal Yield
JVP	Joint Venture Processing
LTPC	Long-term Potential Catch
LWTRP	Large Whale Take Reduction Plan
M	Natural Mortality Rate
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistical Survey
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
mt	metric tons
NAO	National Oceanic and Atmospheric Administration Order
NE	New England
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PBR	Potential Biological Removal
PRA	Paperwork Reduction Act
PREE	Preliminary Regulatory Economic Evaluation
RIR	Regulatory Impact Review
RSA	Research Set-Aside

SAFMC	South Atlantic Fishery Management Council
SARC	Stock Assessment Review Committee
SAV	Submerged Aquatic Vegetation
SAW	Stock Assessment Workshop
SSB	Spawning Stock Biomass
SFA	Sustainable Fisheries Act
TAL	Total Allowable Landings
TALFF	Total Allowable Level OF Foreign Landings
TL	Total Length
VECs	Valuable Environmental Components
VMS	Vessel Monitoring System
VPA	Virtual Population Analysis
VTR	Vessel Trip Report

3.0 List of Tables, Figures and Maps

3.1 List of Tables

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4.0 Introduction and Background of Annual Specification Process

The Mid-Atlantic Fishery Management Council (Council) manages the Atlantic mackerel, squid, and butterfish fisheries pursuant to the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSFCMA), as amended by the Sustainable Fisheries Act (SFA) through the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (FMP). The FMP outlines the requirements of the Council to set annual specifications for the Atlantic mackerel, squid and butterfish fisheries according to national standards specified in the SFA. These fisheries are managed through quotas which are based principally on National Standard One which requires that fishing mortality rates not exceed guidelines established in the SFA. The Council considered the 2007 recommendations for specifications for all four species in the management unit at its June and August 2006 meetings and herein submits them to the Regional Administrator. This document not only serves as a vehicle for the Council's formal submission of recommendations for 2007 specifications, but also contains analyses upon which the recommendations are based.

4.1 Purpose of and Need for the Action

Regulations implementing the Atlantic Mackerel (*Scomber scombrus*), Squid (*Loligo pealei* and *Illex illecebrosus*), and Butterfish (*Peprilus triacanthus*) FMP prepared by the Mid-Atlantic Fishery Management Council appear at 50 CFR Part 648. These regulations stipulate that the Secretary will publish a notice specifying the initial annual amounts of the initial optimum yield (IOY) as well as the amounts for allowable biological catch (ABC) domestic annual harvest (DAH), domestic annual processing (DAP), joint venture processing (JVP), and total allowable levels of foreign fishing (TALFF) for the species managed under the FMP. The requirement to specify annual quotas and other measures was established in the original FMP for each species. In the case of *Loligo*, current regulations allow for the specification of measures for a period of up to three years (subject to annual review). However, the Council has chosen to specify the measures proposed herein for *Loligo* for a period of one year only (i.e., 2007).

These specifications are required pursuant to the implementing regulations of this FMP. The term IOY is used in this fishery to reinforce the fact that the Regional Administrator may alter this specification up to the ABC if economic and social conditions warrant an increase. Therefore, this specification is no different than OY or optimum yield. No reserves are permitted under the FMP for any of these species. Procedures for determining the initial annual amounts are found in §648.21. They were most recently modified in Amendment 8 to the FMP.

Amendment 5 specified that the Atlantic Mackerel, Squid, and Butterfish Monitoring Committee will annually review the best available data including, but not limited to, commercial and recreational catch/landing statistics, current estimates of fishing mortality, stock status, the most recent estimates of recruitment, virtual population analysis results, target mortality levels, beneficial impacts of size/mesh regulations, and the level of noncompliance by fishermen or States. Amendment 5 also requires the Monitoring Committee to use this data to recommend to the Council Committee commercial (annual quota, minimum fish size, and minimum mesh size) and recreational (possession and size limits and seasonal closures) measures designed to assure that the target harvest level (OY) for Atlantic mackerel, squid, or butterfish is not exceeded. The

Council received the report of the Committee at its June 2006 meeting and herein makes its recommendations to the Regional Administrator.

The 2007 specifications are needed to prevent overfishing and to achieve optimum yield. The purpose of the specifications is to establish annual quotas and other measures that will meet this need. Optimum yield is defined as the amount of fish which will provide the greatest overall benefit to the Nation in terms of food production and recreational opportunities and is based on the maximum sustainable yield for each managed species. Failure to specify annual quotas and other management measures could result in overfishing and failure to achieve optimum yield. In the case of *Loligo*, failure to implement these measures could result in derby fisheries with associated economic consequences for communities dependent on the *Loligo* fishery. In the case of mackerel, failure to implement the proposed measures would result in the specification of an ABC which is too high, which in turn could result in overfishing and eventual stock depletion.

4.2 MANAGEMENT OBJECTIVES OF THE FMP

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.

The annual quota specifications are designed to achieve optimum yield which is based primarily on maximum sustainable yield. By maintaining harvest levels consistent with maximum sustained yield, the Council increases the probability that successful recruitment will occur for each of the managed species. By definition, maintenance of the stocks at levels that produce maximum sustainable yield should result in average levels of recruitment to the stocks. The specification of the quota for Atlantic mackerel provides for both commercial and recreational allocation of the mackerel resource which helps to achieve objectives two, three and six. The seasonal allocation of the *Loligo* quota is intended, in part, to help achieve objective three. The quota specifications for all four species in the management unit are designed to achieve optimum yield in each fishery.

5.0 MANAGEMENT ALTERNATIVES

The alternatives were selected based on the evaluation of a range of quota specifications that correspond to biologically based reference points (as specified in the FMP) and various assumptions about stock status. In all cases, the quota recommended by the Council under the preferred alternative for each species is based on the yield or level of catch associated with the overfishing definition specified in the FMP, as modified by relevant economic or social factors. These yield estimates are based on the national standard benchmark of maximum sustainable

yield as specified in the SFA, as modified in the FMP to a lower "target" level to assure that the overfishing threshold is not exceeded. Additional alternatives to the target yield levels specified in the FMP that were examined include changes/reductions from the reference level yield based on assumptions about current stock size or other factors such as economic considerations or reductions to the allowable yield to account for discard mortality. In each case below, the status quo alternative is equivalent to the no action alternative because the current regulations contain a "roll-over" provision. This provision specifies that if the Regional Administrator fails to publish annual quota specifications before the start of the new fishing year, then the previous years' quota specifications shall remain effect. Thus, by default, the no action alternative maintains the status quo.

5.1 Alternatives for Atlantic mackerel

5.1.1 Alternative 1 for Atlantic mackerel (preferred alternative)

The specifications under this alternative would be ABC = 186,000 mt, IOY=115,000 mt, DAH=115,000 mt, DAP=100,000 mt and JVP=0 and TALFF=0 mt (the DAH specification includes an allocation of 15,000 mt to the recreational fishery as per the FMP). This represents the most restrictive alternative in terms of ABC which was considered by the Council. Implicit in this alternative is the ability of the Regional Administrator to increase the IOY up to, but not to exceed, the ABC specification through an in-season adjustment (see section 648.21 of the Federal Code of Regulations).

5.1.2 Alternative 2 for Atlantic mackerel (status quo/no action)

The specifications under this alternative would be ABC = 335,000 mt, IOY=115,000 mt, DAH=115,000 mt, DAP=100,000 mt and JVP=0 and TALFF=0 mt (the DAH specification includes an allocation of 15,000 mt to the recreational fishery as per the FMP). This represents the least restrictive alternative in terms of ABC which was considered by the Council.

5.1.3 Alternative 3 for Atlantic mackerel

The specifications under this alternative would be ABC = 204,000 mt, IOY=115,000 mt, DAH=115,000 mt, DAP=100,000 mt and JVP=0 and TALFF=0 mt (this includes an allocation of 15,000 mt to the recreational fishery as per the FMP).

5.2 Alternatives for *Illex*

5.2.1 Alternative 1 for *Illex* (2006 status quo/no action/preferred alternative)

The specifications under this alternative would be Max OY, ABC, IOY, DAH, and DAP = 24,000 mt and JVP and TALFF = 0 mt.

5.2.2 Alternative 2 for *Illex*

The specifications under this alternative would be Max OY, ABC, IOY, DAH, and DAP = 30,000 mt and JVP and TALFF = 0 mt. This represents the least restrictive alternative in terms of ABC for *Illex* which was considered by the Council.

5.2.3 Alternative 3 for *Illex*

The specifications under this alternative would be Max OY =24,000 mt, ABC, IOY, DAH, and DAP = 19,000 mt and JVP and TALFF = 0 mt. This represents the most restrictive alternative in terms of ABC for *Illex* which was considered by the Council.

5.3 Alternatives for Butterfish

5.3.1 Alternative 1 for butterfish (2006 status quo/no action/preferred alternative)

The specifications under this alternative would be Max OY = 12,175 mt, ABC = 4,545 mt, and IOY, DAH, and DAP = 1,681 mt and JVP and TALFF = 0 mt. This represents the most restrictive alternative in terms of ABC for butterfish which was considered by the Council.

5.3.2 Alternative 2 for butterfish

The specifications under this alternative would be Max OY = 16,000 mt, ABC = 7,200 mt, and IOY, DAH, and DAP = 5,900 mt and JVP and TALFF = 0 mt.

5.3.3 Alternative 3 for butterfish

The specifications under this alternative would be Max OY = 12,175 mt and ABC = 12,175 mt, and IOY, DAH, and DAP = 9,131 mt and JVP and TALFF = 0 mt. This represents the least restrictive alternative in terms of ABC for butterfish which was considered by the Council.

5.4 Alternatives for *Loligo* squid

In the case of *Loligo*, current regulations allow for the specification of management measures for a period of up to three years (subject to annual review). However, the Council has chosen to specify the measures proposed herein for *Loligo* for a period of one year only (i.e., 2007).

5.4.1 Alternative 1 for *Loligo* (2007 preferred alternative quota with trimester quota period allocations and quota period 2 divided into bimonthly subperiods)

The specifications under this alternative would be Max OY =26,000 mt, ABC, IOY, DAH, and DAP = 17,000 mt and JVP and TALFF = 0 mt (up to 3% of the ABC could be set-aside for scientific research). In terms of the annual quota, these specifications represent the 2004-2006 status quo, but the quota specified would be allocated amongst three four month quota periods as follows: January-April (43%), May-August (17%) and September-December (40%).

Under this alternative, the directed fishery during the first trimester period would be closed when 90% of the amount allocated to the period was landed and then a trip limit of 2,500 pounds will remain in effect until quota 1 period ends. Quota period 2 would reopen on May 1, 2007 and the directed fishery will remain open until 90% of the quota period 2 allocation is taken, unless 45% of the quota period 2 allocation is taken prior to July 1, 2007 in which case the directed fishery would be closed and a trip limit of 2,500 pounds would remain in effect until July 1, 2007. The directed fishery would reopen on July 1, 2007. As noted above, quota period 2 would be closed when 90% of the quota period 2 allocation is taken and a 2,500 pound trip limit would remain in effect for the remainder of the period. Any underages from trimesters one and two will be applied to the next trimester and overages will be deducted from trimester three. The directed fishery will be closed for the remainder of the fishing year when 95% of the annual quota has been taken. The intent of the Council is for the fishery to operate at the 2,500 trip limit level for the remainder of the fishing year.

The annual specifications under this alternative would also include a 10,000 pound trip limit for *Illex* moratorium vessels during August if the directed fishery for *Loligo* is closed. To qualify for this trip limit, *Illex* moratorium vessels must be fishing for *Illex* east of the small mesh exemption line and possess a minimum of 10,000 pounds of *Illex* on board. In addition, open access incidental catch permit holders would be limited to landing no more than the incidental catch amount specified for *Loligo* squid in one calendar day.

5.4.2 Alternative 2 for *Loligo* (trimester allocation of quota)

The specifications under this alternative would be Max OY =26,000 mt, ABC, IOY, DAH, and DAP = 17,000 mt and JVP and TALFF = 0 mt (up to 3% of the ABC could be set-aside for scientific research). In terms of the annual quota, these specifications represent the 2004-2006 status quo, with the exception that the quota specified would be allocated amongst three four month quota periods as follows: January-April (43%), May-August (17%) and September-December (40%). The directed fishery during the first two trimester periods would be closed when 90% of the amount allocated to the period was landed and then a trip limit of 2,500 pounds will remain in effect until the quota period ends. Any underages from trimesters one and two will be applied to the next trimester and overages will be deducted from trimester three. The directed fishery will be closed when 95% of the annual quota has been taken. The intent of the Council is for the fishery to operate at the 2,500 trip limit level for the remainder of the fishing year.

The annual specifications under this alternative would also include a 10,000 pound trip limit for *Illex* moratorium vessels during August if the directed fishery for *Loligo* is closed. To qualify for this trip limit, *Illex* moratorium vessels must be fishing for *Illex* east of the small mesh exemption line and possess a minimum of 10,000 pounds of *Illex* on board. In addition, open access incidental catch permit holders would be limited to landing no than the incidental catch amount specified for *Loligo* squid in one calendar day.

5.4.2 Alternative 3 for *Loligo* (No action/2004-2006 status quo quota with quarterly allocation)

The specifications under this alternative would be Max OY =26,000 mt, ABC, IOY, DAH, and DAP = 17,000 mt and JVP and TALFF = 0 mt (up to 3% of the ABC could be set-aside for scientific research). In terms of the annual quota, these specifications represent the 2004-2006 status quo with the quota allocated amongst four quarterly quota periods. The quota allocations among quarters will be as follows: Quarter 1: 5,649.1 mt (33.23%), Quarter 2: 2,993.7 mt, (17.61%),Quarter 3: 2,941 mt (17.3 %),Quarter 4: 5,416.2 mt (31.86 %). In addition, the Council recommended for Quarters 1 through 3, that the directed fishery be closed when 80% of the quarter's allocation is taken and that vessels be restricted to a 2,500 pound trip limit for the remainder of the quarter. In addition, the Council recommended that quarterly overages be deducted as follows: an overage in quarter 1 will be deducted from quarter 3 and an overage in quarter 2 will be deducted from quarter 4. Underages from quarters 2 and 3 are to be added to quarter 4 by default based on the 95% closure rule for the annual quota. When 95% of the total annual quota has been taken (i.e., 16,150 mt) the trip limit will be reduced to 2,500 pounds and will in remain in effect for the rest of the fishing year. In the 2002 specifications, if the first quarter landings were less than 80% of the first quarter allocation, the underage below 80% of the quarter was to be applied to quarter 3.

6.0 DESCRIPTION OF AFFECTED ENVIRONMENT AND FISHERIES

This section serves to identify and describe the *valued ecosystem components* (VECs; Beanlands and Duinker 1984) that are likely to be directly or indirectly affected by the actions proposed in this document. These VECs comprise the affected environment within which the proposed actions will take place. Following the guidance provided by the Council on Environmental Quality (CEQ 1997), the VECs are identified and described here as a means of establishing a baseline for the impact analysis that will be presented in the subsequent document section (section 7 Analysis of Impacts). The significance of the various impacts of the proposed actions on the VECs will ultimately be determined from a cumulative effects perspective.

As indicated in CEQ (1997), one of the fundamental principles of cumulative effects analysis, is that "… the list of environmental effects must focus on those that are truly meaningful." As such, the range of VECs is described in this section is limited to those for which a reasonable likelihood of meaningful impacts could potentially be expected. These VECs are listed below.

1. Managed resources (Atlantic mackerel, *Loligo* and *Illex* squid and butterfish)
2. Non-target species
3. Habitat including EFH for the managed resources and non-target species
4. Endangered and other protected resources
5. Human communities

6.1 Physical Environment

The principal area within which the Atlantic mackerel, squid and butterfish fisheries are prosecuted is the Northeast Shelf Ecosystem which includes the area from the Gulf of Maine south to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream (Figure 1). A number of distinct subsystems comprise the region, including the Gulf of Maine, Georges Bank, and Mid-Atlantic Bight. The Gulf of Maine is an enclosed coastal sea, characterized by relatively cold waters and deep basins, with a patchwork of various sediment types. Georges Bank is a relatively shallow coastal plateau that slopes gently from north to south and has steep submarine canyons on its eastern and southeastern edge. It is characterized by highly productive, well-mixed waters and fast-moving currents. The Mid-Atlantic Bight is comprised of the sandy, relatively flat, gently sloping continental shelf from southern New England to Cape Hatteras, NC.

Climate, physiographic, and hydrographic differences separate the Atlantic ocean from the Gulf of Maine to Florida into two distinct areas, the New England-Middle Atlantic Area and the South Atlantic Area, with the natural division occurring at Cape Hatteras. These differences result in major zoogeographic faunal changes at Cape Hatteras. The New England region from Nantucket Shoals to the Gulf of Maine includes Georges Bank, one of the world's most productive fishing grounds. The Gulf of Maine is a deep cold water basin, partially sealed off from the open Atlantic by Georges and Browns Banks, which fall off sharply into the continental shelf.

The New England-Middle Atlantic area is fairly uniform physically and is influenced by many large coastal rivers and estuarine areas including Chesapeake Bay, the largest estuary in the United States; Narragansett Bay; Long Island Sound; the Hudson River; Delaware Bay; and the nearly continuous band of estuaries behind the barrier beaches from southern Long Island to Virginia. The southern edge of the region includes the estuarine complex of Currituck, Albemarle, and Pamlico Sounds, a 2500 square mile system of large interconnecting sounds behind the Outer Banks of North Carolina (Freeman and Walford 1974 a-d, 1976 a and b).

The South Atlantic region is characterized by three long crescent shaped embayments, demarcated by four prominent points of land, Cape Hatteras, Cape Lookout, and Cape Fear in North Carolina, and Cape Romain in South Carolina. Low barrier islands occur along the coast south of Cape Hatteras with concomitant sounds that are only a mile or two wide. These barriers become a series of large irregularly shaped islands along the coast of Georgia and South Carolina separated from the mainland by one of the largest coastal salt-water marsh areas in the world. Similarly, a series of islands border the Atlantic coast of Florida. These barriers are separated in the north by broad estuaries which are usually deep and continuous with large coastal rivers, and in the south by narrow, shallow lagoons (Freeman and Walford 1976 b-d).

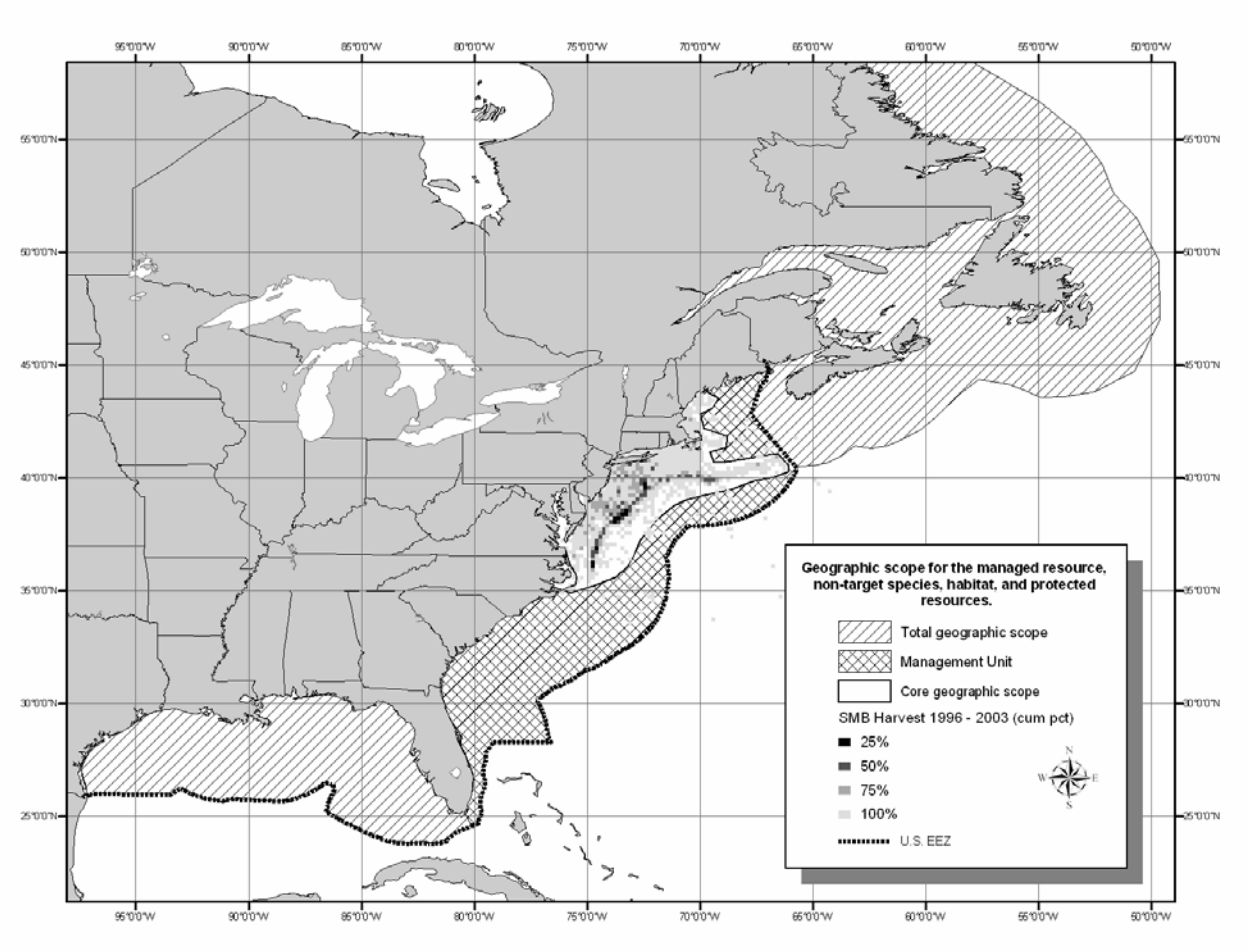

Figure 1. Geographic scope of the Atlantic mackerel, squid and butterfish fisheries.

The continental shelf (characterized by water less than 650 ft in depth) extends seaward approximately 120 miles off Cape Cod, narrows gradually to 70 miles off New Jersey, and is 20 miles wide at Cape Hatteras. South of Cape Hatteras, the shelf widens to 80 miles near the Georgia-Florida border, narrows to 35 miles off Cape Canaveral, Florida and is 10 miles or less off the southeast coast of Florida and the Florida Keys. The shelf is at its narrowest, reaching seaward only 1.5 miles, off West Palm Beach, Florida.

Surface circulation is generally southwesterly on the continental shelf during all seasons of the year, although this may be interrupted by coastal indrafting and some reversal of flow at the northern and southern extremities of the area. Water temperatures range from less than 33 ^{o}F in the New York Bight in February to over 80 ^{o}F off Cape Hatteras in August. Coastwide, an annual salinity cycle occurs as the result of freshwater stream flow and the intrusion of slope water from offshore. Water salinities nearshore average 32 ppt, increase to 34-35 ppt along the shelf edge, and exceed 36.5 ppt along the main lines of the Gulf Stream.

6.2 Biology of the Managed Resources

6.2.1 Atlantic mackerel

Atlantic mackerel is a fast swimming, pelagic, schooling species distributed between Labrador (Parsons 1970) and North Carolina (Anderson 1976a). The existence of separate northern and southern spawning contingents was first proposed by Sette (1950). The southern group spawns primarily in the Mid-Atlantic Bight during April-May while the northern group spawns in the Gulf of St. Lawrence in June-July. Both groups overwinter between Sable Island (off Nova Scotia) and Cape Hatteras in water generally warmer than 45 F (USDC 1984a).

Both groups make extensive northerly (spring) and southerly (autumn) migrations to and from spawning and summer feeding grounds. The southern contingent begins its spring migration from waters off North Carolina and Virginia in March- April, and moves steadily northward, reaching New Jersey and Long Island usually by April-May, where spawning occurs. These fish may spend the summer as far north as the Maine coast. In autumn this contingent moves southward and returns to deep offshore water near Block Island after October (Hoy and Clark 1967).

The northern contingent arrives off southern New England in late May, and moves north to Nova Scotia and the Gulf of St. Lawrence where spawning occurs usually by July (Hoy and Clark 1967, Bigelow and Schroeder 1953). This contingent begins its southerly autumn migration in November and December and disappears into deep water off Cape Cod.

Even though there are two spawning groups of mackerel in the Northwest Atlantic, biochemical studies (Mackay 1967) have not established that genetic differences exist between them. These two contingents intermingle off southern New England in spring and autumn (Sette 1950). Tagging studies reported by Beckett *et al.* (1974), Parsons and Moores (1974) and Moores *et al.* (1975) indicate that some mackerel that summer at the northern extremity of the range overwinter south of Long Island. Precise estimates of the relative contributions of the two contingents cannot be made (ICNAF 1975). Both contingents have been fished by the foreign winter fishery and no attempt was made to separate these populations for assessment purposes by the International Commission for the Northwest Atlantic Fisheries (ICNAF), although separate Total Allowable Catches (TAC) were in effect for Subareas 5 and 6 and for areas to the north from 1973- 1977. Since 1975 all mackerel in the northwest Atlantic have been assessed as a unit stock (Anderson 1982). Thus, Atlantic mackerel are considered one stock for fishery management purposes.

Mackerel spawning occurs during spring and summer and progresses from south to north. The southern contingent spawns from mid-April to June in the Mid-Atlantic Bight and the Gulf of Maine and the northern contingent spawns in the southern Gulf of St. Lawrence from the end of May to mid-August (Morse 1978). Most spawn in the shoreward half of continental shelf waters, although some spawning extends to the shelf edge and beyond. Spawning occurs in surface water temperatures of 45-57 ^{o}F, with a peak around 50-54 ^{o}F (Grosslein and Azarovitz 1982).

All Atlantic mackerel are sexually mature by age 3, while about 50% of the age 2 fish are mature. Average size at maturity is about 10.5-11" FL (Grosslein and Azarovitz 1982). Growth is very rapid with fish reaching 7.9 in (20 cm) by their first autumn (Anderson and Paciorkowski 1978). The maximum age observed is 17 years (Pentilla and Anderson 1976). Fecundity estimates ranged from 285,000 to 1.98 million eggs for southern contingent mackerel between 12-17" FL. Analysis of egg diameter frequencies indicated that mackerel spawn between 5 and 7 batches of eggs per year. The eggs are 0.04-0.05" in diameter, have one 0.1" oil globule, and generally float in the surface water layer above the thermocline or in the upper 30- 50'. Incubation depends primarily on temperature; it takes 7.5 days at 52 ^{o}F, 5.5 days at 55 ^{o}F, and 4 days at 61^{o}F (Grosslein and Azarovitz 1982).

Mackerel are 0.1" long at hatching, grow to about 2" in two months, and reach a length of 8" in December, near the end of their first year of growth. During their second year of growth they reach about 10" in December, and by the end of their fifth year they grow to an average length of 13" FL. Fish that are 10-13 years old reach a length of 15-16" (Grosslein and Azarovitz 1982). MacKay (1973) and Dery and Anderson (1983) have found an inverse relationship between growth and year class size.

Atlantic mackerel are opportunistic feeders that can ingest prey either by individual selection of organisms or by passive filter feeding (Pepin *et al.* 1988). Larvae feed primarily on zooplankton. Juveniles eat mostly small crustaceans such as copepods, amphipods, mysid shrimp and decapod larvae. They also feed on small pelagic molluscs (*Spiratella* and *Clione*) when available. Adults feed on the same food as juveniles but diets also include a wider assortment of organisms and larger prey items. For example, euphausid, pandalid and crangonid shrimp are common prey; chaetognaths, larvaceans, pelagic polychaetes and larvae of many marine species have been identified in mackerel stomachs. Immature mackerel begin feeding in the spring; older fish feed until gonadal development begins, stop feeding until spent and then resume prey consumption (Berrien 1982).

Predation has a major influence on the dynamics of Northwest Atlantic mackerel (Overholtz *et al.* 1991b). In fact, predation mortality is probably the largest component of natural mortality on this stock, and based on model predictions, may be higher than previously thought (Overholtz *et al.* 1991b). Atlantic mackerel serve as prey for a wide variety of predators including other mackerel, dogfish, tunas, bonito, striped bass, Atlantic cod (small mackerel), and squid, which feed on fish <4-5.2 in (10 to 13 cm) in length. Pilot whales, common dolphins, harbor seals, porpoises and seabirds are also significant predators (Smith and Gaskin 1974; Payne and Selzer 1983; Overholtz and Waring 1991; Montevecchi and Myers 1995). Other predators include swordfish, bigeye thresher, thresher, shortfin mako, tiger shark, blue shark, dusky shark, king mackerel, thorny skate, silver hake, red hake, bluefish, pollock, white hake, goosefish and weakfish (Scott and Tibbo 1968; Maurer and Bowman 1975; Stillwell and Kohler 1982, 1985; Bowman and Michaels 1984).

6.2.2 *Loligo pealei*

Statolith ageing studies of *Loligo pealeii* have indicated a life span of less than one year (Macy 1992, Brodziak and Macy 1996). Consequently, all recent stock assessments for *Loligo* have

been conducted under the assumption that the species has a semelparous (i.e., annual) life-cycle and has the capacity to spawn throughout the year (NMFS 1994), as now appears typical of pelagic squid species studied throughout the world (Jereb *et a*l. 1991).

Loligo eggs are collected in gelatinous capsules as they pass through the female's oviduct during mating. Each capsule is about 3" long and 0.4" in diameter. Mating activity among captive *Loligo* was initiated when clusters of newly spawned egg capsules were placed in the tank. During spawning the male cements bundles of spermatophores into the mantle cavity of the female, and as the capsule of eggs passes out through the oviduct its jelly is penetrated by the sperm. The female then removes the egg capsule and attaches it to a preexisting cluster of newly spawned eggs. The female lays between 20 and 30 of these capsules, each containing 150 to 200 large (about 0.05"), oval eggs, for a total of 3,000 to 6,000 eggs. These clusters of demersal eggs, with as many as 175 capsules per cluster, are found in shallow waters (10-100') and may often be found washed ashore on beaches (Grosslein and Azarovitz 1982).

The diet of *Loligo* changes with increasing size; small immature individuals feed on planktonic organisms (Vovk 1972a, Tibbetts 1977) while larger individuals feed on crustaceans and small fish (Vinogradov and Noskov 1979). Cannibalism is observed in individuals larger than 2 in (5 cm) (Whitacker 1978). Juveniles 1.6-2.4 in (4.1-6 cm) long fed on euphausiids and arrow worms, while those 2.4-4 in (6.1-10 cm) fed mostly on small crabs, but also on polychaetes and shrimp (Vovk and Khvichiya 1980, Vovk 1985). Adults 4.8-6.4 in (12.1-16 cm) long fed on fish (Clupeids, Myctophids) and squid larvae/juveniles, and those >6.4 in (16 cm) fed on fish and squid (Vovk and Khvichiya 1980, Vovk 1985). Fish species preyed on by *Loligo* include silver hake, mackerel, herring, menhaden (Langton and Bowman 1977), sand lance, bay anchovy, menhaden, weakfish, and silversides (Kier 1982). Maurer and Bowman (1985) demonstrated seasonal and inshore/offshore differences in diet: in the spring in offshore waters, the diet was composed of crustaceans (mainly euphausiids) and fish; in the fall in inshore waters, the diet was composed almost exclusively of fish; and in the fall in offshore waters, the diet was composed of fish and squid.

Juvenile and adult *Loligo* are preyed upon by many pelagic and demersal fish species, as well as marine mammals and diving birds (Lange and Sissenwine 1980, Vovk and Khvichiya 1980, Summers 1983). Marine mammal predators include long-finned pilot whale, *Globicephala melas*, and common dolphin, *Delphinus delphis* (Waring *et al.* 1990, Overholtz and Waring 1991, Gannon *et al.* 1997). Fish predators include bluefish, sea bass, mackerel, cod, haddock, pollock, silver hake, red hake, sea raven, spiny dogfish, angel shark, goosefish, dogfish and flounder (Maurer 1975, Langton and Bowman 1977, Gosner 1978, Lange 1980).

6.2.3 *Illex illecebrosus*

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).

Illex is a terminal spawner with a protracted spawning season. There have been no direct observations of spawning in nature, but speculation about the timing and location of the winter spawning period is based on squid size and timing of advanced male maturity stagesO', back-calculated hatch dates from aging studies, and the collection of hatchlings (O'Dor and Dawe 1998). The winter spawning area is believed to be south of Cape Hatteras over the Blake Plateau (Black *et al.* 1987), but other spawning occurs between the Florida Peninsula and central New Jersey at depths down to 990 ft (300 m; Fedulov and Froerman 1980). Some spawning may also occur in the northern part of the Gulf Stream/Slope Water frontal zone (Dawe and Beck 1985, O'Dor and Balch 1985, Rowell et al 1985). However, the only confirmed spawning area is located in the mid-Atlantic Bight where a large number of mated females have been collected during May in the vicinity of the US fishing grounds (Hendrickson, 2004). Mated females, indicating spawning shortly thereafter, have also been collected from Illex fishery samples during multiple years (Hendrickson and Hart, 2006).

Short-finned squid feed primarily on fish, cephalopods (i.e. squid) and crustaceans. Fish prey include the early life history stages of Atlantic cod, Arctic cod and redfish (Squires 1957, Dawe *et al.* 1997), sand lance (Dawe *et al.* 1997), mackerel and Atlantic herring (O'Dor *et al.* 1980, Wigley 1982, Dawe *et al.* 1997), haddock and sculpin (Squires 1957). *Illex* also feed on adult capelin (Squires 1957, O'Dor *et al.* 1980, Dawe *et al.* 1997), smelt and mummichogs (O'Dor *et al.* 1980). Cannibalism is significant, and *Illex* also feed on long-finned squid, *Loligo pealei* (Vinogradov 1984). Maurer and Bowman (1985) have demonstrated a seasonal shift in diet. When *Illex* are offshore in the spring, they primarily consume euphausiids, whereas they consume mostly fish and squid when they are inshore in the summer and fall. Individuals 2.4-4 in (6-10 cm) and 10.4-12 in (26-30 cm) ate mostly squid, 4.4-6 in (11-15 cm) *Illex* ate mostly crustaceans and fish, and those 6.4-8 in (16-20 cm) ate mostly crustaceans. Perez (1994) also demonstrated an ontogenetic shift in diet, as short-finned squid consume less crustaceans and more fish as they grow larger.

Numerous species of pelagic and benthic fishes are known to prey extensively on *Illex*, including bluefin tuna (Butler 1971), silver hake and red hake (Vinogradov 1972). Other fish predators include bluefish (Maurer 1975, Buckel 1997), goosefish (Maurer 1975, Langton and Bowman 1977), four-spot flounder (Langton and Bowman 1977), Atlantic cod (Lilly and Osborne 1984), sea raven (Maurer 1975), spiny dogfish (Templeman 1944, Maurer 1975), and swordfish (Langton and Bowman 1977, Stillwell and Kohler 1985, Scott and Scott 1988). Mammalian predators include pilot whales (Squires 1957, Wigley 1982) and the common dolphin (Major 1986). Seabird predators include shearwaters, gannets and fulmars (Brown *et al.* 1981). Short-finned squid are known to exhibit a variety of defense mechanisms in order to reduce predation, such as camouflage coloration, (O'Dor 1983), schooling behavior, direction changes and ink release (Major 1986).

6.2.4 Butterfish

Butterfish spawning takes place chiefly during summer (June- August) in inshore waters generally less than 100' deep. The times and duration of spawning are closely associated with changes in surface water temperature. The minimum spawning temperature is approximately 60 ^{o}F. Peak egg production occurs in Chesapeake Bay in June and July, off Long Island and Block Island in late June and early July, in Narragansett Bay in June and July, and in Massachusetts Bay June to August (Grosslein and Azarovitz 1982).

Butterfish eggs are found throughout the New York Bight and on Georges Bank, and they occur in the Gulf of Maine, but larvae appear to be relatively scarce east and north of Nantucket Shoals. In 1973, from mid-June to early September, larvae were common in the plankton off Shoreham, NY. Post larvae and juveniles were common in plankton net samples taken in August in the vicinity of Little Egg Inlet, NJ. Juveniles 3-4" long have been taken in Rhode Island waters in late October (Grosslein and Azarovitz 1982).

Growth is fastest during the first year and decreases each year thereafter. Young of the year butterfish collected in October trawl surveys (at about 4 months old) average 4.8" long. Fish about 16 months old are 6.6", at about 28 months old fish are 6.8", and at 40 months old they are 7.8". Maximum age is reported as six years. More recent studies showed that the population was composed of four age groups ranging from young of the year to over age three (Grosslein and Azarovitz 1982). Some butterfish are sexually mature at age one, but all are sexually mature by age two (Grosslein and Azarovitz 1982).

Butterfish feed mainly on planktonic prey, including thaliaceans (primarily Larvacea and Hemimyaria), molluscs (primarily squids), crustaceans (copepods, amphipods, and decapods), colenterates (primarily hydrozoans), polychaetes (primarily Tomopteridae and Goniadidae), small fishes, and ctenophores (Fritz 1965, Leim and Scott 1966, Haedrich 1967, Horn 1970a, Schreiber 1973, Mauer and Bowman 1975, Tibbets 1977, Bowman and Michaels 1984).

Butterfish are preyed on by many species including haddock, silver hake, goosefish, weakfish, bluefish, swordfish, sharks (hammerhead), and *Loligo* (Bigelow and Schroeder 1953, Scott and Tibbo 1968, Horn 1970a, Maurer and Bowman 1975, Tibbets 1977, Stillwell and Kohler 1985, Brodziak 1995a).

6.3 Habitat (Including Essential Fish Habitat (EFH))

Pursuant to the Magnuson Stevens Act / EFH Provisions (50 CFR Part 600.815 (a)(1)), an FMP must describe EFH by life history stage for each of the managed species in the plan. This information was previously described in Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish FMP. EFH for the managed resource is described using fundamental information on habitat requirements by life history stage that was summarized in a series of documents produced by NMFS. These documents are entitled "Essential Fish Habitat Source Document: Atlantic mackerel, *Scomber scombrus*, Life History and Habitat Characteristics" (Studholme et al. 1999), "Essential Fish Habitat Source Document: Northern Shortfin Squid, *Illex illecebrosus*, Life

History and Habitat Characteristics" (Hendrickson and Holmes 2004), "Essential Fish Habitat Source Document: Longfin Inshore Squid, *Loligo pealeii*, Life History and Habitat Characteristics" (Jacobson 2004), and "Essential Fish Habitat Source Document: Butterfish, *Peprilus triacanthus*, Life History and Habitat Characteristics" (Cross et al. 1999). This series of documents, as well as additional reports and publications, were used to provide the best available information on life history characteristics, habitat requirements, as well as ecological relationships at this time. Electronic versions of these source documents are available at the following website: http://www.nefsc.noaa.gov/nefsc/habitat/efh/. Matrices of habitat parameters (i.e. temperature, salinity, light, etc.) for eggs/larvae and juveniles/adults were developed in the Atlantic mackerel, *Loligo* and *Illex* squid and butterfish EFH background documents described above. In addition, Amendment 8 identified and described essential fish habitat for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish in section 2.2.2 and this description is summarized below.

Atlantic mackerel

In general, Atlantic mackerel EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the Exclusive Economic Zone (EEZ)), from Maine through Cape Hatteras, North Carolina in areas that comprise the highest 75% of the catch for each of the life stages (eggs /larvae/juveniles/adults) where Atlantic mackerel were collected in MARMAP ichthyoplankton surveys. Inshore, EFH is the "mixing" and/or "seawater" portions of all the estuaries where each of the life stages are "common," "abundant," or "highly abundant" on the Atlantic coast, from Passamaquaddy Bay, Maine to James River, Virginia. More specific EFH designations for the Atlantic mackerel's life stages are listed below.

Eggs: Atlantic mackerel eggs are collected from shore to 50 ft and temperatures between 41 ^{o}F and 73 ^{o}F.

Larvae: Atlantic mackerel larvae are collected in depths between 33 ft and 425 ft and temperatures between 43 ^{o}F and 72 ^{o}F.

Juveniles: Juvenile Atlantic mackerel are collected from shore to 1050 ft and temperatures between 39 ^{o}F and 72 ^{o}F.

Adults: Adult Atlantic mackerel are collected from shore to 1250 ft and temperatures between 39 ^{o}F and 61 ^{o}F.

Loligo

The *Loligo* population is comprised of pre-recruits and recruits, which are terms that are 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. The 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 for each of the life stages (pre-recruits and recruits) where *Loligo* were collected in the NEFSC trawl surveys. More specifically, pre-recruit *Loligo* are collected from

shore to 700 ft and temperatures between 4 ^{o}F and 27 ^{o}F, while recruited *Loligo* are collected from shore to 1000 ft and temperatures between 39 ^{o}F and 81 ^{o}F.

Illex

Illex EFH is the same as that for *Loligo*, with a couple of exceptions. Generally, pre-recruit *Illex* are collected from shore to 600 ft and temperatures between 36 ^{o}F and 73 ^{o}F, while recruited *Illex* are collected from shore to 600 ft and temperatures between 39 ^{o}F and 66 ^{o}F. *Illex* pre-recruits are less than or equal to 10 cm and recruits are greater than 10 cm.

Butterfish

Butterfish EFH is the same as that for Atlantic mackerel, with the following qualifications for various life stages.

> **Eggs:** butterfish eggs are collected from shore to 6000 ft and temperatures between 52 ^{o}F and 63 ^{o}F.
>
> **Larvae:** butterfish larvae are collected in depths between 33 ft and 6000 ft and temperatures between 48 ^{o}F and 66 ^{o}F.
>
> **Juveniles:** juvenile butterfish are collected in depths between 33 ft and 1200 ft and temperatures between 37 ^{o}F and 82 ^{o}F.
>
> **Adults:** adult butterfish are collected in depths between 33 ft and 1200 ft and temperatures between 37 ^{o}F and 82 ^{o}F.

6.4 Endangered and Protected Species

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 rest are protected by the provisions of the MMPA. The subset of these species that are known to have interacted with the SMB fisheries is provided in this document section. 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

Species	Status
Northern right whale (*Eubalaena glacialis*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Blue whale (*Balaenoptera musculus*)	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Sperm whale (*Physeter macrocephalus*	Endangered
Minke whale (*Balaenoptera acutorostrata*)	Protected
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

* = Known to have interacted with SMB fisheries

Fish

Species	Status
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered
Atlantic salmon (*Salmo salar*)	Endangered
Smalltooth sawfish (*Pristis pectinata*)	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 and Great South Channel

Protected Species Interactions with the Managed Resources – Includes Fishery Classification under Section 118 of Marine Mammal Protection Act

Species	Status
Common dolphin (*Delphinus delphis*)	Protected
White-sided dolphin (*Lagenorhynchus acutus*)	Protected
Pilot whale (*Globicephala spp*.)	Protected
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered
Loggerhead sea turtle (*Caretta caretta*)	Threatened

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 Potential Biological Removal (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. 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).

Under Tier 2, individual fisheries are subject to the following categorization:

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

Category 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

Category 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.

In the 2005 List of Fisheries, NMFS is modified the name of the ‘‘Atlantic squid, mackerel, and butterfish trawl fishery’’ to the ‘‘Mid-Atlantic mid-water trawl fishery.’’ Trawl fisheries targeting squid occur mainly in southern New England and Mid-Atlantic waters and typically use small mesh otter trawls throughout the water column. Trawl fisheries targeting mackerel occur mainly in southern New England and Mid-Atlantic waters and generally operate in mid-water. Butterfish are predominately caught incidental to directed squid and mackerel trawl fisheries. There have been frequent interactions documented between this fishery and several species/stocks of marine mammals and, thus, the fishery is currently classified as a Category I fishery. NMFS modified the name of this fishery in order to appropriately classify all similar mid-water trawl fisheries operating in the Mid-Atlantic region, with home ports between New York and North Carolina that may be interacting with marine mammals.

NMFS elevated the SMB fishery to Category I in the 2001 LOF and it has remained a Category I fishery since then. The 2006 List of Fisheries can be found at the following internet website address: http://www.nmfs.noss.gov/pr/interactions/lof/#lof). Because this fishery is a Category I fishery, it has received a high priority with respect to observer coverage and consideration for measures under the Atlantic Trawl Take Reduction Plan which will be developed beginning in the Fall of 2006.

6.4.1 Protected Species with known interactions with the Atlantic mackerel, squid and butterfish fisheries

6.4.1.1 Species protected under the Endangered Species Act

Leatherback sea turtles (*Dermochelys coriacea*)

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 amendment. 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. 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 near shore.

Although leatherbacks are a long lived species (> 30 years), they are slightly 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 include fishery interactions as well as intense exploitation of the eggs (Ross 1979). Eckert (1996) and Spotila *et al.* (1996) noted 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 State and Federal waters are known to interact with 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. 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.

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."

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. 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.

Fishery Interactions

A single leatherback sea turtle capture has been documented on observed SMB fishing trips according to the NMFS Observer Database. The animal was caught in a bottom otter trawl net in October 2001 on a trip for which *Loligo* was recorded as the target species. The animal was alive when captured and was released. No information is available on the subsequent survival of the turtle. There are no mortality estimates for leatherback turtles that are attributed to the *Loligo* fishery.

Loggerhead sea turtle (*Caretta caretta*)

The loggerhead sea turtle occurs throughout the temperate and tropical regions of the Atlantic, Pacific and Indian Oceans (Dodd 1998). 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).

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 leaves 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. 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 is stable or declining. 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 has 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.

Fishery Interactions

Illex Fishery A single capture of a loggerhead turtle on an *Illex* trip was documented in 1995 according to the NMFS Observer Database. The animal was alive when captured, and was subsequently tagged. No information on the survival of this individual is available at present. There are no mortality estimates for loggerhead turtles that are attributed to the *Illex* fishery.

Loligo Fishery A loggerhead capture was observed once in each year of 1995, 1996, and 1997 on *Loligo* trips. In every case the animal was alive when captured and no injuries were reported. In 2002, a loggerhead mortality that was likely the result of capture during a *Loligo* haul was observed. In 2004, a loggerhead was resuscitated after capture on an observed *Loligo* haul, and was tagged and released alive. There are no mortality estimates for loggerhead turtles that are attributed to the *Loligo* fishery.

6.4.1.2 Species protected under the Marine Mammal Protection Act

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. This following species of cetaceans are known to interact with the Atlantic Mackerel Squid and Butterfish fisheries:

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 dolphins appear to be present along the coast over the continental shelf along the 200-2000m isobaths or over prominent underwater topography from 50° N to 40°S latitude (Evans 1994). The species is less common south of Cape Hatteras, although schools have been reported as far south as eastern Florida (Gaskin 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. Unpubl. Ms.). Selzer and Payne (1988) reported very large aggregations (greater than 3,000 animals) on

Georges Bank in autumn. Common dolphins are occasionally found in the Gulf of 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).

Total numbers of common dolphins off the USA or Canadian Atlantic coast are unknown, although several estimates from selected regions of the habitat do exist for selected time periods. As recommended in the GAMS Workshop Report (Wade and Angliss 1997), estimates older 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). The best 2004 abundance estimate for common dolphins is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 120,743 (CV = 0.23), where the estimate from the northern U.S. Atlantic is 90,547 (CV =0.24), and from the southern U.S. Atlantic is 30,196 (CV =0.54). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat. The minimum population size is 99,975. 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 and 0.6 (Wade and Angliss 1997), and because this stock is of unknown status. PBR for the western North Atlantic common dolphin is 960.

Fishery Interactions

Illex Squid No incidental takes of common dolphins have been observed in the *Illex* fishery.

Loligo Squid All incidental takes attributed to this fishery were observed during the first quarter of the year (Jan-Mar), exclusively in the offshore fishery. The estimated fishery-related mortality of common dolphins attributable to the fall/winter offshore fishery was 0 between 1997-1998, 49 in 1999 (CV=0.97), 273 in 2000 (CV=0.57), 126 in 2001 (CV=1.09) and 0 in 2002-2003. The average annual mortality between 1999-2003 was 90 common dolphins (CV=0.47). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

Atlantic Mackerel The estimated fishery-related mortality attributed to this fishery was 161 (CV=0.49) animals in 1997 and 0 between 1999-2003. The average annual mortality between 1999-2003 was 0 (zero). A U.S. joint venture (JV) fishery was conducted in the mid-Atlantic region from February-May 1998. NMFS maintained 100% observer coverage on the foreign JV vessels where 152 transfers from the U.S. vessels were observed. Seventeen incidental takes of common dolphin were observed in the 1998 JV mackerel fishery.

White-sided dolphin (*Lagenorhynchus acutus*)

White-sided dolphins are found in temperate and sub-polar waters of the North Atlantic, primarily in continental shelf waters to the 100m 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: Gulf of Maine, Gulf of St. Lawrence and Labrador Sea stocks (Palka et al. 1997). 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 the summers of 1995 and 1999 that covered waters from Virginia to the entrance of the Gulf of St. Lawrence. White-sided dolphins were seen frequently in Gulf of Maine waters and in waters at the mouth of the Gulf of St. Lawrence, but only a few sightings were recorded between these two regions. 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 May, 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, particularly 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 U.S. waters were found primarily offshore on the continental slope, while whitebeaked dolphins (L. albirostris) were found on the continental shelf. During the 1970's, there was an apparent switch in habitat use between these two species. This shift may have been a result of the decrease in herring and 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 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. The minimum population size is 37,904. 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 white-sided dolphin is 364.

Fishery Interactions

Illex squid No white-sided dolphin takes have been observed taken incidental to *Illex* squid fishing operations since 1996.

Loligo squid No white-sided dolphin takes have been observed taken incidental to *Loligo* squid fishing operations since 1996.

Atlantic mackerel NMFS observers in the Atlantic foreign mackerel fishery 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; NMFS unpublished data). This total includes 9 documented takes by U.S. vessels involved in joint-venture fishing operations in which U.S. captains transfer their catches to foreign processing vessels. No incidental takes of white-sided dolphin were observed in the Atlantic mackerel JV fishery when it was observed in 1998. One white-sided dolphin incidental take was observed in 1997 and none since then.

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 pilot whales off the eastern USA and Canadian Atlantic coast is unknown, although the best 2004 abundance estimate for *Globicephala sp*. is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 31,139 (CV =0.27), where the estimate from the northern U.S. Atlantic is 15,728 (CV =0.34) , and from the southern U.S. Atlantic is 15,411 (CV =0.43). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat. The minimum population size for *Globicephala sp*. is 24,866. 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 0.50 because the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997) and because this stock is of unknown status. PBR for the western North Atlantic *Globicephala sp*. is 239.

Fishery Interactions

Illex Squid Since 1996, 45% of all pilot whale takes observed were caught incidental to *Illex* squid fishing operations; 1 in 1996, 1 in 1998 and 2 in 2000. Annual observer coverage of this fishery has varied widely and reflects only the months when the fishery is active. The estimated fishery-related mortality of pilot whales attributable to this fishery was: 45 in 1996 (CV=1.27), 0 in 1997, 85 in 1998 (CV=0.65), 0 in 1999, 34 in 2000 (CV=0.65), unknown in 2001-2002 due to no observer coverage, and 0 in 2003. The average annual mortality between 1999-2003 was 11 pilot whales (CV=0.65).

Loligo Squid Only one pilot whale incidental take has been observed in *Loligo* squid fishing operations since 1996. The one take was observed in 1999 in the offshore fishery. No pilot whale takes have been observed in the inshore fishery. The estimated fishery-related mortality of pilot whales attributable to the fall/winter offshore fishery was 0 between 1996 and 1998, 49 in 1999 (CV=0.97) and 0 between 2000 and 2003. The average annual mortality between 1999-2003 was 10 pilot whales (CV=0.97). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

Atlantic Mackerel No incidental takes of pilot whales have been observed in the mackerel fishery. The former distant water fleet fishery has been non-existent since 1977. There is also a mackerel trawl fishery in the Gulf of Maine that generally occurs during the summer and fall months (May-December) (Clark ed. 1998). There have been no observed incidental takes of pilot whales reported for the Gulf of Maine fishery.

6.5 Port and Community Description

The Council fully described the ports and communities that are associated with the Atlantic mackerel, *Loligo* and *Illex* squid and butterfish fisheries in Amendment 8 to the FMP. An update of the importance of the Atlantic mackerel, squid and butterfish to the ports and communities along the Atlantic Coast of the United States are described in section 6.6 of this EA. The landings of Atlantic mackerel in 2005 by port are given in Table 5. Cape May NJ accounted for 34% of the of mackerel landings in 2004 , followed by New Bedford, MA (23%), Gloucester, MA (21%) Fall River MA (11%) and North Kingstown, RI (8%). The major ports most dependent on Atlantic mackerel based on percent of total revenue from the mackerel fishery landings in 2005 included North Kingstown, RI (20%), Fall River , MA (11%) Gloucester, MA (3%), and Cape May, NJ (6%) (Table 6). The landings of *Loligo* by port in 2005 are given in Table 17. Point Judith, RI accounted for over one-third of the *Loligo* landings in 2005. Other important ports in terms of *Loligo* landings included Hampton Bay, NY (6%), Montauk, NY (11%), Cape May, NJ (10%), Newport, RI (5%) and North Kingstown, RI (15%). The importance of the *Loligo* fishery is reflected in the fact that there were 11 ports that were dependent on *Loligo* for more than 10% of the value of total fishery landings in those ports in 2005 (Table 18). The landings of *Illex* by port in 2005 are given in Table 26. Cape May, NJ and North Kingstown, RI accounted for 27 % and 55%, respectively, of the *Illex* landings in 2005. Only the port of North Kingstown, RI was dependent on *Illex* for more than 10% of the value of total fishery landings in 2005 (Table 27). The landings of butterfish by port in 2005 are given in Table 37. Two ports, Point Judith, RI and Montauk, NY accounted for half of the butterfish landings in 2005. There was only one port that was dependent on butterfish for more than 10% of the value of total fishery landings in 2005 (Table 38).

6.6 Fishery and Socioeconomic Description (Human Communities)

6.6.1 Atlantic mackerel

6.6.1.1 Status of the Stock

The status of the Atlantic mackerel stock was most recently assessed at SARC 42. Biological reference points (BRP) for Atlantic mackerel adopted in Amendment 8 to the Atlantic Mackerel, Squid and Butterfish FMP (implemented in 1998) are Fmsy = 0.45 and SSBmsy = 890,000 mt. These reference points were re-estimated in SARC 42 to be $F_{msy} = 0.16$ and $SSB_{msy} = 644{,}000$ mt. Fishing mortality on Atlantic mackerel in 2004 was estimated to be F = 0.05 and spawning stock biomass was 2.3 million mt. Relative to the updated biological reference points, SARC 42 concluded that the northwest Atlantic mackerel stock is not overfished and overfishing is not occurring.

SARC 42 also noted that fishing mortality on mackerel has remained low for the last decade, but increased slightly from 0.01 in 2000 to 0.05 in 2004 concomitant with a recent increase in fishing activities. The confidence interval ($\pm$ 2 SD) for F in 2004 ranged from 0.035 to 0.063. Retrospective analysis shows that F may be underestimated in recent years. Mackerel spawning stock biomass increased from 663,000 mt in 1976 to 2.3 million mt in 2004. The confidence interval on the 2004 SSB estimate ($\pm$ 2 SD) ranged from 1.49 to 3.14 million mt; based on

retrospective analysis, SSB has sometimes been overestimated in recent years.

Recruitment was variable during 1962-2004, with three very large year-classes observed in 1967, 1982, and 1999. Recruitment during 2000-2004 averaged 2.3 billion fish, and ranged from 0.8-5.0 billion age-1 fish. Recruitment from the 2002 (1.8 billion fish) and 2003 (2.8 billion fish) cohorts appears promising.

Deterministic projections for 2006-2008 were conducted by assuming an estimated catch of 95,000 mt (209 million lbs) in 2005, a target fishing mortality of 0.12 (assuming F_{target}=0.75 x F_{msy}) in 2006-2008, and annual recruitment values based on the fitted S/R curve. If 95,000 mt (209 million lbs) were landed in 2005, SSB in 2006 would increase to 2,640,210 mt (5.8 billion lbs). If the F_{target} F=0.12 is attained in 2006-2008, SSB will decline to 2,304,020 mt (5.1 billion lbs) in 2007 and to 2,043,440 mt (4.5 billion lbs) in 2008. Landings during 2006-2008 would be 273,290 mt (603 million lbs), 238,790 mt (527 million lbs), and 211,990 mt (467 million lbs), respectively if fishing mortality was maintained at F_{target}. These landings are the result of an unusually large year-class (1999) present in 2005, and will not be sustainable in the long term. It is expected that these projected landings will decline to MSY (89,000 mt (196 million lbs)) in the future when more average recruitment conditions exist in the stock.

The projections for SSB (000 mt), landings (000 mt), and recruits (millions of individuals) during 2006-2008 for the northwest Atlantic stock of mackerel given in SARC 42 are as follows:

Year	SSB	F	Landings	Recruits
2005	2450	0.04	95	942
2006	2640	0.12	273	951
2007	2304	0.12	238	963
2008	2043	0.12	211	941

6.6.1.2 Historical Commercial Fishery

Atlantic mackerel have a long history of exploitation off the northeastern coast of the United States dating back to colonial times. 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. Total international commercial landings (NAFO Subareas 2-6,) peaked at 437,000 mt in 1973 and then declined sharply to 77,000 by 1977 (Overholtz 1989).

The MSFCMA established control of the portion of the mackerel fishery occurring in US waters (NAFO Subareas 5-6) under the auspices of the 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 the MSFCMA (the foreign mackerel fishery was restricted by NOAA Foreign Fishing regulations to certain areas or "windows"). Under the control of Mid-Atlantic Fishery Management Council (MAFMC) mackerel 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.

US management policy of no TALFF combined with political and economic changes in Eastern Europe resulted in a decline in foreign landings from 9,000 mt in 1991 to 0 in 1992 and 1993. US commercial landings of mackerel increased steadily from roughly 3000 mt in the early 1980s to greater than 31,000 mt by 1990. However, US mackerel landings declined to 12,418 mt in 1992 and 4,653 mt in 1993. NMFS weighout data indicate that US landings were roughly 8,500 mt in 1994 and 1995. US Atlantic mackerel landings increased to about 15,500 mt in 1996 and 1997 (valued at ranged from $4.6 million to $9.5 million). NMFS weighout data indicate that US Atlantic mackerel landings then declined to approximately 12,500 mt in 1998 and 1999 (valued at $4.7 million and $3.6 million, respectively). Atlantic mackerel landings declined further to 5,645 mt in 2000 (valued at $2.0 million) but increased to 12,308 mt in 2001 (valued at $2.2 million), 26,192 mt (valued at $6.1 million) in 2002, and to 30,738 (valued at $7.2 million) in 2003.

NMFS weighout data (Maine-Virginia), shows that the average ex-vessel prices for Atlantic mackerel in the US declined steadily from $400/mt ($0.18/lb) in 1989 to $281/mt ($0.13/lb) in 1994. Since then, ex-vessel prices have moved upward from $296/mt ($0.13/lb) in 1994 to $321/mt ($0.15/lb) in 1995. Ex-vessel prices for Atlantic mackerel declined slightly in 1996 to $296/mt ($0.13/lb) and then increased to $376/mt ($0.17/lb) in 1998. Ex-vessel prices for Atlantic mackerel declined again in 1999 to $299/mt ($0.13/lb) and then increased to $354/mt in 2000 ($0.16/lb). Ex-vessel prices for Atlantic mackerel increased again in 2000 to $354/mt ($0.16/lb) but declined to $178/mt ($0.08/lb) in 2001. Ex-vessel prices for Atlantic mackerel increased again in 2002 to $233/mt ($0.16/lb), even in the face of a 113% increase in US production of Atlantic mackerel in 2002. Industry members report that the increase in price in 2002 was due to an increase in the average size of mackerel landed in 2002. The ex-vessel price for Atlantic mackerel remained steady in 2003 at $234/mt. Unpublished NMFS dealer reports indicate that 54,993 mt of Atlantic mackerel valued at $13.1 million was landed in 2004 (average value = $238/mt). Landings did not exceed the annual quotas during 1998-2004 (Table 10).

6.6.1.3 2005 Commercial Fishery

Based on NMFS dealer reports, a total of 293 vessels landed 42,206 mt (valued at $11.0 million) of Atlantic mackerel in 2005 (Table 1). (Please note that all landings data are subject to audit and update.) The landings during 2005 were 37% of the annual quota (115,000 mt). Massachusetts (56.2%), New Jersey (34.8%) and Rhode Island (8.7%) accounted for the majority of landings in 2005 (Table 2). Although mackerel landings occur year round, the primary mackerel fishing season extends from January through April when greater than 95% of the annual landings are taken (Table 3). The principal gears used to land mackerel in 2005 were mid-water trawls (91%) and bottom otter trawls (6.5%) (Table 4).

Table 1. Total landings and value of Atlantic mackerel, *Loligo*, *Illex* and butterfish during 2005.

	Landings (mt)	Value ($)	Vessels	Trips
Atlantic mackerel	42,206	11,022,821	293	2,310
Loligo	16,765	28,547,919	339	10,935
Illex	11,719	8,380,257	64	364
Butterfish	393	708,521	257	6,999

Table 2. Atlantic mackerel landings (mt) by state in 2005.

State	Landings (mt)	Pct of Total
Massachusetts	23,699	56.15%
New Jersey	14,703	34.84%
Rhode Island	3,663	8.68%
New York	70	0.17%
Maine	38	0.09%
Connecticut	21	0.05%
Maryland	7	0.02%
Virginia	4	0.01%
New Hampshire	1	0.00%
North Carolina	0	0.00%
Delaware	0	0.00%
Pennsylvania	0	0.00%
Total	42,206	100.00%

Table 3. Atlantic mackerel landings (mt) by month in 2005.

Month	Landings (lbs)	Pct. of Total
January	10,836	25.67%
February	8,443	20.00%
March	13,117	31.08%
April	8,985	21.29%
May	329	0.78%
June	10	0.02%
July	1	0.00%
August	0	0.00%
September	0	0.00%
October	5	0.01%
November	9	0.02%
December	472	1.12%
Total	42,206	100.00%

Source: Unpublished NMFS dealer reports

Table 4. Atlantic mackerel landings (mt) by gear category in 2005.

Gear Category	Landings (mt)	Pct. of Total
Trawl, Otter, Midwater	38,435	91.07%
Hook and Line	2	0.01%
Trawl, Otter, Bottom	2,734	6.48%
Dredge	2	0.01%
Unknown	779	2.32%
Gill Net	19	0.05%
Pound Net	5	0.01%
Total	42,206	100.00%

Source: Unpublished NMFS dealer reports

The landings of Atlantic mackerel in 2005 by port are given in Table 5. Cape May NJ accounted for 34% of the of mackerel landings in 2004 , followed by New Bedford, MA (23%), Gloucester, MA (21%) Fall River MA (11%) and North Kingstown, RI (8%). The major ports most dependent on Atlantic mackerel based on percent of total revenue from the mackerel fishery landings in 2005 included North Kingstown, RI (20%), Fall River , MA (11%) Gloucester, MA (3%), and Cape May, NJ (6%) (Table 6).

Table 5. Atlantic mackerel landings by port in 2005.

Port	Landings (mt)	Pct.	Cum. Pct.
Cape May, NJ	14,670	34%	34%
New Bedford, MA	9,893	23%	57%
Gloucester, MA	9,102	21%	79%
Fall River, MA	4,674	11%	90%
North Kingstown, RI	3,352	8%	98%
All Others	515	2%	100%
Total	42,206	100%	100%

Source: unpublished NMFS dealer reports.

Table 6. Value of Atlantic mackerel landings by port compared to total value of all species landed by port in 2005 where Atlantic mackerel comprised >1% of total value.

Port	Vessels	Value All Species	Value Atlantic mackerel only	Pct
North Kingstown, RI	3	$13,760,855	$2,752,228	20%
Fall River, MA	6	$6,266,674	$712,234	11%
Cape May, NJ	22	$63,091,635	$4,055,675	6%
Gloucester, MA	41	$45,185,826	$1,417,762	3%
Point Lookout, NY	4	$831,573	$15,578	2%
Other Providence, RI		$31,284	$570	2%
Branford, CT		$51,271	$880	2%

Source: unpublished NMFS dealer reports.

6.6.1.4 Analysis of Human Communities/Permit Data

According to unpublished NMFS permit file data, there were 2528 vessels with Atlantic mackerel permits in 2005 (a slight increase compared to 2004). These permits are currently open access and are available to any vessel which meets the size and horsepower restrictions implemented in Amendment 8 to the FMP. The distribution of vessels which possessed Atlantic mackerel permits in 2005 by home port state is given in Table 7. Most of these vessels were from the states of Massachusetts (40.5%), Maine (11.9%), New York (9.6%), New Jersey (11.9%), Rhode Island (6.1%), Virginia (4.2%), New Hampshire (4.3%) and North Carolina (5.1%).

Table 7. Atlantic mackerel vessel permit holders in 2005 by homeport state.

Home Port State	No. Vessels	Pct of Total
MA	1,024	40.51%
ME	303	11.99%
NJ	302	11.95%
NY	243	9.61%
RI	154	6.09%
NC	128	5.06%
NH	111	4.39%
VA	107	4.23%
CT	50	1.98%
MD	33	1.31%
FL	23	0.91%
DE	21	0.83%
PA	11	0.44%
GA	9	0.36%
Other	9	0.36%
Total	2,528	100%

Source: unpublished NMFS permit data.

In addition, there were 468 dealers which possessed Atlantic mackerel, squid and butterfish dealer permits in 2005. The distribution of these dealers by state is given in Table 8. Of the 468 dealers which possessed an Atlantic mackerel, squid and butterfish dealer permit in 2004, there were 94 dealers that reported buying Atlantic mackerel (Table 9).

Table 8. Atlantic mackerel, squid, and butterfish dealer permit holders in 2005 by state.

Home Port State	No. Dealers	Pct of Total
MA	137	29.27%
NY	96	20.51%
NJ	51	10.90%
RI	46	9.83%
NC	34	7.26%
ME	31	6.62%
VA	28	5.98%
MD	10	2.14%
NH	9	1.92%
CT	7	1.50%
DE	5	1.07%
FL	4	0.85%
PA	3	0.64%
Other	7	1.50%
Total	468	100.00%

Source: unpublished NMFS permit data.

Table 9. Atlantic mackerel, squid, butterfish dealer permit holders who bought Atlantic mackerel in 2005 by state.

Home Port State	No. Dealers	Pct of Total
NY	29	30.85%
MA	25	26.60%
RI	16	17.02%
NC	6	6.38%
NJ	6	6.38%
ME	4	4.26%
VA	4	4.26%
Other	4	4.26%
Total	94	100.00%

Source: unpublished NMFS dealer reports.

Atlantic mackerel landings by permit category are given in Table 10. As noted above, a total of 293 vessels landed 42,206 mt of Atlantic mackerel in 2005. The majority of the total landings in 2005 were by vessels possessing Federal open access mackerel permits (91.8%).

Table 10. Atlantic mackerel landings by permit category for the period 1998-2005.

	MACK_PERM		PARTY_CHART		NO_MACK_PERM		UNKNOWN		TOTAL	
Year	mt	pct	mt	pct	mt	pct	mt	pct	mt	quota (mt)
1998	12,022	82.8%	3	0.0%	454	3.1%	2,046	14.1%	14,525	80,000
1999	11,378	94.6%	4	0.0%	363	3.0%	286	2.4%	12,031	75,000
2000	5,333	94.4%	10	0.2%	152	2.7%	154	2.7%	5,649	75,000
2001	12,063	97.7%	0	0.0%	119	1.0%	159	1.3%	12,341	85,000
2002	25,887	97.6%	0	0.0%	156	0.6%	487	1.8%	26,530	85,000
2003	33,969	99.0%	0	0.0%	44	0.1%	284	0.8%	34,297	175,000
2004	54,651	99.4%	0	0.0%	149	0.3%	193	0.4%	54,993	170,000
2005	38,731	91.8%	0	0.0%	3,360	8.0%	115	0.3%	42,206	115,000
Mean pct		94.7%		0.0%		2.3%		3.0%		

6.6.1.5 Recreational Fishery

Atlantic mackerel are seasonally important to the recreational fisheries of the Mid-Atlantic and New England regions. They are available to recreational anglers in the Mid-Atlantic primarily during the spring migration. Historically, mackerel first appear off Virginia in March and gradually move northward. Christensen *et al.* 1979 found mackerel to be available to the recreational fishery from Delaware to New York for about three weeks (generally from early April to early May). As a result, the annual recreational catch of mackerel appears to be sensitive to changes in their migration and subsequent distribution pattern (Overholtz *et al.* 1989).

Recreational landings of Atlantic mackerel since 1981, as estimated from the NMFS Marine Recreational Fishery Statistics Survey, are given in Table 11. Total recreational mackerel landings have varied from 284 mt in 1992 to 4,223.4 mt in 1986. In recent years, recreational mackerel landings have varied from roughly 1740 mt in 1997 to 690 mt in 1998. However, recreational mackerel landings have exceeded 1,200 mt in most years since 1994. Annual recreational mackerel landings by state (Table 11) indicate that, in most years, the majority of recreational mackerel landings occur from Virginia to Maine, with highest catches occurring from New Jersey to Massachusetts. Most Atlantic mackerel are taken from boats (Table 12).

Table 11. Recreational landings (metric tons) of Atlantic mackerel by state, 1981-2005. *Source: MRFSS.*

STATE	ME	NH	RI	MA	CT	NY	NJ	DE	MD	VA	NC
1981	383.9	99.5	32.0	239.1	112.2	67.5	2275.7	0.0	0.0	0.0	0.0
1982	23.5	80.6	27.2	24.0	227.6	101.4	706.5	0.0	0.0	0.0	0.0
1983	77.3	51.1	123.4	243.8	0.0	0.2	430.3	47.2	392.7	1618.5	17.4
1984	138.7	172.4	157.6	312.8	1.6	20.5	731.9	605.3	170.8	7.8	0.0
1985	1110.0	83.9	162.6	507.4	39.9	35.5	752.5	8.5	0.0	12.9	0.0
1986	133.4	14.3	46.1	628.7	36.5	22.7	1839.3	775.0	0.0	487.6	0.0
1987	318.5	55.3	0.1	485.4	330.6	1681.8	992.3	0.0	132.0	35.8	0.0
1988	538.7	72.6	5.5	1952.5	2.0	0.0	1.0	524.9	159.3	0.0	0.0
1989	147.2	73.8	9.9	877.5	0.2	119.0	253.1	106.7	194.9	4.3	0.0
1990	79.7	65.6	41.7	1009.7	0.0	11.2	400.2	16.3	220.2	22.4	0.0
1991	298.3	0.4	150.5	1172.9	0.0	364.6	457.5	21.1	79.3	21.2	0.0
1992	71.2	4.9	10.0	154.4	0.0	0.6	2.2	9.5	19.8	11.4	0.0
1993	136.1	3.9	0.0	53.9	0.2	33.5	26.1	0.0	345.8	0.0	0.0
1994	337.0	390.7	43.7	895.3	0.0	0.1	32.4	1.7	4.3	0.0	0.0
1995	276.5	52.2	3.2	517.3	0.0	7.1	372.6	16.4	3.1	0.8	0.0
1996	146.6	215.4	10.9	793.0	2.8	0.5	112.7	3.7	52.2	1.8	0.7
1997	409.3	211.9	18.3	556.4	0.0	23.4	438.7	25.8	28.2	24.6	0.2
1998	149.2	89.7	7.7	351.7	0.0	7.3	70.1	2.6	6.3	4.7	0.2
1999	258.2	156.1	44.9	624.0	0.0	15.3	214.1	0.0	17.1	5.3	0.0
2000	364.3	166.0	2.5	857.2	0.0	9.8	31.2	0.3	1.4	15.1	0.0
2001	287.3	223.6	7.2	885.2	0.0	17.5	77.8	12.6	22.1	2.4	0.0
2002	386.6	65.0	1.9	728.3	3.0	0.0	95.9	2.5	2.2	0.0	0.0
2003	165.7	97.1	7.9	509.8	0.0	18.7	22.0	0.2	0.3	2.9	0.0
2004	204.9	27.6	0.3	278.1	0.0	19.0	0.6	3.0	0.0	0.1	0.0
2005	175.1	78.1	779.1	0.2	0.0	0.0	5.8	0.0	0.0	0.0	0.0

Table 12. Recreational landings (pounds) of Atlantic mackerel by mode, 1981-2005.

Year	Shore	Party / Charter	Private / Rental
1981	27,072	5,558,341	1,491,302
1982	243,103	1,063,118	1,318,763
1983	82,102	5,833,502	702,317
1984	114,807	2,659,114	2,339,182
1985	123,087	4,184,595	1,673,902
1986	119,234	3,702,247	5,489,359
1987	180,588	2,763,642	5,944,386
1988	173,079	1,013,699	6,010,771
1989	404,414	1,438,032	2,096,378
1990	217,594	1,290,037	2,608,176
1991	191,743	1,383,457	4,081,506
1992	127,267	92,274	406,418
1993	187,953	161,110	972,663
1994	528,577	927,253	2,303,719
1995	330,454	923,154	1,500,303
1996	353,111	511,685	2,090,183
1997	662,304	1,458,065	1,708,164
1998	146,469	241,322	1,132,294
1999	192,221	645,648	2,105,503
2000	279,945	179,294	2,732,591
2001	179,869	361,581	2,844,174
2002	216,606	50,587	2,566,763
2003	271,792	115,971	1,309,823
2004	249,896	44,509	839,926
2005	29,130	23,978	2,231,066

Source: MRFSS

6.6.1.5 Description of areas fished

Atlantic mackerel landings in 2005 by NMFS three digit statistical area (Figure 2) are given in Table 13. Statistical areas 622, 613, 616, and 621 accounted for the majority of the commercial Atlantic mackerel landings in 2005.

Table 13. Statistical areas from which 1% or more of Atlantic mackerel were landed in 2005.

Stat Area	Landings (mt)	Pct of Total
622	11,940	28.98%
613	7,319	17.76%
616	7,303	17.73%
621	6,004	14.57%
615	3,466	8.41%
537	1,256	3.05%
612	1,045	2.54%
626	842	2.04%
625	677	1.64%
614	461	1.12%

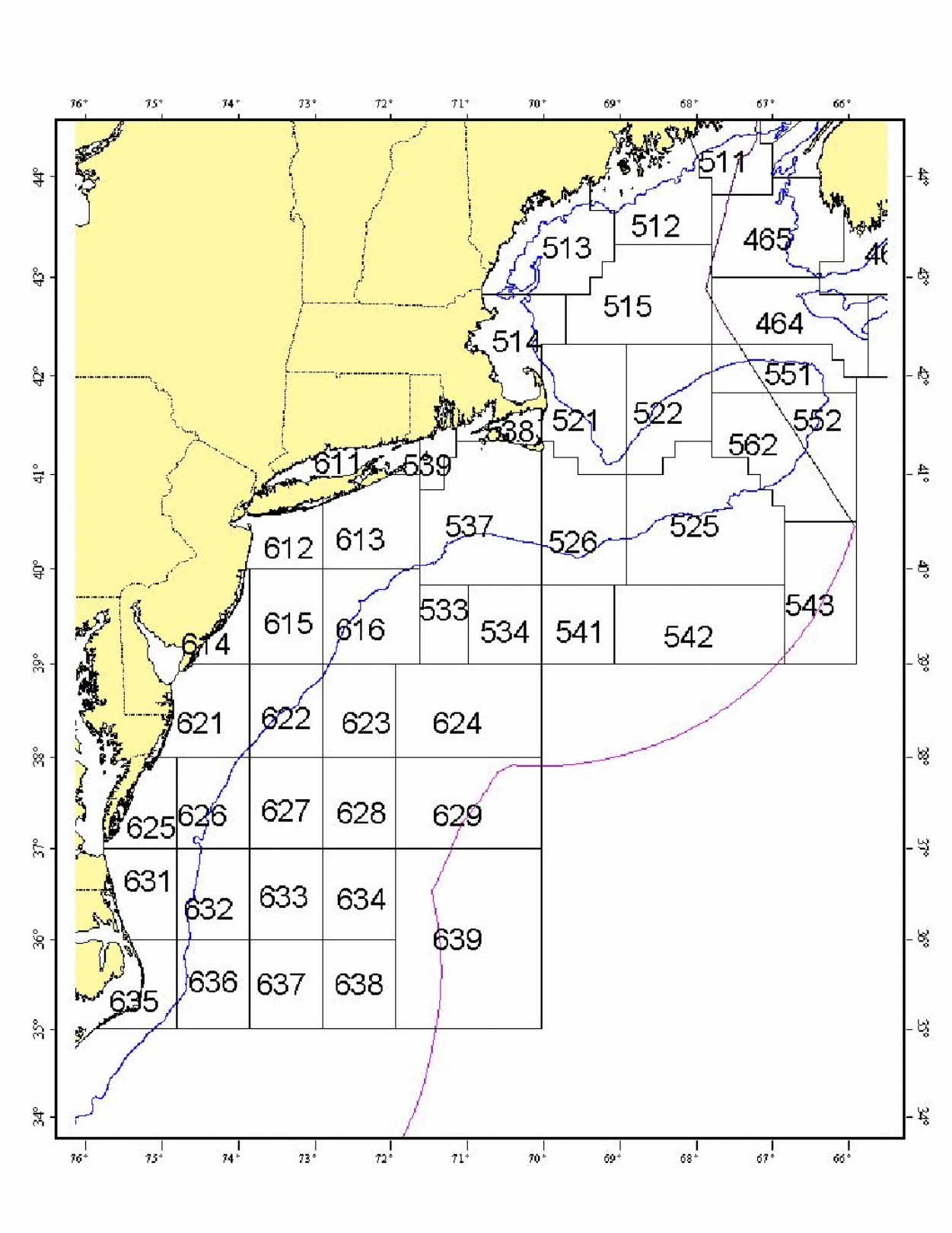

Figure 2 . NMFS statistical areas.

6.6.1.7 Current Market Overview for Mackerel

The Management Plan for Atlantic Mackerel, Squid, and Butterfish Fisheries requires that specific evaluations be made in the quota setting process before harvest rights are granted to foreign interests in the form of TALFF or joint venture allocations. The Council has concluded in recent years that conditions in the world market for mackerel have changed only slightly from year to year.

6.6.1.7.1 Recent World Production and Prices

According to the FAO, world landings of Atlantic mackerel were on an increasing trend in the early 1990s. In 1993, Atlantic mackerel world landings were estimated to be 840,833 mt. This represented a 7% increase from the 1992 landings (FAO 2000). Total world landings of Atlantic mackerel peaked in 1994 at 842,920 mt. World landings of Atlantic mackerel decreased steadily to about 560,000mt by 1997 and then increased slightly to 657,278 mt in 1998 (FAO 2000). World landings of Atlantic mackerel decreased to 618,014 mt in 1999 and then increased slightly to about 686,000 mt in 2000. By 2002, world mackerel landings had increased to a recent peak of 765,813 mt but then declined to 685,787 mt in 2003 (the most recent year for which published FAO statistics are available).

6.6.1.7.2 Future Supplies of Mackerel

The potential for future mackerel production depends largely on the future production of the European mackerel stock. European mackerel stock production appears to have stabilized at levels of about 600,000 mt. These levels are approximately 150,000-200,000 mt lower than those observed in mid-1990s. This reduction in European mackerel production is also about equal to the long term sustainable yield of the Northwest Atlantic mackerel stock. Thus, it appears that the recent increase in world demand for US mackerel will likely continue to remain high even if US production increases to a level approaching MSY since US production appears to be supplanting European production in the world marketplace.

6.6.1.7.3 US Production and Exports of Mackerel

NMFS weighout data showed that in 1995, Atlantic mackerel landings increased by 81% from the 1993 level. The average value of mackerel increased over 14% for the same period. In 1991, landings peaked due to a relatively successful IWP venture between Russia and the state of New Jersey, and the one-year open door into the Japanese market. That year US producers were able to ship over more than 2,800 mt of frozen mackerel to Japan at an average value of $882/mt. The following year shipments fell to only 63 mt.

Overall, US exports of fresh/chilled and frozen mackerel in 1995 were estimated at 3,296 mt, this represented a 12% increase from 1994, and a 51% increase from 1993 (Ross 1996). In 1995, US producers were able to export 2,303 mt of frozen Atlantic mackerel valued at $1.7 million ($747/mt), and 992 mt of fresh/chilled mackerel valued at $1.5 million ($1,207/mt). US exports of Atlantic mackerel continued to increase in 1996 to 6,137 mt valued at $5.3 million. US

exports of all mackerel species were 17,367 mt valued at $14.2 million in 1998. US exports of all mackerel species declined to 11,747 mt in 1998.

The lack of mackerel in the North Sea area during the 1990's and the potential for future mackerel TAC reductions provided opportunities for US producers to place additional exports of mackerel in the international market. Mackerel prices in the international market have increased in recent years which should help the US Atlantic mackerel industry in their attempt to sell large volumes of this product (Ross 1996). In 1995, the US exported small quantities of Atlantic mackerel to non-traditional markets such as South Korea, Mexico, and Brazil. In 1996, US exporters placed Atlantic mackerel in Latvia, the Philippines, and South Africa.

In 2004, US exports of all mackerel products totaled 24,874 mt valued at $22.1 million. The leading markets for US exports of mackerel in 2004 were Nigeria (8,639 mt), Romania (3,768 mt), Bulgaria (2,091 mt), Canada (1,260 mt) and Egypt (1,034 mt). In 2005, US exports of all mackerel products totaled 34,209 mt valued at $18.3 million. The leading markets for US exports of mackerel in 2005 were Romania (7,904 mt), Egypt (5,875 mt), Bulgaria (4,579 mt), Georgia (1979 mt) and China (1,627 mt).

6.6.2 *Loligo pealei*

6.6.2.1 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 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 Loligo was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Loligo* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{max} is exceeded (F_{max} is a proxy for F_{msy}). When an estimate of F_{msy} becomes available, it will replace the current overfishing proxy of F_{max}. Annual quotas will be specified which correspond to a target fishing mortality rate. Target F is defined as 75% of the F_{msy} when biomass is greater than B_{msy}, and decreases linearly to zero at 50% of B_{MSY}. Maximum OY is specified as the catch associated with a fishing mortality rate of F_{max}. In addition, the biomass target is specified to equal B_{MSY}.

The *Loligo* stock was most recently assessed by the 34th Northeast Regional Stock Assessment Committee (SARC 34). New analyses of survey data indicated that *Loligo* stock biomass since 1967 has fluctuated without trend and has supported annual catches around 20,000 mt. A new surplus production model suggests that biomass has fluctuated between 14,000 and 27,000 mt since 1987. During this period quarterly F fluctuated between 0.06 and 0.6 about a mean of 0.24. While estimates of biomass have increased in recent years based on survey data, biomass in the longer term has fluctuated without trend.

SARC 34 concluded that it is unlikely that overfishing is occurring. The largest feasible scaled catch-survey estimates of fishing mortality for 2000-2001 ranged from 0.11-0.17 per quarter. Estimates of fishing mortality from a surplus production model ranged from 0.12-0.31 per quarter. Thus all recent estimates of fishing mortality are well below the biomass weighted estimates of F_{max} for *Loligo*. Results from length based virtual population analyses (LVPA) and catch survey biomass estimates for winter and spring surveys generally indicated that fishing mortality rates for *Loligo* declined to relatively low levels during 2000 and 2001.

SARC 34 also concluded that it is unlikely that the Loligo stock is overfished. Survey data (with the exception of the Massachusetts inshore spring survey), LVPA results, scaled survey biomass estimates, and production modeling estimates all indicate that *Loligo* biomass was high in 2000 and 2001. The smallest feasible catch-survey biomass estimate for 2001 was 34,000 mt, which is smaller than the best available estimate of $B_{msy}/2$ (40,000 mt). However, the probability that the *Loligo* biomass is less than or equal to the lowest feasible biomass is small. SARC 34 recommended that the Council maintain a catch not to exceed about 20,000 mt (to include both landings and discards).

6.6.2.2 Historical Commercial Fishery

United States fishermen have been landing squid along the Northeastern coast of the US since the 1880's (Kolator and Long 1978). The early domestic fishery utilized fish traps and otter trawls but was of relatively minor importance to the US fishery due to low market demand. The squid taken were used primarily for bait (Lux et al. 1974). However, squid have long been a popular foodfish in various foreign markets and therefore a target of the foreign fishing fleets throughout the world, including both coasts of North America (Okutani 1977). USSR vessels first reported incidental catches of squid off the Northeastern coast of the United States in 1964. Fishing effort directed at the squids began in 1968 by USSR and Japanese vessels. By 1972, Spain, Portugal and Poland had also entered the fishery. Reported foreign landings of *Loligo* increased from 2000 mt in 1964 to a peak of 36,500 mt in 1973. Foreign *Loligo* landings averaged 29,000 mt for the period 1972-1975.

Foreign fishing for *Loligo* began to be regulated with the advent of extended fishery jurisdiction in the US in 1977. Initially, US regulations restricted foreign vessels fishing for squid (and other species) to certain areas and times (the so-called foreign fishing "windows"), primarily to reduce spatial conflicts with domestic fixed gear fishermen and minimize bycatch of non-target species. The result of these restrictions was an immediate reduction in the foreign catch of *Loligo* from 21,000 mt in 1976 to 9,355 mt in 1978.

By 1982, foreign *Loligo* catches had again risen above 20,000 mt. At this time, US management of the squid resources focused on the Americanization of these fisheries. This process began with the development of joint ventures between US fishermen and foreign concerns. Domestic annual harvest (DAH) was increased from 7,000 mt in the 1982-83 fishing year to 22,000 mt for 1983-84. Foreign allocations were reduced from 20,350 mt during 1982-83 to 5,550 mt during 1983-84 (Lange 1985). The foreign catch of *Loligo* fell below 5,000 mt by 1986, to 2 mt in 1987 and finally to zero in 1990.

The development and expansion of the US squid fishery was slow to occur for several reasons. First, the domestic market demand for squid in the US had traditionally been limited to the bait market. Secondly, the US fishing industry lacked both the catching and processing technology necessary to exploit squid in offshore waters. In the late 19th and early 20th century, squid were taken primarily by pound nets. Even though bottom otter trawls eventually replaced pound nets as the primary gear used to capture squid during this century, the US industry did not develop the appropriate technology to catch and process squid in deep water until the 1980's.

The annual US domestic squid landings (including *Illex* landings) from Maine to North Carolina averaged roughly 2,000 mt from 1928-1967 (NMFS 1994a). During the period 1965-1980, US *Loligo* landings ranged from roughly 1,000 mt in 1968 to 4,000 mt in 1980. The US *Loligo* fishery began to increase dramatically beginning in 1983 when reported landings exceeded 15,000 mt. With the cessation of directed foreign fishing in 1987, the US domestic harvest of *Loligo* averaged 17,800 mt during 1987-1992. The ex-vessel value of US caught *Loligo* increased from 7.8 million dollars in 1983 to 23.3 million by 1992.

US *Loligo* landings reached a peak of about 22,500 mt in 1993 and 1994 (valued at $29.1 and $31.9 million, respectively). *Loligo* landings declined to 17,928 mt in 1995 (value declined to $23.0 million) and then increased slightly to 18,008 mt in 1995 (dockside value remained stable at $23.1 million). *Loligo* landings declined to 12,459 mt in 1996 (valued at $18.6 million) and then increased to 16,203 mt in 1997 (valued at $26.5 million). *Loligo* landings were about 18,500 mt in 1998 and 1999 and then declined to 16,561 mt in 2000. Based on NMFS dealer reports, a total 14,091 mt (31.1 million pounds) of *Loligo* (valued at $20.5 million) was landed in 2001. Based on NMFS dealer reports, a total 16,672 mt of *Loligo* (valued at $23.5 million) was landed in 2002 and a total 11,623 mt of *Loligo* (valued at $19.3 million) was landed in 2003. Unpublished NMFS dealer reports indicate that 15,448 mt of *Loligo* valued at $25.7 million was landed in 2004. Landings did not exceed the annual quotas during 1998-2004 (Table 21).

6.6.2.3 2005 Commercial Fishery

Based on NMFS dealer reports, a total 16,765 mt of *Loligo* (valued at $28.5 million) was landed in 2005. (Please note that all landings data are subject to audit and update.) The landings during 2005 were 99% of the annual quota (17,000 mt). The 2005 landings of *Loligo* by state are given in Table 14. Four states, Rhode Island, New York, New Jersey and Massachusetts accounted for the majority (96%) of *Loligo* landings in 2005. Rhode Island accounted for almost 60% of the 2005 *Loligo* landings. The 2005 landings of *Loligo* by month are given in Table 15. The majority of *Loligo* landings occurred in the fall through winter months. Most (99%) were taken by bottom otter trawls (Table 16).

Table 14. *Loligo* landings (mt) by state in 2005.

State	Landings (mt)	Pct of Total
Rhode Island	10,041	59.89%
New York	3,029	18.07%
New Jersey	2,143	12.78%
Massachusetts	981	5.85%
Connecticut	490	2.92%
Virginia	57	0.34%
North Carolina	14	0.09%
Maine	7	0.04%
Maryland	4	0.02%
Total	16,765	100.00%

Source: Unpublished NMFS dealer reports

Table 15. *Loligo* squid landings (mt) by month in 2005.

Month	Landings (mt)	Pct. of Total
January	3,190	19.03%
February	4,366	26.04%
March	610	3.64%
April	2,711	16.17%
May	673	4.01%
June	285	1.70%
July	241	1.44%
August	64	0.38%
September	297	1.77%
October	1,003	5.98%
November	2,042	12.18%
December	1,285	7.67%
Total	16,765	100.00%

Source: Unpublished NMFS dealer reports

Table 16. *Loligo* landings (mt) by gear category in 2005.

Gear Category	Landings (mt)	Pct. of Total
Trawl, Otter, Bottom	16,480	98.30%
Trawl, Otter, Midwater	22	0.01%
Pound Net	33	0.01%
Other	230	1.40%
Total	16,765	100.00%

Source: Unpublished NMFS dealer reports

The landings of *Loligo* by port in 2005 are given in Table 17. Point Judith, RI accounted for over one-third of the *Loligo* landings in 2005. Other important ports in terms of *Loligo* landings included Hampton Bay, NY (6%), Montauk, NY (11%), Cape May, NJ (10%), Newport, RI (5%) and North Kingstown, RI (15%). The importance of the *Loligo* fishery is reflected in the fact that there were 11 ports that were dependent on *Loligo* for more than 10% of the value of total fishery landings in those ports in 2005 (Table 18).

Table 17. *Loligo* landings by port in 2005.

Port	Landings (mt)	Pct. of total	Cum Pct
Point Judith, RI	6,579	39%	39%
North Kingstown, RI	2,503	15%	54%
Montauk, NY	1,898	11%	65%
Cape May, NJ	1,669	10%	75%
Newport, RI	845	5%	80%
Hampton Bays, NY	777	5%	85%
New Bedford, MA	582	3%	89%
New London, CT	350	2%	91%
Pt. Pleasant, NJ	336	2%	93%
Point Lookout, NY	194	1%	94%
Chatham, MA	149	1%	95%
Belford, NJ	130	1%	96%
Stonington, CT	117	1%	96%
Little Compton, RI	114	1%	97%
Harwichport, MA	111	1%	98%
All Others	412	2%	100%
Total	16,765	100%	100%

Source: Unpublished NMFS dealer reports

Table 18. Value of *Loligo* landings by port compared to total value of all species landed by port in 2005 where *Loligo* comprised >2% of total value.

Port	Vessels	Value All Species	Value Loligo only	Pct
Other New London, CT		$33,222	$33,222	100%
Point Lookout, NY	3	$831,573	$360,270	43%
North Kingstown, RI	6	$13,760,855	$4,453,312	32%
Point Judith, RI	81	$37,397,902	$11,096,137	30%
New London, CT	3	$2,401,165	$645,283	27%
Montauk, NY	26	$16,093,896	$3,797,799	24%
Hampton Bays, NY	34	$6,677,515	$1,544,944	23%
Shinnecock, NY		$672,748	$118,224	18%
Woods Hole, MA	15	$476,125	$68,411	14%
New York City, NY	3	$551,923	$78,073	14%
Greenport, NY	5	$699,165	$70,448	10%
Other Barnstable, MA	8	$459,957	$41,490	9%
Newport, RI	19	$14,483,682	$1,288,881	9%
Little Compton, RI		$2,879,892	$205,497	7%
Belford, NJ	18	$3,471,024	$234,556	7%
Harwichport, MA		$2,974,181	$183,393	6%
Ammagansett, NY		$378,813	$20,915	6%
Other Suffolk, NY		$374,295	$14,189	4%
Cape May, NJ	37	$63,091,635	$2,296,606	4%
Branford, CT		$51,271	$1,809	4%
Pt. Pleasant, NJ	15	$14,162,392	$361,842	3%
Mattituck, NY		$661,248	$12,897	2%

6.6.2.4 Analysis of Human Communities/Permit Data

According to unpublished NMFS permit file data, there were 383 vessels with *Loligo*/butterfish moratorium permits in 2005. These are limited access permits and are available only to vessels which meet the qualifications specified in Amendment 5 to the FMP in 1997. The distribution of vessels which possessed *Loligo*/butterfish moratorium permits in 2004 by home port state is given in Table 19. Most of these vessels were from the states of Massachusetts (26.4%), New York (15.9%), Rhode Island (16.7%), New Jersey (20.6), North Carolina (6.8%), Virginia (3.4%), and Maine (5.7%). In addition, there were 468 dealers which possessed Atlantic mackerel, squid and butterfish dealer permits in 2005. The distribution of these dealers is given by state in Table 8. Of the 468 dealers which possessed a Atlantic mackerel, squid and butterfish dealer permit in 2005, there were 106 dealers that reported buying *Loligo* in 2005 (Table 20).

Table 19. *Loligo*-butterfish moratorium vessel permit holders in 2005 by homeport state.

Home Port State	No. Vessels	Pct of Total
MA	101	26.37%
NJ	79	20.63%
RI	64	16.71%
NY	61	15.93%
NC	26	6.79%
ME	22	5.74%
VA	13	3.39%
CT	9	2.35%
PA	4	1.04%
Other	4	1.04%
Total	383	100.00%

Table 20. Atlantic mackerel, squid, butterfish dealer permit holders who bought *Loligo* in 2005 by state.

Home Port State	No. Dealers	Pct. of Total
NY	39	36.79%
RI	22	20.75%
MA	14	13.21%
NC	12	11.32%
NJ	9	8.49%
VA	5	4.72%
Other	5	4.72%
Total	106	100.00%

Based on NMFS dealer reports, a total of 339 vessels landed 16765 mt of *Loligo* valued at $21.5 million in 2005 (Table 1). Most of *Loligo* landed in 2005 was taken by *Loligo*/butterfish moratorium permit holders (Table 21). About 57% of the vessels which possessed *Loligo*/butterfish moratorium permits in 2005 actually landed *Loligo.* There were 164 vessels which landed 3,233 mt of *Loligo* in 2005 which possessed incidental catch permits (Table 21).

Table 21. *Loligo* landings by permit category for the period 1998-2005.

	LOLIGO MORATORIUM		INCIDENTAL TAKE		PARTY CHARTER		NO LOLIGO PERMIT		UNKNOWN		TOTAL	
Year	mt	pct	mt	pct	mt	pct	mt	pct	mt	pct	mt	quota (mt)
1998	18,263	95.5%	126	0.7%	0	0.0%	101	0.5%	633	3.3%	19,123	21,000
1999	18,214	95.3%	215	1.1%	0	0.0%	110	0.6%	570	3.0%	19,109	21,000
2000	16,280	93.2%	393	2.2%	0	0.0%	146	0.8%	657	3.8%	17,475	13,000
2001	13,423	94.3%	170	1.2%	6	0.0%	116	0.8%	523	3.7%	14,238	17,000
2002	15,279	91.5%	408	2.4%	4	0.0%	135	0.8%	881	5.3%	16,707	17,000
2003	10,988	92.1%	98	0.8%	0	0.0%	98	0.8%	751	6.3%	11,935	17,000
2004	13,934	90.2%	158	1.0%	1	0.0%	89	0.6%	1,267	8.2%	15,448	17,000
2005	15,734	93.9%	73	0.4%	11	0.1%	42	0.2%	905	5.4%	16,765	17,000
Mean pct		93.2%		1.2%		0.0%		0.7%		4.9%		

6.6.2.5 Description of areas fished

The 2005 landings of *Loligo* by NMFS statistical area (three digit) are given in Table 22. There were three statistical areas which, individually, accounted for greater than 10% of the *Loligo* landings in 2005: 616, 537, and 622. Collectively, these three areas accounted for over half of the 2005 *Loligo* landings.

Table 22. Statistical areas from which 1% or more of *Loligo* were landed in 2005.

Stat Area	Landings (mt)	Pct. of Total
616	4,379	26.27%
622	3,923	23.54%
537	2,572	15.43%
525	1,649	9.89%
526	816	4.89%
612	805	4.83%
613	616	3.70%
632	441	2.65%
626	224	1.34%
623	190	1.14%

Source: Unpublished NMFS dealer reports

6.6.3 *Illex illecebrosus*

6.6.3.1 Status of the Stock

The *Illex illecebrosus* population is assumed to constitute a unit stock throughout its range of exploitation from Cape Hatteras to Newfoundland (Dawe and Hendrickson 1998; Hendrickson and Holmes 2004). Spawning occurs throughout the year (Dawe and Beck 1997; Hendrickson 2004) and stock structure is complicated by the overlap of seasonal cohorts. This highly migratory, oceanic species tends to school by size and sex and, based on age validation studies (Dawe et al. 1985: Hurley et al. 1985), is a sub-annual species. A statolith-based aging study of squid caught in a research survey conducted in U.S. waters indicated that the oldest individual was about seven months (215 days) of age (Hendrickson 2004). Spawning occurs on various places on the US shelf, including on the fishing grounds during the fishing season.

Observer data for 1995-2004 indicate that discarding of *Illex* occurs primarily in the *Illex* and offshore *Loligo* fisheries and is higher in the latter. During this time period, annual discards from both fisheries combined ranged between 53 and 1,565 mt, 0.5% - 6.0% of the annual *Illex* landings by weight. Annual discards were highest during 1998 (453 mt) and 2004 (1,565 mt), when USA *Illex* landings were highest.

The most recent stock assessment occurred in 2005 at SAW 42. It was not possible to evaluate current stock status because there are no reliable current estimates of stock biomass or fishing mortality rate. In addition, no projections were made in SAW 42. In addition, at SAW 37 (previous assessment) 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.

As noted above, current absolute stock size is unknown and no stock projections were done in SAW 42. Although new models show promise, the results could not be accepted because required seasonal maturity and age data are lacking. Cooperative research projects with the *Illex* fishing industry such as the collection of tow-based fisheries and biological data and electronic logbook reporting (Hendrickson et al. 2003) should continue because these high resolution data are needed to improve the assessment models. Based on promising new models, the collection of in-season maturity and age data are essential for improvement of the assessment.

6.6.3.2 Historical Commercial Fishery

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. Unpublished NMFS weighout data indicate that 2,723 mt of *Illex* valued at $1.4 million was landed in 2002 and 6,389 mt of *Illex* valued at $4.0 million was landed in 2003. Unpublished NMFS dealer reports indicate that 25,442 mt of *Illex* valued at $16.8 million was landed in 2004. Landings exceeded the annual quota by x% in 1998 and by 9% in 2004 (Table 28).

6.6.3.4 2005 Commercial Fishery

Unpublished NMFS weighout data indicate that 11,719 mt of *Illex* valued at $8.4 million was landed in 2005. (Please note that all landings data are subject to audit and update.) The landings during 2005 were 49% of the annual quota (24,000 mt). Two states, Rhode Island and New Jersey accounted for the majority (>87%) of *Illex* landings in 2005 (Table 23). Rhode Island accounted for more than half of the 2005 *Illex* landings. The majority of *Illex* landings occurred during June through September (Table 24). The directed fishery remained open for the entire fishing year in 2005. Most (>90%) *Illex* was taken by otter trawls (Table 25).

Table 23. *Illex* landings (mt) by state in 2005.

State	Landings (mt)	Pct. of Total
Rhode Island	7,132	60.86%
New Jersey	3,217	27.45%
North Carolina	654	5.58%
Connecticut	313	2.67%
Virginia	313	2.67%
Massachusetts	82	0.70%
New York	8	0.06%
Maine	0	0.00%
Total	11,719	100.00%

Source: Unpublished NMFS dealer reports

Table 24. *Illex* squid landings (mt) by month in 2005.

Month	Landings (mt)	Pct. of Total
January	15	0.13%
February	3	0.02%
March	2	0.02%
April	10	0.08%
May	240	2.00%
June	2,438	20.29%
July	3,062	25.49%
August	2,593	21.59%
September	2,415	20.10%
October	1,086	9.04%
November	143	1.19%
December	6	0.05%
Total	11,719	100.00%

Source: Unpublished NMFS dealer reports

Table 25. *Illex* landings (mt) by gear category in 2005.

Gear Category	Landings (mt)	Pct of Total
Trawl, Otter, Bottom	10,913	99.65%
Trawl, Otter, Midwater	38	0.35%
Other	<1	0.0%
Total	10,951	100.00%

Source: Unpublished NMFS vessel trip reports

The landings of *Illex* by port in 2005 are given in Table 26. Cape May, NJ and North Kingstown, RI accounted for 27 % and 55%, respectively, of the *Illex* landings in 2005. Only the port of North Kingstown, RI was dependent on *Illex* for more than 10% of the value of total fishery landings in 2005 (Table 27).

Table 26. *Illex* landings by port in 2005.

Port	Landings (mt)	Pct.	Cum. Pct.
North Kingstown, RI	6,431	55%	55%
Cape May, NJ	3,217	27%	82%
Wanchese, NC	654	6%	88%
Point Judith, RI	605	5%	93%
Stonington, CT	313	3%	96%
Hampton, VA	313	3%	98%
All Others	187	2%	100%
Total	11,719	100%	100%

Table 27. Value of *Illex* landings by port compared to total value of all species landed by port in 2005 where *Illex* comprised >1% of total value.

Port	Vessels	Value All Species	Value Illex only	Pct.
North Kingstown, RI	3	$13,760,855	$5,468,867	39.7%
Woods Hole, MA		$476,125	$13,595	2.9%
Wanchese, NC	6	$10,518,853	$275,405	2.6%
Cape May, NJ	15	$63,091,635	$1,568,786	2.5%
Stonington, CT	2	$10,603,974	$248,371	2.3%
Point Judith, RI	7	$37,397,902	$437,606	1.2%

Source: Unpublished NMFS dealer reports.

6.6.3.5 Analysis of Human Communities/Permit Data

Based on NMFS dealer reports, a total of 64 vessels landed 11,719 mt of *Illex* valued at $8.4 million in 2005 (Table 1). Virtually all of the *Illex* landed in 2005 was taken by *Illex* moratorium permit holders (Table 28). However, only 24 (38%) of the vessels which possessed *Illex* moratorium permits in 2005 actually landed *Illex*. Thus, the majority of the *Illex* fleet was inactive in the 2005 *Illex* fishery. There were 24 vessels which landed 24 mt of *Illex* which possessed incidental catch permits.

Table 28. *Illex* landings by permit category for the period 1998-2005.

	ILLEX MORATORIUM		INCIDENTAL TAKE		PARTY CHARTER		NO ILLEX PERMIT		UNKNOWN		TOTAL	
Year	mt	pct	mt	pct	mt	pct	mt	pct	mt	pct	mt	quota
1998	23,520	99.8%	6	0.0%	0	0.0%	41	0.2%	1	0.0%	23,568	*19,000
1999	7,367	99.7%	13	0.2%	0	0.0%	8	0.1%	1	0.0%	7,389	19,000
2000	8,234	99.1%	1	0.0%	0	0.0%	1	0.0%	76	0.9%	8,312	24,000
2001	3,922	97.8%	0	0.0%	0	0.0%	0	0.0%	86	2.1%	4,009	24,000
2002	2,743	99.7%	2	0.1%	0	0.0%	3	0.1%	2	0.1%	2,750	24,000
2003	6,389	98.2%	0	0.0%	0	0.0%	117	1.8%	2	0.0%	6,508	24,000
2004	25,008	98.8%	139	0.6%	0	0.0%	1	0.0%	157	0.6%	25,306	*24,000
2005	11,447	97.7%	24	0.2%	0	0.0%	0	0.0%	247	2.1%	11,718	24,000
Mean pct		98.9%		0.1%		0.0%		0.3%		0.7%		

* annual qota exceeded

Source: Unpublished NMFS dealer reports.

According to unpublished NMFS permit file data, there were 77 vessels with *Illex* moratorium permits in 2005. 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 2005 by home port state is given in Table 29. Most of these vessels were from the states of New Jersey (35%), Massachusetts (12%), and Rhode Island (14%) New York (9%), and North Carolina (10%). In addition, there were 468 dealers which possessed Atlantic mackerel, squid and butterfish dealer permits in 2005. The distribution of these dealers is given by state in Table 8. Of the 468 dealers which possessed an Atlantic mackerel, squid and butterfish dealer permit in 2005, there were 29 dealers that reported buying *Illex* in 2005 (Table 30).

Table 29. *Illex* vessel permit holders in 2005 by homeport state.

Home Port State	No. Vessels	Pct. of Total
NJ	27	35.06%
MA	12	15.58%
RI	11	14.29%
NC	8	10.39%
NY	7	9.09%
VA	6	7.79%
PA	3	3.90%
Other	3	3.90%
Total	77	100.00%

Source: Unpublished NMFS dealer reports.

Table 30. Atlantic mackerel, squid, butterfish dealer permit holders who bought *Illex* in 2005 by state.

Home Port State	No. Dealers	Pct of Total
NC	8	27.59%
RI	6	20.69%
NY	5	17.24%
MA	4	13.79%
Other	6	20.69%
Total	29	100.00%

Source: Unpublished NMFS dealer reports.

6.6.3.6 Description of the areas fished

The 2005 landings of *Illex* by statistical area (Figure 2) are given in Table 31 (includes only the three digit statistical areas that individually accounted for greater than 1% of the *Illex* landings in 2005). Four statistical areas (622, 632, 626 and 636) accounted for roughly 80% of *Illex* landings in 2005.

Table 31. Statistical areas from which 1% or more of *Illex* were landed in 2005.

Stat Area	Landings (mt)	Pct. of Total
622	4,844	44.23%
626	2,154	19.67%
632	1,326	12.11%
636	644	5.88%
623	623	5.69%
621	489	4.46%
627	411	3.75%
616	190	1.74%
615	145	1.33%

Source: Unpublished NMFS dealer reports.

6.6.4 Atlantic butterfish

6.6.4.1 Status of the stock

The Atlantic butterfish stock was recently assessed at SARC 38 (NMFS 2004). Atlantic butterfish were previously assessed in August 1993 (SAW 17). The current assessment (SARC 38) relies on NMFS survey biomass indices (kg/tow) [from NEFSC Winter, Spring, and Autumn research vessel surveys], USA landings from the NMFS dealer database, USA discard estimates from the NMFS observer program, and foreign catch (Murawski and Waring 1979). The abundance and catch data provide a very noisy signal, due to the variable availability of butterfish to the survey and because 2/3rd of the catch is from imprecisely estimated discards. A delay-difference model was developed as a basis for stock assessment.

Fishing mortality estimates averaged about 0.5 during 1967-1977 and then declined to an average of about 0.3 thereafter (NMFS 2004). Fishing mortality increased to 0.58 in 1996 and then declined to 0.12 in 2000. The average F during 2000-2002 was 0.39 and the F in 2002 was 0.34. There is an 80% probability that F in 2002 was between 0.25-1.02 (NMFS 2004). Recruitment biomass (Age 0) has been highly variable over a range of spawning biomass between 10,000 mt - 50,000 mt. Average recruitment biomass during 1968-2002 was 23,200 mt. Recruitment for this stock averaged 26,600 mt during 1968-1994 and more recently has declined to 5,000 mt and 3,000 mt in 2001 and 2002, respectively (NMFS 2004). Butterfish spawning

stock biomass (Age 0) has been variable during 1968-2002, fluctuating between 7,800-62,900 mt and averaging 23,200 mt. Spawning stock biomass in 2002 was estimated to be 8,700 mt, one of the lowest in the time series. Average biomass fluctuated between 7,800 -77,200 mt during 1969-2002, averaged 34,000 mt, and declined to 7,800 mt in 2002. There is an 80% probability that average biomass in 2002 was between 2,600-10,900 mt (NMFS 2004).

Based on the current overfishing definition, overfishing is not occurring (NMFS 2004). New biological reference points estimated for butterfish in SARC 38 are F_{msy}=0.38 and B_{msy}=22,798 mt. According to these estimates, fishing mortality in 2002 was near F_{msy} and stock biomass was 8,700 or less than half of B_{msy}. However, the estimates of fishing mortality and biomass are highly uncertain. Recruitment has declined since 1995 and was poor in 2001 and 2002. The last two NEFSC fall survey indices for butterfish were among the lowest of the time series dating back to 1967. Discards are a significant source of mortality for this stock: discards are estimated to be twice landings. SARC 38 noted that conservation and management measures should be implemented to reduce discards. In February 2005, the Council was notified by NMFS that the butterfish stock is overfished. The Council is currently developing a stock rebuilding plan for butterfish in Amendment 10 to the FMP.

6.6.4.2 Historical Commercial Fishery

Atlantic butterfish were landed exclusively by US fishermen from the late 1800's (when formal record keeping began) until 1962 (Murawski and Waring 1979). Reported landings averaged about 3,000 mt from 1920-1962 (Waring 1975). Beginning in 1963, vessels from Japan, Poland and the USSR began to exploit butterfish along the edge of the continental shelf during the late-autumn through early spring. Reported foreign catches of butterfish increased from 750 mt in 1965 to 15,000 mt in 1969, and then to about 18,000 mt in 1973. With the advent of extended jurisdiction in US waters, reported foreign landings declined sharply from 10,353 mt in 1976 to 1,326 mt in 1978. Foreign landings were slowly phased out by 1987. Since 1988, foreign butterfish landings have averaged about 1 mt.

During the period 1965-1976, US Atlantic butterfish landings averaged 2,051 mt. From 1977-1987, average US landings doubled to 5,252 mt, a historical peak of slightly less than 12,000 mt landed in 1984. Since then US landings have declined sharply to an average of 2,500 mt since 1988. Recent reductions in Japanese demand for butterfish has probably had a negative effect on butterfish landings.

Butterfish landings totaled 2,700 mt in 1992. Almost half (45%) of the 1992 total came from southern New England waters (Statistical area 53). Two statistical areas, 53 and 61, accounted for over 75% of the 1992 total. About half of the landings occurred during January and February, the remainder being distributed throughout the rest of the year. Butterfish landings were 3,631 mt and 2,013 mt in 1994 and 1995 , respectively. NMFS weighout data indicate that US butterfish landings increased to 3,489 mt in 1996 (valued at $5.1 million) and then decreased to 2,797 mt (valued at $4.7 million) in 1997. NMFS weighout data indicate that butterfish landings were 1,964 mt in 1998 (valued at $2.5 million) and that butterfish landings increased to 2,116 mt in 1999 (valued at $2.7 million). Butterfish landings decreased to 1,432 mt in 2000 (valued at $1.5 million). Unpublished NMFS weighout data indicate that 4,373 mt of butterfish

valued at $3.2 million was landed in 2001. Unpublished NMFS weighout data indicate that recent landings of butterfish have been low, declining from 872 mt (valued at $0.9 million) in 2002 to 473 mt in 2003 and then to 538 mt in 2004 (valued at $0.7 million). Landings did not exceed the annual quotas during 1998-2004 (Table 38).

6.6.4.3 2005 Commercial Fishery

Unpublished NMFS weighout data indicate that 393 mt of butterfish valued at $0.6 million was landed in 2005. (Please note that all landings data are subject to audit and update.) The landings during 2005 were less than 25% of the annual quota (1,681 mt). Two states, Rhode Island and New York accounted for the majority (>80%) of butterfish landings in 2005 (Table 32). New York accounted for more than half of 2005 butterfish landings. Approximately 39% of the butterfish landings in 2005 occurred during February, May and June (Table 33). The majority were taken with bottom otter trawls (Table 34).

Table 32. Butterfish landings (mt) by state in 2005.

State	Landings (mt)	Pct. of Total
New York	198	50.54%
Rhode Island	122	31.02%
New Jersey	37	9.42%
Connecticut	22	5.67%
Massachusetts	8	2.00%
Virginia	3	0.87%
Maryland	1	0.38%
Delaware	<1	0.10%
Maine	<1	0.00%
Total	393	100.00%

Source: Unpublished NMFS dealer reports.

Table 33. Butterfish landings (mt) by month in 2005.

Month	Landings (mt)	Pct. of Total
January	27	6.90%
February	45	11.59%
March	30	7.60%
April	39	9.81%
May	51	13.00%
June	57	14.50%
July	32	8.18%
August	14	3.61%
September	23	5.95%
October	25	6.48%
November	27	6.81%
December	22	5.56%
Total	393	100.00%

Source: Unpublished NMFS dealer reports.

Table 34. Butterfish landings (mt) by gear category in 2005.

Gear Category	Landings (mt)	Pct. of Total
Trawl, Otter Bottom	343.2	96.45%
Gill Net	6.6	1.86%
Pound Net	3.7	1.04%
Trawl, Otter, Midwater	2.1	0.50%
Other	0.2	0.06%
Total	355.8	100.00%

Source: Unpublished NMFS vessel trip reports.

The landings of butterfish by port in 2005 are given in Table 35. Two ports, Point Judith, RI and Montauk, NY accounted for half of the butterfish landings in 2005. There was only one port that was dependent on butterfish for more than 10% of the value of total fishery landings in 2005 (Table 36).

Table 35. Butterfish landings by port in 2005.

Port	Landings (mt)	Pct.	Cum. Pct.
Montauk, NY	103.0	26%	26%
Point Judith, RI	92.6	24%	50%
Ammagansett, NY	26.4	7%	57%
Point Lookout, NY	21.0	5%	62%
Greenport, NY	19.3	5%	67%
New London, CT	18.2	5%	71%
Newport, RI	16.2	4%	76%
Hampton Bay, NY	13.7	4%	79%
Belford, NJ	13.2	3%	82%
Cape May, NJ	11.7	3%	85%
North Kingstown, RI	11.3	3%	88%
Pt. Pleasant, NJ	10.0	3%	91%
New Bedford, MA	7.4	2%	93%
Unknown	5.6	1%	94%
New York City, NY	4.0	1%	95%
All Others	19.1	5%	100%
Total	392.5	100%	100%

Source: Unpublished NMFS dealer reports

Table 36. Value of butterfish landings by port compared to total value of all species landed by port in 2005 where butterfish comprised >1% of total value.

Port	Vessels	Value All Species	Value Butterfish Only	Pct.
Ammagansett, NY		$378,813	$42,714	11.3%
Greenport, NY	4	$699,165	$37,023	5.3%
Point Lookout, NY	4	$831,573	$30,098	3.6%
Montauk, NY	24	$16,093,896	$207,748	1.3%
New London, CT	3	$2,401,165	$26,182	1.1%
Mattituck, NY		$661,248	$6,688	1.0%

Source: Unpublished NMFS dealer reports

6.6.4.4 Analysis of Human Communities/Permit Data

According to unpublished NMFS permit file data, there were 383 vessels with *Loligo*/butterfish moratorium permits in 2005. These are limited access permits and are available only to vessels which meet the qualifications specified in Amendment 5 to the FMP in 1997. The distribution of vessels which possessed *Loligo*/butterfish moratorium permits in 2005 by home port state is given in Table 19. Most of these vessels were from the states of Massachusetts (26%), New York (16%), Rhode Island (17%), New Jersey (21%), North Carolina (7%), Virginia (3%), and Connecticut (2%). In addition, there were 468 dealers which possessed Atlantic mackerel, squid and butterfish dealer permits in 2005. The distribution of these dealers is given by state in Table 8. Of the 468 dealers which possessed a Atlantic mackerel, squid and butterfish dealer permit in 2005, there were 85 dealers that reported buying butterfish in 2005 (Table 37).

Table 37. Atlantic mackerel, squid, butterfish dealer permit holders who bought butterfish in 2005 by state.

Home Port State	No. Dealers	Pct. of Total
NY	36	42.35%
RI	19	22.35%
MA	8	9.41%
NJ	8	9.41%
VA	7	8.24%
MD	3	3.53%
Other	4	4.71%
Total	85	100.00%

Source: Unpublished NMFS dealer reports

Based on NMFS dealer reports, a total of 257 vessels landed 393 mt of butterfish valued at $0.7 million in 2005 (Table 1). Most of the butterfish landed in 2005 was taken by *Loligo/*butterfish moratorium permit holders (Table 38). There were 118 vessels which landed 75 mt of butterfish in 2005 which possessed incidental catch permits

Table 38. Butterfish landings by permit category for the period 1998-2004.

	BUTT MORATORIUM		INCIDENTAL TAKE		PARTY CHARTER		NO BUTT PERMIT		UNKNOWN	
Year	mt	pct	mt	pct	mt	pct	mt	pct	mt	quota (mt)
1998	1,711	87.0%	34	1.7%		0.0%	35	1.8%	186	5,900
1999	1,868	88.5%	33	1.6%		0.0%	28	1.3%	181	5,900
2000	1,175	81.1%	60	4.1%	0	0.0%	41	2.9%	173	5,900
2001	3,991	90.6%	52	1.2%	1	0.0%	89	2.0%	271	5,897
2002	653	74.9%	39	4.5%	0	0.0%	40	4.6%	140	5,900
2003	398	84.2%	17	3.7%	0	0.0%	15	3.1%	43	5,900
2004	318	75.4%	22	5.3%	0	0.0%	8	2.0%	74	5,900

6.6.4.5 Description of the areas fished

The 2005 landings of butterfish by NMFS three-digit statistical area (Figure 2) are given in Table 39. Statistical area 611 was the most important area, accounting for 30% of total butterfish landings in 2005. Other important statistical areas for butterfish included areas 616, 537, and 525.

Table 39. Statistical areas from which 1% or more of butterfish were landed in 2005 based on unpublished NMFS dealer reports.

Stat Area	Landings (mt)	Pct. of Total
611	107.5	30.27%
616	85.7	24.12%
537	57.7	16.22%
525	22.3	6.27%
613	15.8	4.45%
539	13.8	3.89%
526	10.8	3.03%
621	8.7	2.45%
612	8.1	2.29%
622	4.4	1.23%

7.0 ENVIRONMENTAL CONSEQUENCES – ANALYSIS OF (DIRECT AND INDIRECT) IMPACTS

7.1 Impacts of Alternatives for Atlantic mackerel

7.1.1 Biological Impacts on Managed Resource and Non-Target Species

The three alternatives considered for Atlantic mackerel specifications for 2007 are fully described in section 5.1 and are summarized in Table 7.1.1.1 below (alternative 1 is the preferred alternative).

Table 7.1.1 Summary of Atlantic mackerel specifications considered for 2007.

	ABC	IOY	DAH	DAP	JVP	TALFF
Alt. 1 (preferred alternative)	186,000	115,000	115,000	100,000	0	0
Alt. 2	335,000	115,000	115,000	100,000	0	0
Alt. 3	204,000	115,000	115,000	100,000	0	0

According to current regulations, ABC for Atlantic mackerel must be calculated using the formula ABC = T - C, where C is the estimated catch of mackerel in Canadian waters for the upcoming fishing year and T is the catch associated with a fishing mortality rate that is equal to F_{target} . Biological reference points for Atlantic mackerel adopted in Amendment 8 to the Atlantic Mackerel, Squid and Butterfish FMP (implemented in 1998) are Fmsy = 0.45 and SSBmsy = 890,000 mt . These reference points were re-estimated in SARC 42 to be F_{msy} = 0.16 and SSB_{msy} = 644,000 mt. Thus, based on these newly revised reference points, SARC 42 recommended that the target F for mackerel (which forms the basis for calculation of ABC) be revised to F=0.12. Deterministic projections for 2006-2008 were conducted in SARC 42 assuming an estimated catch of 95,000 mt (209 million lbs) in 2005, a target fishing mortality of 0.12 (assuming F_{target}=0.75 x F_{msy}) in 2006-2008, and annual recruitment values based on the fitted S/R curve. If 95,000 mt (209 million lbs) were landed in 2005, SSB in 2006 would increase to 2,640,210 mt (5.8 billion lbs). If the F_{target} F=0.12 is attained in 2006-2008, SSB will decline to 2,304,020 mt (5.1 billion lbs) in 2007 and to 2,043,440 mt (4.5 billion lbs) in 2008. Landings during 2006-2008 would be 273,290 mt (603 million lbs), 238,790 mt (527 million lbs), and 211,990 mt (467 million lbs), respectively if fishing mortality was maintained at F_{target}. These landings are the result of an unusually large year-class (1999) present in 2005, and will not be sustainable in the long term. It is expected that these projected landings will decline to MSY (89,000 mt (196 million lbs)) in the future when more average recruitment conditions exist in the stock.

The projections for SSB (000 mt), landings (000 mt), and recruits (millions of individuals) during 2006-2008 for the northwest Atlantic stock of mackerel given in Table 7.1.2 below (from SARC 42):

Table 7.1.2 Summary of stock projections for Atlantic mackerel contained in SARC 42.

Year	SSB	F	Landings	Recruits
2005	2450	0.04	95	942
2006	2640	0.12	273	951
2007	2304	0.12	238	963
2008	2043	0.12	211	941

Given the projections above from SARC 42 for 2007, MAFMC staff recommended that ABC (mt) for 2007 be specified as follows:

ABC= Yield at F_{target}- expected Canadian catch[1]

ABC= 238,000 - 34,000
ABC=204,000

[1]Projected Canadian catch computed as the five year average Canadian landings for the period 2000-2004. The most recent five years available for Canadian landings are given in Table 7.1.3 below.

Table 7.1.3 Reported Canadian landings of Atlantic mackerel used in calculation of US ABC.

Year	Canadian landings (mt)
2000	13383
2001	23868
2002	34402
2003	44475
2004	53365
2005	51918

The Monitoring Committee reached consensus that the ABC recommendation for Atlantic mackerel for 2007 should be specified at 204,000 mt (alternative 3). The Atlantic Mackerel, Squid and Butterfish Committee and Council subsequently adopted a lower ABC specification by assuming a higher expected Canadian catch in 2007. The Committee and Council noted that the Canadian mackerel catch has been increasing over the past five years. Because of this trend, the Council was concerned that the Canadian catch in 2007 was likely to be underestimated based on a five year average. The Council ultimately adopted an ABC of 186,000 mt using the same projection for 2007 from SARC 42 but assuming a higher Canadian catch based on the most recent year for which Canadian landings are available (i.e., 2005 when reported Canadian landings were approximately 52,000 mt). The specification of ABC under alternative 2 assumes maintenance of the 2006 status quo specification of ABC.

The specification of ABC under the three alternatives ranged from 186,000 mt to 335,000 mt. Otherwise, the specifications under the three alternatives considered are identical. The ABC

specification under alternatives 1 and 3 are both consistent with the overfishing control rule adopted in Amendment 8 and the most recent assessment advice for this species. The ABC specification under alternative 3 is different from alternative 1 because it assumes a lower anticipated Canadian catch in the calculation of ABC (as discussed above).

It was also noted that IOY is specified as 115,000 mt for each of the alternatives. Projections from SARC 42 for the NW Atlantic mackerel stock indicate that the acceptable safe level of harvest from the current mackerel stock size is considerably higher than the level of IOY proposed under any of the three alternatives considered. As a result, the Council concluded that the level of exploitation associated with an IOY of 115,000 mt is not expected to have any negative biological effects on the Atlantic mackerel stock.

In-season adjustment to OY

The Council spent considerable time discussing the fact that regulations implementing the FMP allow for an increase in optimum yield (OY) for mackerel during the fishing season up to a level not to exceed ABC through an in-season adjustment to IOY. The FMP allows the Council and NMFS to specify an initial optimum yield in an amount less than or equal ABC. Under all three alternatives considered by the Council, the initial optimum yield was specified at 115,000 mt, an amount well below the yield associated with the target F (75% F_{msy}) and subsequently ABC (after the appropriate deduction for the anticipated Canadian catch for the upcoming fishing year is made). As noted above, the IOY specification (in this case 115,000 mt) can be increased up to the amount specified for ABC through the in-season adjustment mechanism.

Alternative 1 (the preferred alternative) contains the most conservative ABC specification considered by the Council and is not expected to have any negative biological impacts on the Atlantic mackerel stock. The proposed specification of Allowable Biological Catch (ABC) under the preferred alternative (186,000 mt) for Atlantic mackerel for 2007 represents a substantial reduction compared to previous specifications of ABC for Atlantic mackerel and reflects the results of the recently updated stock assessment for mackerel. By lowering the specification of ABC to 186,000 mt, the Council is consistent with both the current overfishing definition and recent stock assessment (SARC 42) which downwardly revised the estimate of both F_{msy} and F_{target} for the Northwest Atlantic mackerel stock. Thus, any in season adjustment from IOY up to ABC specified under alternative 1 will allow for the long term sustainable exploitation of the mackerel resource. Therefore, an in season increase in IOY up to 186,000 mt should have no negative biological impacts on the Atlantic mackerel stock since fishing at the ABC level will result in a fishing mortality rate well below the threshold fishing mortality rate threshold of F_{msy}. In fact, a US removal of 186,000 mt is likely to result in a fishing mortality rate less than the threshold level (75% F_{msy}) because the projections used as the basis for this harvest level assumed higher total catches (US and Canadian) than actually occurred in the years prior to the 2007 projection year.

An ABC specification of 204,000 mt is also not expected to significantly impact the Atlantic mackerel stock since it is in the range of removals for this species at the target F level given estimates of current stock size and expected landings in 2006. The projections conducted in SARC 42 (see Table above) assumed that the target F=0.12 would be achieved in 2006 and that the associated landings would be 273,000 mt (combined US and Canadian). Based on

preliminary landing statistics, it is unlikely that total US and Canadian landings will exceed a range of about 100,000 to 150,000 mt. If the projections from SARC 42 were recalculated with the expected landings for 2006, then the projected landings at F=0.12 for 2007 would be greater and would probably allow for a US ABC of 204,000 mt or greater. In addition, the ABC specification of 204,000 mt is associated with a target F (75% of F_{msy}) and, therefore, it is unlikely that landings at this level would result in a fishing mortality rate that would exceed the threshold $F=F_{msy}$ which defines overfishing for this stock (i.e., it is unlikely that overfishing would occur in 2007 at this level of ABC).

The ABC specified under Alternative 2 (i.e., 335,000 mt) could have negative biological consequences for the Atlantic mackerel stock. Fishery removals of Atlantic mackerel at this level could result in a fishing mortality rate that would exceed the threshold fishing mortality rate ($F>F_{msy}$) in 2007. Prosecution of the Atlantic mackerel fishery at this level would constitute overfishing and could reduce spawning stock biomass which could also result in reduced recruitment and eventual spawning stock depletion. Therefore, the Council concluded that an in season adjustment to ABC specified under alternative 2 would likely result in negative biological consequences for the NW Atlantic mackerel stock.

Fishery removals at the ABC level for either alternative 1 or 3 are not expected to adversely affect species that prey on Atlantic mackerel since assumptions about natural mortality are made implicitly in the calculation of MSY. That is, the allowable fishery yields at the biological reference points defined in the FMP are assumed to occur *in conjunction with* assumed mortality due to natural causes, including mortality due to predation. Since fishing at the ABC levels under Alternatives 1 and 3 are not expected to affect sustainability of the mackerel resource, no negative effects on species which prey on mackerel are anticipated. If the fishery were prosecuted at the ABC level under alternative 2 and the stock was reduced below the target biomass, then some negative effects on species that prey on Atlantic mackerel are possible, but these effects are difficult if not impossible to quantify. Fishery removals at the IOY level (115,000 mt) for all three alternatives are not expected to adversely affect species that prey on Atlantic mackerel.

The list of species taken incidentally and discarded in the directed Atlantic mackerel fishery are listed in Table 40. The species listed included those with discards that comprised more than 2% of the total catch by weight on trips which landed 5,000 pounds of more of Atlantic mackerel based on the unpublished NMFS sea sampling data for the 1989-2005. The species of importance based on this criteria included Atlantic herring, spiny dogfish, scup, red hake, blueback herring and butterfish. All of these species will be impacted to some degree by the prosecution of the Atlantic mackerel fishery. However, an IOY specification of 115,000 mt is not expected to significantly increase or re-distribute fishing effort by gear type in 2007 since this level of IOY represents the status quo. An in season adjustment up to ABC under all three alternatives would result in an increase in fishing effort relative to the IOY level. Of the three alternatives, alternative 2 would likely result in the greatest increase in fishing effort followed in descending order by alternative 3 and alternative 2. All of these alternatives would likely increase the incidental capture of the non-target species described in Table 40 relative to the IOY specification of 115,000 mt, but the biological significance of these levels of bycatch can't be quantified given current information.

Table 40. Species taken and discarded in directed trips for butterfish, *Illex, Loligo* and Atlantic mackerel based on unpublished NMFS sea sampling data from 1989-2005.

Butterfish

	Catch Disposition				
SPECIES	Disc	Kept	Grand Total	Pct Disc (% of all species listed)	Pct Disc (% of species Grand Total)
BUTTERFISH	680,748	760,766	1,441,514	23%	47%
HAKE, SILVER	487,920	804,790	1,292,710	17%	38%
HAKE, RED	404,604	62,055	466,659	14%	87%
SKATES	246,261	23,740	270,001	8%	91%
DOGFISH SPINY	227,413	4,998	232,411	8%	98%
SCUP	192,269	175,967	368,236	7%	52%
SQUID (LOLIGO)	141,265	2,255,835	2,397,100	5%	6%
MACKEREL, ATLANTIC	128,524	825,732	954,256	4%	13%
FLOUNDER, FOURSPOT	92,948	568	93,516	3%	99%
SKATE, LITTLE	76,474	15,434	91,908	3%	83%

Illex

	Catch Disposition				
SPECIES	Disc	Kept	Grand Total	Pct Disc (% of all species listed)	Pct Disc (% of species Grand Total)
SQUID (ILLEX)	176,835	13,368,862	13,545,697	53%	1%
BUTTERFISH	57,009	74,665	131,674	17%	43%
MACKEREL, ATLANTIC	50,024	69	50,093	15%	100%
MACKEREL, CHUB	45,797	9,600	55,397	14%	83%

Loligo

	Catch Disposition				
SPECIES	Disc	Kept	Grand Total	Pct Disc (% of all species listed)	Pct Disc (% of species Grand Total)
BUTTERFISH	702,437	118,629	821,066	22%	86%
HAKE, SILVER	635,251	321,788	957,039	20%	66%
SCUP	297,682	105,592	403,275	9%	74%
SQUID (ILLEX)	279,459	55,869	335,327	9%	83%
DOGFISH SPINY	230,283	4,731	235,014	7%	98%
SQUID (LOLIGO)	223,176	8,056,034	8,279,210	7%	3%
HAKE, RED	221,548	7,524	229,072	7%	97%
MACKEREL, ATLANTIC	136,581	113,708	250,289	4%	55%
SKATES	123,412	479	123,891	4%	100%
SKATE, LITTLE	85,230	15,704	100,934	3%	84%

Mackerel

	Catch Disposition				
SPECIES	Disc	Kept	Grand Total	Pct Disc (% of all species listed)	Pct Disc (% of species Grand Total)
MACKEREL, ATLANTIC	376,195	11,175,709	11,551,904	48%	3%
HERRING, ATLANTIC	121,914	1,797,865	1,919,779	16%	6%

DOGFISH SPINY	77,705	8,885	86,590	10%	90%
SCUP	61,071	25,238	86,309	8%	71%
HAKE, RED	39,753	4,662	44,415	5%	90%
HERRING, BLUE BACK	28,482	8,408	36,890	4%	77%
HAKE, SILVER	25,001	55,025	80,026	3%	31%
BUTTERFISH	21,971	38,163	60,134	3%	37%

7.1.2 Habitat Impacts

As noted in Table 3, Atlantic mackerel are taken primarily with mid-water otter trawls. This gear is not expected to adversely impact essential fish habitat since it is not in contact with the seabed. In addition, all three alternatives represent the 2006 status quo IOY in 2007. Since the IOY under the all three alternatives represent the status quo specification, it should not result in an increase in fishing effort or redistribute effort by gear type and, therefore no negative impacts on habitat are anticipated as a result of the proposed specification of IOY under all three alternatives.

In-season adjustment to OY

As noted above, current regulations allow the Council and NMFS to increase optimum yield (OY) for mackerel during the fishing season up to a level not to exceed ABC through an in-season adjustment to IOY. The FMP allows the Council and NMFS to specify an initial optimum yield in amount less than or equal to ABC. Under all three alternatives considered by the Council, the initial optimum yield was specified at 115,000 mt, but the ABC specifications ranged from 186,000 mt under alternative 1 to 335,000 mt under alternative 2. An in-season adjustment up to ABC could potentially result in an increase in fishing effort under any of the three alternatives considered compared to the initial specification or relative to the status quo measured either as recent landings or specification of IOY. However, this fishery is prosecuted primarily with mid-water trawls which do not contact the seabed. Therefore, an in-season adjustment under any of the three alternatives is not expected to have negative impacts on habitat since no physical contact and hence disturbance of any habitat is anticipated.

7.1.3 Impacts on Endangered and Other Protected Species

ESA-listed cetaceans and others protected under the MMPA (described in section 6.4) may occur in areas where the Atlantic mackerel fishery operates. The U.S. commercial Atlantic mackerel fishery takes place over the mid-Atlantic shelf region from Cape Hatteras to southern New England primarily during December through May as the species migrate. Smaller coastal fisheries work the stocks within the Gulf of Maine from May-December. Mid-water trawl gear is the primary gear type for the Atlantic mackerel fishery. ESA-listed cetaceans may be present in mid-Atlantic and New England waters year round but most animals move in the late fall to more southern locations for mating and/or calving or disperse farther offshore. Mid-Atlantic waters are used as a migratory pathway in the spring as right whales and humpback whales return from their wintering calving areas in the south. Most species of ESA-listed cetaceans, including right, humpback, fin and sperm whales are observed in southern New England waters by March-April. Right, humpback, and fin whales are also observed in Gulf of Maine waters throughout the summer. Of these species, humpback and fin whales are most likely to be

affected by the Atlantic mackerel fishery, since both species are known to prey on Atlantic mackerel. The most recent Northwest Atlantic mackerel stock assessment was at SAW-42 (NMFS 2006). The assessment concluded that the Atlantic mackerel stock is currently at a high level of abundance and is under-exploited. The stock is capable of sustaining any likely increase in fishing effort from this action. Furthermore, the action will not deplete the food source to such an extent that any whales that compete for the food resource will be adversely affected. In addition, these whales may be attracted to domestic vessels as they transfer their catch to a JVP, as has been seen in other fisheries. However, records suggest that mid-water trawl gear does not pose a significant entanglement risk to these ESA-listed cetaceans, and there is no information on ESA-listed cetaceans interacting with this fishery as mackerel is being transferred from a domestic vessel to a JVP. Observation records for the time period (1994 to 2001) show there were no known interactions between the Atlantic mackerel fishery and ESA-listed cetacean species.

Sea turtle distribution also overlaps with the operation of the Atlantic mackerel fishery. Sea turtles typically occur in southern waters or at the southern limit of mid-Atlantic waters throughout the winter, and migrate up the coast to southern New England waters in the spring as water temperatures increase. However, most of these species, including green, Kemp's ridley and loggerhead sea turtles, stay close to the coast feeding on bottom dwelling species (i.e., crabs) or vegetation where the mackerel fishery is less likely to occur. Leatherbacks do not prey on mackerel and are unlikely to be attracted to operations of this fishery. While, loggerheads do not typically prey on fish species, and are unlikely to catch or target fast moving fish such as mackerel. Thus, interactions between sea turtles and the inshore Atlantic mackerel fishery are not anticipated. While in waters farther offshore where the predominant sea turtle species are leatherbacks and larger loggerheads the interaction possibilities may be greater. Observation data from 1994 to 2006 show no interactions have occurred between the mackerel sink gillnet and otter trawl fishery and endangered cetaceans or sea turtles.

Based on the analysis of observed mortalities given in Waring *et al.* (2003), the three cetacean species of primary concern in the prosecution of the Atlantic mackerel fishery include common dolphins and two species of pilot whales. As noted above, all three alternatives considered represent the 2006 status quo IOY and therefore no increase in fishing effort is expected as a result. Therefore, the implementation of any of the three alternatives considered are not expected to increase the chance of an interaction with common dolphins and/or pilot whales compared to the 2006 status quo IOY.

In-season adjustment to OY

As noted above, current regulations allow the Council and NMFS to increase optimum yield (OY) for mackerel during the fishing season up to a level not to exceed ABC through an in-season adjustment to IOY. The FMP allows the Council and NMFS to specify an initial optimum yield in amount less than or equal to ABC. Under all three alternatives considered by the Council, the initial optimum yield was specified at 115,000 mt, but the ABC specifications were 186,000 mt under alternative 1, 335,000 mt under alternative 2 (no action) and 204,000 under alternative 3. These specifications represent the maximum level to which IOY could be increased to during the fishing season should the need arise. An in-season adjustment up to ABC could potentially result in an increase in fishing effort under any of the three alternatives

considered compared to the initial specification or relative to the status quo measured either as recent landings or specification of IOY. The Council concluded that an increase in fishing effort in the mackerel fishery as a result of an in-season adjustment has the potential to increase the number of interactions with common dolphins. However, the anticipated levels of interactions with common dolphins due to in season adjustments in IOY up to ABC under the three alternatives considered by the Council can't be quantified given current information. The Council is participating in the development of a take reduction plan which includes common dolphins. NMFS has convened an Atlantic Trawl Gear Take Reduction Team (ATGTRT) as part of a settlement agreement between the Center for Biological Diversity (CBD) and NMFS to address the incidental mortality and serious injury of long-finned pilot whales, short-finned pilot whales, common dolphins and white sided dolphins in several trawl gear fisheries operating in the Atlantic Ocean. As noted in section 6.4 of this EA, takes of pilot whales, common dolphins and white-sided dolphins have occurred in fisheries operating under the Atlantic Mackerel, Squid, and Butterfish FMP as well as in mid-water and bottom trawl fisheries in the Northeast. The western North Atlantic stocks of pilot whales, common dolphins, and white-sided dolphins were designated as non-strategic in the 2005 Marine Mammal Stock Assessment Report. As noted above, the species of principal concern in the directed mackerel fishery are common dolphins.

Section 118 of the MMPA requires NMFS to develop and implement take reduction plans (TRP) designed to assist in the recovery or prevent the depletion of each strategic stock which interacts with a category I or II fishery. Section 118 MMPA calls for the establishment of take reduction teams (TRT) to develop, and submit to NMFS a take reduction plan for strategic stocks of marine mammals. The immediate goal of a TRP is to reduce, within six months of implementation, the incidental mortality and serious injury of marine mammals to levels less than the stock's Potential Biological Removal (PBR) level. The takes of all the marine mammal species of concern in the ATGTRT are currently below their respective potential biological removal (PBR) levels and therefore are non-strategic stocks. The charge to the ATGTRT is to develop a take reduction plan (TRP) within 11 months that, once implemented, will achieve the long-term goal of the MMPA of reducing serious injury and mortality of affected stocks to a level approaching a zero mortality rate goal (ZMRG) (which is 10% of the Potential Biological Removal (PBR) of each stock). The measures developed under the ATGRP should help to mitigate the probability of any additional interactions between the mackerel fishery and common dolphins which might result form an in-season adjustment to the mackerel IOY. Additional background information on the ATGTRT is available at the following website: http://www.nero.noaa.gov/prot_res/atgtrp/index.html

7.1.4 Impacts on Human Communities

The Council selected an IOY under all three alternatives that is consistent with the recent increases in processing capacity and domestic landings of mackerel. The recent increase in US processing capacity in conjunction with high world demand has created conditions which are favorable for continued growth of US mackerel fishery. Prior to 2005, there was a steady increase in domestic harvest of Atlantic mackerel. Increased landings occurred primarily as a result of increased demand for mackerel as a result of improved world markets combined with the recent expansion of US domestic processing capacity. Industry member testified before the Council that the increase in shore side processing capacity was primarily a result of shore side

processing plant expansion in New Bedford and Gloucester, MA and Cape May, NJ. This expansion included the addition of new processing facilities as well as an increase in existing processing infrastructure. Industry testimony from shore side processors indicated that the ability and intent exist to land and process well in excess of 100,000 mt of Atlantic mackerel in 2007. To reach this level, the Atlantic mackerel stock will need to be sufficiently abundant and available in the right sizes to the harvest sector. The landings of mackerel in 2005 failed to reach these levels due to a lack of availability of large mackerel. Industry members testified that if stock conditions are similar to those prior to 2005, then they fully intend and expect to land the entire IOY in 2006 and 2007.

The IOY in 2007 will provide the greatest overall benefit to the nation because it responds to the investments made in the last several years in the domestic mackerel fishery, particularly in the processing sector. Also, setting an IOY at a level that the domestic fishery can harvest and process precludes any TALFF or JVP that could threaten the strides the domestic mackerel fishery is making towards harvesting the allowable biological catch. Foreign caught mackerel as the result of any TALFF could compete for the markets currently buying domestic processed mackerel. The specification of IOY at the preferred level should allow the US mackerel industry to take advantage of improved world market conditions for Atlantic mackerel, which will directly benefit the ports and communities which are dependent upon Atlantic mackerel. In recent years the production of Atlantic mackerel in Europe has declined relative to their production of Atlantic mackerel in the early 1990's. This relative decline in European production has resulted in an increase in world demand for US mackerel. While development of the domestic mackerel fishery has been slowed by such factors as transportation costs to foreign markets, significant strides are being made towards realizing the goal of the MSFCMA to fully utilize the mackerel fishery by the US industry.

As noted above, the Council concluded that due to recent increases in processing capacity and domestic landings, the US has the capacity to land and process 100,000 mt of mackerel, which is the preferred level of DAP in 2007. As a result, the Council concluded that IOY=DAH and therefore TALFF=0. The Council reached this conclusion based on the fact that there has been a steady increase in domestic harvest of Atlantic mackerel in recent years, with the landings increasing dramatically in recent years. For example, mackerel landings roughly doubled annually from 5,645 mt in 2000 to 26,192 mt in 2002. Since then, mackerel landings increased three-fold from 2001 to 2003 and nearly four-fold from 2001 to 2004. Unpublished NMFS landings data (based on dealer reports) for Atlantic mackerel indicate that 53,781 mt of mackerel was landed in 2004. However, vessel trip report (logbook) data submitted by industry members indicate that landings in 2004 approached 60,000 mt. Given this information and the observation that there is generally a lag in production relative to increases in harvest and processing capacity, the Council concluded that the US domestic fishery could potentially land all of the IOY in 2007.

Based on a preliminary analysis of recent fishery performance, 2004 US commercial mackerel landings appear to have been in the range of 54,000 - 60,000 mt. Subsequent to the 2004 fishing year, mackerel landings decreased to 42,000 mt in 2005 but preliminary landings data indicate that year to date 2006 mackerel landings increased to over 50,000 mt. The recent stock assessment re-estimated MSY levels for the NW Atlantic mackerel stock ranging from 89,000-149,000 mt. Depending on the amount assumed as the appropriate level of MSY and depending on the amount to be shared by the Canadian fishery, the development of the US fishery is

quickly converging with the US portion of MSY for this stock. The Council recently voted to proceed with the development of a controlled or limited access program for Atlantic mackerel in Amendment 11 to the FMP. This decision is significant because it was based on additional preliminary analyses of existing harvest capacity within the permitted mackerel fleet which indicated that the portion of the fleet that is currently active is capable of landing the entire long term yield. Thus, it appears that no surplus exists between current fleet capacity and either long term potential yield or the 2007 DAH specification. In addition, industry members testified that they intended to fully utilize the 2006 and 2007 DAH but did not achieve this level of landings due to poor availability of large mackerel during recent fishing seasons. The reason for the poor performance of the 2005 fishery is not fully understood, but industry members testified that the distribution of the mackerel stock along the coast of North America was atypical in 2005. This atypical pattern is believed to be primarily due to anomalous sea temperatures which affected their distribution. Most industry members testified that the mackerel stock appears to be in fair condition and that the poor catches of mackerel in 2005 were a result of the anomalous distribution of large mackerel rather than a decrease in overall abundance of the stock. None the less, the poor performance in 2005 could also be an indication that the stock is less abundant than stock assessments would indicate. Industry members also testified that, if mackerel stock abundance and availability permit it, they intend to fully utilize the DAH proposed for 2007.

The MSFMCA provides that the specification of TALFF, if any, shall be that portion of the optimum yield of a fishery which will not be harvested by vessels of the United States. While a surplus existed between ABC and DAH for many years, that surplus has disappeared due to the downward revision in the estimate of MSY from SARC 42 and recent increases in both US and Canadian landings. Therefore, the Council concluded that no surplus exists between the US portion of the sustainable yield from this stock and the IOY for 2007. As a result TALFF is specified as zero under all three alternatives considered by the Council. In addition, the term optimum yield under the Magnuson-Stevens Act means the amount of fish which will provide the provide the greatest overall benefit to the Nation with respect to food production and recreation, taking into account the protection of marine ecosystems. The Council believes that the proposed level of IOY will provide the greatest overall benefit to the nation. Based on this analysis and a review of the state of the world mackerel market and possible increases in US production levels, the Council concluded that specifying an IOY that results in zero TALFF will yield positive social and economic benefits to the mackerel fishery and to the Nation.

Because the Council recommended an IOY that results in a zero TALFF specification in 2007, the economic benefit to the nation is reduced relative to the 2001 TALFF specification (3,000 mt). Foreign vessels fishing in the US EEZ for Atlantic mackerel must pay fees based on the mt of mackerel harvested. For Atlantic mackerel, the poundage fee paid to the nation is $64.76 per mt. In 2001, TALFF was specified at 3000 mt. If the entire TALFF allocation had been harvested, about $195,000 in fees would have been collected for the nation. In addition, TALFF operations are often brokered by a US representative. Although the amount of income gained by the US broker is unknown, this income would also be lost with the elimination of TALFF in the 2007 fishing year. However, this loss will be recouped easily through the specification of an IOY at a level that stimulates the growth of the domestic mackerel market with its concomitant benefits to the communities and service industries that will participate in this development.

The status quo specification of IOY for 2006 is 115,000 mt. This is the preferred alternative adopted by the Council for 2007 under all three alternatives and includes a JVP specification of zero. In years prior to 2005, the Council specified JVP greater than zero because it believed US processors lacked the capability to process the total amount of mackerel that US harvesters could land (i.e., this was a limiting factor). The Council has systematically reduced JVP because it has concluded that the surplus between DAP and DAH has been declining as US shore side processing for mackerel has expanded over the last several years. The Council received testimony from processors and harvesters that the shore side processing sector of this industry has been under going significant expansion since 2002-2003. US shore side processing capabilities for mackerel have expanded as a result of increased capacity at existing plants in Cape May, NJ as well as the addition of new processing facilities in New Bedford and Gloucester, MA. As a result of the significant expansion in shore side processing capacity in recent years, the Council concluded that shore side processing capacity was no longer a limiting factor relative to domestic production of Atlantic mackerel. As a result, the Council concluded that the US mackerel fishery has the potential to land and process the DAH (i.e., DAP=DAH), so JVP is specified at 0 in 2005, 2006 and is proposed again under all three alternatives in 2007. In addition to the recent increases in domestic processing capacity, the Council noted that there has been only minimal JVP activity over the past five years. For example, JVP landings of Atlantic mackerel were 0 in 2000, <1 mt in 2001, 1,787 mt in 2002 and then declined to 0 again in 2003 and 2004. Thus, the Council's conclusion that DAH=DAP in 2007 was based, in part, on the fact no JVP activity has occurred for Atlantic mackerel since 2002.

In-season adjustment up to ABC

As noted above, all three alternatives represent the status quo for 2007 in terms of IOY (compared to 2006). Therefore, no changes in landings of Atlantic mackerel are expected compared to the status quo and therefore, there should be no changes in social and economic benefits to the ports and communities dependent on mackerel under each of these alternatives for IOY. However, the Council had considerable discussion about the fact that IOY for mackerel could be increased during the fishing season up to a level not to exceed ABC through an in-season adjustment. Under all three alternatives considered by the Council, the initial optimum yield was specified at 115,000 mt, but the ABC specifications were 186,000 mt under alternative 1, 335,000 mt under alternative 2 (no action) and 204,000 under alternative 3. These specifications represent the maximum level to which IOY could be increased to during the fishing season should the Regional Administrator determine that such a need exists. An in-season adjustment up to ABC could potentially result in an increase in landings and hence revenue under all three alternatives considered compared to the status quo measured either as recent landings or the 2006/2007 specification of IOY.

Under alternative 1, an in-season adjustment of IOY (115,000 mt) up to ABC (186,000 mt) would represent an increase of about 38% in landings and revenue (assuming a constant ex-vessel price of $261/mt; see Table 7.1.1 below). This would amount to an increase of about $18.5 million in total revenue or $63,680 per vessel (based on the total of 293 vessels which landed mackerel in 2005). This assessment assumes that the additional revenue realized as a result of an in-season adjustment would be shared equally across all vessels active in the fishery. In fact, a relatively small number of vessels account for a relatively large share of the mackerel landings in any given year (i.e., roughly 25-30 vessels account for greater than 90% of the

mackerel landings). These vessels would likely benefit to much greater extent than the average vessel in the fishery under alternatives 1, 2, or 3, assuming an in-season adjustment up to ABC.

Under alternative 2, an in-season adjustment of IOY (115,000 mt) up to ABC (335,000 mt) would represent an increase of about 66% in landings and revenue (Table 7.1.1 below). This would amount to an increase of about $57.4 million in total revenue or $197,320 per vessel (based on the total of 293 vessels which landed mackerel in 2005). Under alternative 3, an in-season adjustment of IOY (115,000 mt) up to ABC (204,000 mt) would represent an increase of about 44% in landings and revenue (assuming a constant ex-vessel price of $261/mt; see Table 7.1.1 below). This would amount to an increase of about $23.2 million in total revenue or $79,825 per vessel (based on the total of 293 vessels which landed mackerel in 2005).

Table 7.1.1 Summary of potential increases in landings and revenues for the Atlantic mackerel fishery assuming an in-season adjustment up to ABC under Alternatives 1-3 in 2007.

	Alt. 1	Alt. 2	Alt. 3
ABC(mt)	186,000	335,000	204,000
Increase (ABC-IOY in mt)	71,000	220,000	89,000
Additional Revenue($)	18,531,000	57,420,000	23,229,000
$/vessel	63,680	197,320	79,825
% revenue increase	38.2	65.7	43.6

In summary, current regulations allow the Regional Administrator to increase the IOY for Atlantic mackerel up to the level specified for ABC during the fishing season through an in-season adjustment mechanism. An in-season adjustment up to ABC under all three alternatives has the potential to substantially increase Atlantic mackerel revenues compared to IOY. These increases in revenue would directly benefit the ports and communities described in Tables 5 and 6, including the vessel owners and crews as well as the firms engaged in the processing of Atlantic mackerel in those ports. Increased revenues due to an in-season adjustment would be particularly beneficial to the ports of Cape May, New Bedford, Gloucester, Fall River and North Kingston.

7.2 *Illex*

7.2.1 Biological Impacts on Managed Resource and Non-Target Species

The Council considered three quota options for *Illex* in 2007. Alternative 1 would maintain the 2006 specifications in 2007 (status quo) and was also the preferred alternative. Under this alternative the Council recommended that the specification of MAX OY and ABC be specified at 24,000 mt (yield associated with F_{msy}) in 2007 (same as in 2006) Under this option, the directed fishery for *Illex* would remain open until 95% of ABC is taken or 22,800 mt. This level of landings is also ostensibly equal to the most recent estimate of the yield associated with 75% F_{msy} for *Illex*. When 95% of ABC is taken, the directed fishery will be closed and a 10,000 pound trip limit will remain in effect for the remainder of the fishing year. Due to the large volume/low value nature of the *Illex* fishery, closure of the directed fishery essentially results in a complete closure of the fishery, since a very low level of landings is expected after a directed *Illex* fishery closure. Thus, the Council concluded that these specifications are consistent with the FMP overfishing definition for *Illex* and, therefore, are not expected to have any negative biological effects on the *Illex* stock, nor is it expected to significantly impact non-targeted species.

In setting the quota for 2007, the Council considered the management advice provided by recent stock assessments (SAW 37 and SAW 42) that the nominal TAC of 24,000 mt, which assumes a stock at B_{msy}, may not be sufficient to prevent overfishing in years of moderate abundance. SAW 37 recommended that, given uncertainties in the stock distribution and population biology, the fishery should be managed in relation to the proportion of the stock on the shelf and available to US fisheries. The Council could follow this advice if the stock size and/or the proportion of the stock available to US fisheries were known in a given year. However, since for 2007 both are currently unknown, the Council concluded that the specification of the quota at 24,000 mt is not likely to result in overfishing. This conclusion is based on the observation that given recent economic and stock conditions, the fishery is unlikely to produce catches approaching 24,000 mt unless stock size begins to approach or exceed B_{msy}. If the landings were to approach 22,600 mt (the point at which the directed fishery is closed) in 2007, then the Council concluded that it is likely that stock biomass would be at or above B_{msy}. For example, since the foreign fishery was eliminated in the mid-1980's, the domestic fishery has only produced landings approaching 24,000 mt in two years - 1998 and 2004. SAW 29 concluded that fishing mortality was unlikely to have occurred during 1994-1998 because the *upper bound* on the feasible estimates of fishing mortality for *Illex* for those years was *below* potential F_{msy} proxies. During the period 1994-1998, US landings averaged about 17,320 mt and ranged from 13,629 mt in 1997 to 23,597 in 1998. The Council assumed that at least some of those years could be considered to be years of "moderate abundance." Yet average landings of about 75% of the level at which the directed fishery would be closed (i.e., 22,600 mt under the preferred alternative) during the period 1994-1998 resulted in fishing mortality estimates whose upper bounds of confidence were below the overfishing proxies. The Council concluded that while some chance exists that the overfishing could occur, this outcome is unlikely based on the analyses provided in SAW 29. The overfishing definition adopted for *Illex* squid in Amendment 8 results in setting a fixed quota for a resource that exhibits large inter-annual variability in abundance. Changes in *Illex* abundance and US landings of the species are a result of fluctuations in population size in the Northwest Atlantic Ocean, availability to the fishery in the US EEZ, and world market conditions. Ideally,

the fishery would be managed on a real time basis and harvest policy would be adjusted during the fishing season according to stock conditions. Unfortunately, the current understanding of *Illex* stock dynamics and available data are insufficient to permit implementation of such a real time management system. Rather, the Council has implemented the current management program for *Illex* in the US EEZ which sets a fixed quota which, under most circumstances, prevents overfishing. This management approach strikes a balance between minimizing the risk that overfishing might occur and minimizing the chance that yield is not foregone unnecessarily in years of high abundance. If evidence were available that the overfishing was occurring based on stock assessment data in 2007, the current FMP does allow for in-season adjustments to the IOY (i.e., either upward or downward).

In addition to specifying the quota at 24,000 mt in 2007, the Council also recommended that the non-moratorium incidental catch allowance be specified at 10,000 pounds per trip. Overall, this recommendation is not expected to result in any negative biological consequences for the *Illex* stock since fishing mortality is controlled via the annual quota. In addition, given the relatively low economic value of *Illex*, no increases in fishing effort are expected as a result of this measure. *Illex* is a high volume, low value species which is taken offshore near the edge of the continental shelf during the summer months. The species also spoils rapidly, so either freezing or refrigerated seawater equipment is necessary to hold the catch and deliver shore side in a marketable condition. Given the substantial capital investment required to prosecute this fishery, it is unlikely that non-moratorium vessels will increase their fishing effort materially as result of the incidental catch allowance. Rather, this measure will allow non-moratorium vessels to retain the *Illex* taken as incidentally during the course of fishing in other directed fisheries. Since this measure is not expected to increase or redistribute fishing effort by gear type in the *Illex* fishery, no negative biological consequences for non target species are expected.

The species taken incidentally and discarded in the directed *Illex* fishery are listed in Table 40. The species listed included those with discards that comprised more than 2% of the total catch by weight on trips comprised of greater than 50% of *Illex* by weight based on the unpublished NMFS sea sampling data for the period 1989-2005. The species of importance based on this criteria included butterfish, Atlantic mackerel and chub mackerel. All of these species will be impacted to some degree by the prosecution of the *Illex* fishery. However, Alternative 1 is not expected to significantly increase or re-distribute fishing effort by gear type in 2007. Therefore, no additional negative biological consequences for non-target species are expected compared to the 2006 specifications.

The second alternative evaluated in this environmental assessment was the specification of the quota for *Illex* at 30,000 mt (Alternative 2). The specification of ABC at 30,000 mt may not prevent overfishing in years of moderate to low abundance of *Illex* squid. Such overfishing would have a negative biological 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 fish that prey on *Illex*. 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, although the extent of such impacts cannot be quantified. As noted above, the non-

target species taken incidentally and discarded in the directed *Illex* fishery are listed in Table 40. The species of importance based on this criteria included butterfish, chub mackerel, unclassified herring, silver hake, red hake and John Dory. All of these species will be impacted to some degree by the prosecution of the *Illex* fishery. Alternative 2 could reasonably be expected to increase or re-distribute fishing effort by gear type in 2007. Therefore, the proposed measures under Alternative 2 could negatively impact the non-target fish species listed in Table 40 compared to the status quo. However, this level of ABC would be expected to only minimally impact the non-target fish species listed in Table 40 because the mortality rates of non-target species due to the *Illex* fishery are expected to be minimal compared to other sources of mortality.

The third alternative evaluated in this environmental assessment was the specification of the quota for *Illex* at 19,000 mt (Alternative 3). Under this option, the directed fishery for *Illex* would remain open until 95% of ABC is taken (18,050 mt). As noted above, in SAW 29, an upper bound on annual fishing mortality was computed for the US EEZ portion of the stock based on a model which incorporated weekly landings and relative fishing effort and mean squid weights during 1994-1998. These estimates of F were well below the biological reference points. Based on the analyses presented in SAW 29, it can be concluded that this level ABC, which is less than the yield at F_{msy}, will not have any additional negative biological consequences for the *Illex* stock or non-target species compared to the 2006 specifications since the measure is not expected to increase or redistribute fishing effort by gear type. As noted above, the species taken incidentally and discarded in the directed *Illex* fishery are listed in Table 40. All of these species will be impacted to some degree by the prosecution of the *Illex* fishery. However, this level of ABC would be expected to only minimally impact the non-target fish species listed in Table 40 because the mortality rates of non-target species due to the *Illex* fishery are expected to be minimal compared to other sources of mortality.

7.2.2 Impacts on Habitat

Illex are taken almost exclusively by bottom otter trawls (>99%). Since alternatives 1 and 3 are not expected to increase fishing effort in the *Illex* fishery, these alternatives are not expected to increase any existing impacts on EFH caused by this fishery. However, specifications for *Illex* under alternative 2 (30,000 mt) could result in an increase in fishing effort or redistribute effort by gear type. Therefore, this alternative for *Illex* could negatively impact essential fish habitat relative to the status quo, although the extent of such impacts cannot be quantified.

7.2.3 Impacts on Endangered and Other Protected Species

Section 6.4 describes available information relative to fishery interactions with protected resources and the Atlantic mackerel, squid and butterfish fisheries. Based on an analysis of available observer data, the cetaceans of primary concern relative to the prosecution of the *Illex* fishery are pilot whales. The NMFS has convened a take reduction team which will develop measures to reduce the take of common dolphins and pilot whales in offshore Atlantic trawl fisheries, including the *Illex* fishery. The first meeting of the Atlantic Trawl Take Reduction Team took place in September of 2006. While the significance of the impact on these cetacean stocks by the *Illex* fishery is currently unknown, the specifications under the alternatives 1 and 3 are not expected to increase fishing effort or redistribute effort by gear type. As such, the

implementation of these alternatives is not expected to increase the impacts to protected species described in section 6.4 relative to 2006 specifications for *Illex.* However, specifications for *Illex* under alternative 2 (30,000 mt) could result in an increase in fishing effort or redistribute effort by gear type. Therefore, this alternative for *Illex* could negatively impact the protected species described in section 6.4 relative to 2006 specifications for *Illex*, although the extent of such impacts cannot be quantified. There are no known interactions between the *Illex* fishery and any ESA listed species including sea turtles.

7.2.4 Impacts on Human Communities

Alternative 1 for *Illex* in 2007 represents the 2006 status quo, so no reductions in landings or revenues due to the 2007 specifications under this alternative are expected. Therefore, no changes in economic and/or social impacts to the US *Illex* industry are expected from the preferred alternative. As a result, none of the vessel owners, crews, dealers, processors or fishing communities associated with the ports given in Tables 26 and 27 are expected to be significantly affected by the this quota alternative for the 2007 annual specifications for *Illex*. In addition, alternative 2 represents no constraint on the fishery relative to recent landings. So this alternative is also not expected to have any negative effect on the ports and communities which are dependent on the *Illex* fishery. Compared to the 2004 *Illex* landings, alternative 3 would represent a restriction on landings of about 6,000 mt. However, compared to average landings over the past three to five years, alternative 3 would represent no constraint on landings. Therefore, while there is some chance that alternative 3 could have negative economic consequences for the ports given in Tables 26 and 27, it is more likely that there would be no negative economic consequences as a result of this alternative.

7.3 Butterfish

7.3.1 Biological Impacts on Managed Resource and Non-Target Species

The specifications under alternative 1 (2006 status quo and preferred alternative for 2007) would be max OY = 12,175 mt, ABC = 4,545 mt, and IOY, DAH, and DAP = 1,681 mt and JVP and TALFF = 0 mt. The FMP and current regulations specify maximum optimum yield for butterfish as the catch associated with F_{msy} or MSY. The most recent stock assessment re-estimated MSY at 12,175 for butterfish which now becomes the basis for the max OY specification as defined in the FMP. In addition, the FMP specifies that the annual quota be the catch associated with 75% of F_{msy}. Based on the current overfishing definition, overfishing is not occurring (NMFS 2004). However, the stock was designated as being overfished since the most recent estimate of biomass was lower than the biomass threshold of 50% B_{msy}. New biological reference points estimated for butterfish in SARC 38 are F_{msy}=0.38 and B_{msy}=22,798 mt. SARC 38 estimated F in 2000-2002 to be about F_{msy} (0.39). As a result, the Council considered several options when setting a quota for butterfish in 2007. Based on analyses presented in SARC 38 and assuming that biomass in 2007 will be the same as 2000-2002, then the catch associated with the target F would be 2,242 mt and forms the basis for the specification of ABC. Assuming that the discard to landing ratio remains constant, then IOY, DAH, and DAP = 1,681 mt (i.e., the allowable landings equals ABC less estimated discards). This level of landings should achieve the target fishing mortality rate and allow for stock rebuilding. Therefore, the preferred alternative should result in positive benefits to the butterfish stock.

Under alternative 2 the specifications would be Max OY = 16,000 mt, ABC = 7,200 mt, and IOY, DAH, and DAP = 5,900 mt and JVP and TALFF = 0 mt. These specifications were based on the SAW 17 assessment which estimated yield at MSY at 16,000 mt and the yield associated with 75% F_{msy} at 12,000 mt. In making it's 2004 quota recommendation for butterfish, the Council also took into consideration the advice from the SAW 17 stock assessment which cautioned that discards might be significant and should be taken into account when setting the annual quota. As a result the Council recommended setting the annual quota at 5,900 mt primarily to allow for discards in this and other fisheries. Based on conclusions of the most recent stock assessment (SARC 38), these specifications could have negative biological consequences for the butterfish stock. Given estimates of the most recent stock biomass presented in SARC 38, it is likely that landings of 5,900 mt would exceed both the fishing mortality target (75% F_{msy}) and the overfishing threshold (F_{msy}). The last estimated stock size for butterfish was slightly below the biomass threshold of ½ B_{msy} as specified in the current FMP based on analyses presented in SARC 38. In addition, fishing mortality in the most recent years estimated was roughly equal to the fishing mortality limit of F_{msy}. These fishing mortality rates occurred at harvest levels well below 5,900 mt. Assuming that the ratio of discards of landings remains constant in 2007, then it is likely that if 5,900 mt was landed then fishing mortality (which is a function of landings and discards) would exceed the overfishing threshold (F_{msy}). If this were to occur, stock biomass would not be expected to increase given recent recruitment levels. Fishing in excess of the overfishing threshold would likely result in additional depletion of spawning stock biomass and hence reduce the probability of increased recruitment.

Under Alternative 3, the specifications would be Max OY and ABC = 12,175 mt, IOY, DAH, and DAP = 9,131 mt and JVP and TALFF = 0 mt. The yield under this alternative assumes that the stock would be at or above B_{msy} in 2007. Hence, ABC which includes landings and discards, would be equal to MSY and the allowable level of landings would be the yield at 75% F_{msy}. Given the current level of the stock, this level of landings would likely result in overfishing and additional depletion of the spawning stock biomass. Any further reductions in spawning stock biomass will decrease the probability of successful recruitment and stock rebuilding. Overall, the fishing mortality rate under this alternative would be expected to have unacceptable negative biological consequences for the butterfish stock.

The list of species taken incidentally and discarded in the directed butterfish fishery are listed in Table 40. The species listed include those with discards that comprised more than 2% of the total catch by weight on trips which landed 500 pounds of more of butterfish based on the unpublished NMFS sea sampling data for the 1989-2005. The species of importance based on this criteria included red hake, silver hake, spiny dogfish, scup, unclassified skates, fourspot flounder, *Loligo* squid, Atlantic mackerel, fourspot flounder and little skates. All of these species will be impacted to some degree by the prosecution of the butterfish fishery. However, fishing effort under alternatives 1and 2 would be expected to remain the same or decline relative to the status quo specifications. Therefore, Alternatives 1 and 2 are not expected to substantially impact the non-target fish species listed in Table 40 compared to the status quo. However, alternative 3 for butterfish could reasonably be expected to increase or re-distribute fishing effort by gear type in 2007. Therefore, the proposed measures under Alternative 3 could negatively impact the non-target fish species listed in Table 40 compared to the status quo.

7.3.2 Impacts on Habitat

Butterfish are taken with a number of gears. The gear used of concern relative to habitat is bottom otter trawls which accounts for roughly about 90% of the landings in any given year. Because alternative 1 represents the 2006 status quo specification for butterfish, it should not result in an increase in fishing effort or redistribute effort by gear type. Therefore, by maintaining the status quo in 2007, alternative 1 is not expected to increase any existing impacts on EFH caused by this fishery.

Relative to the 2006 specifications, under alternatives 2 and 3, butterfish landings could potentially exceed recent observed landings since the quota specified under these options is far greater than recent observed landings. Therefore, it is possible that fishing effort could increase under these options relative to the status quo. However, recent analyses indicate that most of the butterfish landings are taken incidental to the prosecution of other directed fisheries. As such, an increase in the landings does not necessarily translate into increased levels of fishing effort. Therefore, these alternatives are not expected to result in an increase in fishing effort or redistribute effort by gear type. Therefore, alternatives 2 and 3 are not expected to increase any existing impacts on EFH caused by this fishery.

7.3.3 Impacts on Endangered and Other Protected Species

The basic interactions between fisheries and protected resources are discussed in section 6.4 (see Affected Environment). As discussed in that section, these fisheries are listed as category 1 fisheries under MMPA. However, within the overall classification, no interactions between marine mammals and the butterfish fishery have been observed. Therefore, the impacts expected from the alternatives considered below should be minimal based on available data.

Alternative 1 represents the 2006 status quo so this alternative is not expected to increase fishing effort or redistribute effort by gear type. As such, the implementation of this alternative is not expected to impact the protected species described in section 6.4 relative to 2006 specifications for butterfish.

As noted above, alternatives 2 and 3 have the potential to increase fishing effort in 2007. However, most butterfish are taken incidentally during fishing effort directed at other species such as *Loligo* and whiting. As such, an increase in the quota specification for butterfish in 2007 does not necessarily mean that fishing effort for butterfish will increase under either of these alternatives. Therefore, given that no interaction between the butterfish fisheries and protected resources have been observed and that effort is unlikely to increase under alternative 2 and 3, these alternatives are not expected to impact the protected species described in section 6.4 relative to 2006 specifications for butterfish.

7.3.4 Impacts on Human Communities

Since alternative 1 represents the 2006 status quo specifications, no reductions in landings or revenues due to the specifications under this alternative are expected. Therefore, no change in economic and/or social impacts to the US butterfish industry are expected from this alternative. As a result, none of the vessel owners, crews, dealers, processors or fishing communities associated with the ports given in Tables 35 and 36 are expected to be significantly affected by the this alternative for the 2007 annual specifications for butterfish.

Alternatives 2 and 3 would result in an increase in the quota for 2007 compared to the 2006 specifications. As a result, it would be anticipated that revenues from fishing for butterfish might increase in the short term as a result of these alternatives. Therefore, implementation of alternative 2 and 3 for butterfish are likely to positively affect the vessel owners, crews, dealers, processors or fishing communities associated with the ports given in Tables 35 and 36 in the near term. However, sustained levels of fishing at these levels given current stock conditions is likely to be deleterious to the stock and hence the fishery. If overfishing of the butterfish stock continues, then the long term negative consequences to the stock would result in revenue losses and negative economic and social impacts for the vessel owners, crews, dealers, processors or fishing communities associated with the ports given in Tables 35 and 36.

7.4 *Loligo*

7.4.1 Biological Impacts on Managed Resource and Non-Target Species

Specification of annual quota

The alternatives considered for *Loligo* squid are fully described in section 5.4. The specifications under all three alternatives would be Max OY =26,000 mt, ABC, IOY, DAH, and DAP = 17,000 mt and JVP and TALFF = 0 mt with up to 3% of the ABC could be set-aside for scientific research. In terms of the annual quota, these specifications represent the 2006 status quo (no action - status quo).

MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative to biological reference points outlined in the Magnuson-Stevens Act. The overfishing definition for *Loligo* was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Loligo* is defined to occur when the catch associated with a threshold fishing mortality rate of F_{max} is exceeded (F_{max} is a proxy for F_{msy}). Annual quotas are to be specified which correspond to a target fishing mortality rate. Target F is defined as 75% of the F_{msy} when biomass is greater than B_{msy}, and decreases linearly to zero 50% of B_{MSY}. Maximum OY is 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 recommended specifications under alternatives 1, 2 and 3 are consistent with the overfishing definition adopted in Amendment 8. The yield associated with 75% of F_{msy} at B_{msy} is 17,000 mt for *Loligo* based on projections in SAW-29 (NMFS 1999). Given the management advice in SARC 34 and that the FMP currently specifies that the annual target quota be specified as the yield associated with 75% F_{msy}, the Monitoring Committee recommended that the status quo be maintained for *Loligo* in 2007. Since this specification is consistent with the FMP overfishing

definition and the most recent stock assessment advice , the Council concluded that the level of exploitation associated with an ABC, IOY, DAH, and DAP specification of 17,000 mt is not expected to have any negative biological effects on the *Loligo* stock. Also, this measure is not expected to increase or redistribute fishing effort by gear type in the *Loligo* fishery, no additional negative biological consequences for non-target species are expected, compared to 2006

The species taken incidentally and discarded in the directed *Loligo* fishery are listed in Table 40. The species listed included those with discards that comprised more than 2% of the total catch by weight on trips comprised of greater than 50% of *Loligo* by weight based on the unpublished NMFS sea sampling data for the 1989-2005. The species of importance based on this criteria included butterfish, silver hake, scup, spiny dogfish, red hake, skates, Atlantic mackerel, sea robins *Loligo* squid and fourspot flounder. All of these species will be impacted to some degree by the prosecution of the *Loligo* fishery. However, alternatives 1, 2 and 3 are not expected to increase or re-distribute fishing effort by gear type in 2007. Therefore, none of the alternatives considered are expected to impact the non-target fish species listed in Table 40 compared to the status quo.

Seasonal allocation of quota

In the fall of 1999, an assessment of the *Loligo* stock (SAW 29) concluded that the stock was approaching an overfished condition and that overfishing was occurring (NMFS 1999). Recently implemented requirements of the SFA required the Council to take remedial action for the 2000 fishing year to rebuild the stock to a level which will produce MSY (B_{msy}) given the status determination that *Loligo* was approaching an overfished state. Based on the SAW 29 projections, the Council chose to specify ABC as the yield associated with 90% F_{msy} or 13,000 mt in 2000. Management advice from SAW 29 also made special note that yield from this fishery should be distributed throughout the fishing year. Given that the permitted fleet historically had demonstrated the ability to land *Loligo* in excess of the quota specified for 2000, the Council recommended that the annual quota be sub-divided into three quota period or trimesters for 2000. The quota was allocated to each period based on the proportion of landings occurring in each trimester from 1994-1998 using landings data from SAW 29. Based on the seasonal distribution of landings during this time period, the quota for January-April was 5,460 mt (42% of the total), the quota for May-August is 2,340 mt (18% of the total), and the quota for September-December is 5200 mt (40% of the total). The directed fishery during the first two trimester periods was to be closed when 90% of the amount allocated to the period was landed and then a trip limit of 2,500 pounds was to remain in effect until the quota period ended. Any underages from trimesters one and two were to be applied to the next trimester and overages were to be deducted from trimester three.

Following the quota reduction action taken by the Council for the 2000 fishing year, subsequent NEFSC survey results for *Loligo* squid indicated a significant increase in abundance of the species. Estimates of biomass based on NEFSC fall 1999 and spring 2000 survey indices for *Loligo* indicated that the stock had increased to level at or near B_{msy}. Based on the assumption that the stock was at or near B_{msy} in 2001, the Council recommended that the 2001 quota be specified as the yield associated with 75% of F_{msy} or 17,000 mt based on projections in SAW-29 (NMFS 1999). As noted above, the 2000 quota was allocated among three four month trimesters in an attempt to ensure that landings and fishing mortality were distributed throughout the

fishing year. During Quota Period I in 2000, the directed fishery was closed on March 25, 2000. During Quota Period II, the directed fishery was closed on July 2, 2000. In addition, the quota for each period was exceeded, causing the dislocation of quota from the Quota Period III. As a result of these premature closures and overages, the Council recommended that the 2001 quota of 17,000 mt be allocated into quarterly quota periods based on the quarterly seasonal distribution of landings during the period 1994-1998 (i.e., same base years and data used to calculate the trimester allocations for fishing year 2000). Based on this criteria, the 2001 quota allocations among quarters were: Quarter 1: 5,649.1 mt (33.23%), Quarter 2: 2,993.7 mt, (17.61%),Quarter 3: 2,941 mt (17.3 %),Quarter 4: 5,416.2 mt (31.86 %). In addition, the Council recommended for Quarters 1 through 3, that the directed fishery be closed when 80% of the quarter's allocation was taken and that vessels be restricted a 2,500 pound trip limit for the remainder of the quarter. In addition, the Council recommended that quarterly overages be deducted as follows: an overage in quarter 1 was deducted from quarter 3 and an overage in quarter 2 was deducted from quarter 4. When 95% of the total annual quota was taken (i.e., 16,150 mt) the trip limit was reduced to 2,500 pounds and remained in effect for the rest of the fishing year. The annual *Loligo* quota and seasonal allocation rules have remained in unchanged since then (i.e., they have been in effect for fishing years 2001-2006).

The trimester percentage allocations for fishing year 2000 were calculated based on the observed landings for each respective allocation period according to landing statistics as reported in SAW 29 (which were considered the best available data at that time). When the Council changed to quarterly allocations beginning in 2001, for consistency the Council chose to calculate the percentages allocated to each quarter based on the same data set (i.e., *Loligo* landings data by quarter for the period 1994-1998 as published in SAW 29- Table 41).

Table 41. *Loligo* landings (mt) by quarter used in quarterly quota allocations for fishing years 1994-1998 (from SAW 29).

Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
1994	4762	2285	6603	9830	23480
1995	5815	3820	3933	5312	18880
1996	5201	4648	1019	1158	12026
1997	3347	2961	2753	7248	16309
1998	10479	1976	1099	4831	18385
Sum	29604	15690	15407	28379	89080
Percent	33.23	17.61	17.30	31.86	100

A summary of *Loligo* landings by year is given in Table 42. The periodic closures of the directed *Loligo* fishery during the period 2000-2005 are summarized in Table 43. Annual landings ranged from 11,935 mt in 2001 to 16,765 mt in 2005. *Loligo* landings by month for the period 2001-2005 compared to the observed landings for the base period (1994-1998) are given in Table 44 and Figure 3. The fishery during January and February 2001-2005 exceeded the amount observed during the period 1994-1998, caught less than the amount observed for March for the period 1994-1998, and exceeded the amounts landed in April compared to the baseline period. The 2001-2005 fishery during the months of June, July September and October landed less than the amount observed in 1994-1998 and exceeded the amount compared to the base

period in November and December 2001-2005.

Table 42. Annual *Loligo* fishery landings since 2001 based on unpublished NMFS Dealer reports.

Year	Landings (mt)
2001	14,238
2002	16,707
2003	11,935
2004	15,448
2005	16,765

Table 43. *Loligo* closure dates 2000-2005

Year	Closures
2000	March 25-Apr 30; Jul 1-Aug 31; Sep 7-Dec 31
2001	May 29-Jun 30
2002	May 28-Jun30;Aug 16-Sep 30;Nov 2 -Dec 11; Dec 24-Dec31
2003	Mar 25-MAr 31
2004	Mar 5- Mar 31
2005	Feb 20-Mar 31; April 25-Jun 30; Dec 18-Dec 31

Table 44. *Loligo* landings (pounds) by month based on unpublished NMFS weighout data for 1994-1998 compared to 2001-2005.

MONTH	1994-1998	%	2001-2005	%
1	16725864	8.57	20442723	12.35
2	26705289	13.68	28105686	16.98
3	26248509	13.44	15931362	9.62
4	14555011	7.45	16257648	9.82
5	9757697	5.00	8848854	5.35
6	5225576	2.68	3908385	2.36
7	10327069	5.29	6838351	4.13
8	7350012	3.76	6310266	3.81
9	15065825	7.72	5524559	3.34
10	26540269	13.59	15446400	9.33
11	19428906	9.95	18512249	11.18
12	17309060	8.87	19422758	11.73
TOTAL	195239087	100.00	165549241	100.00

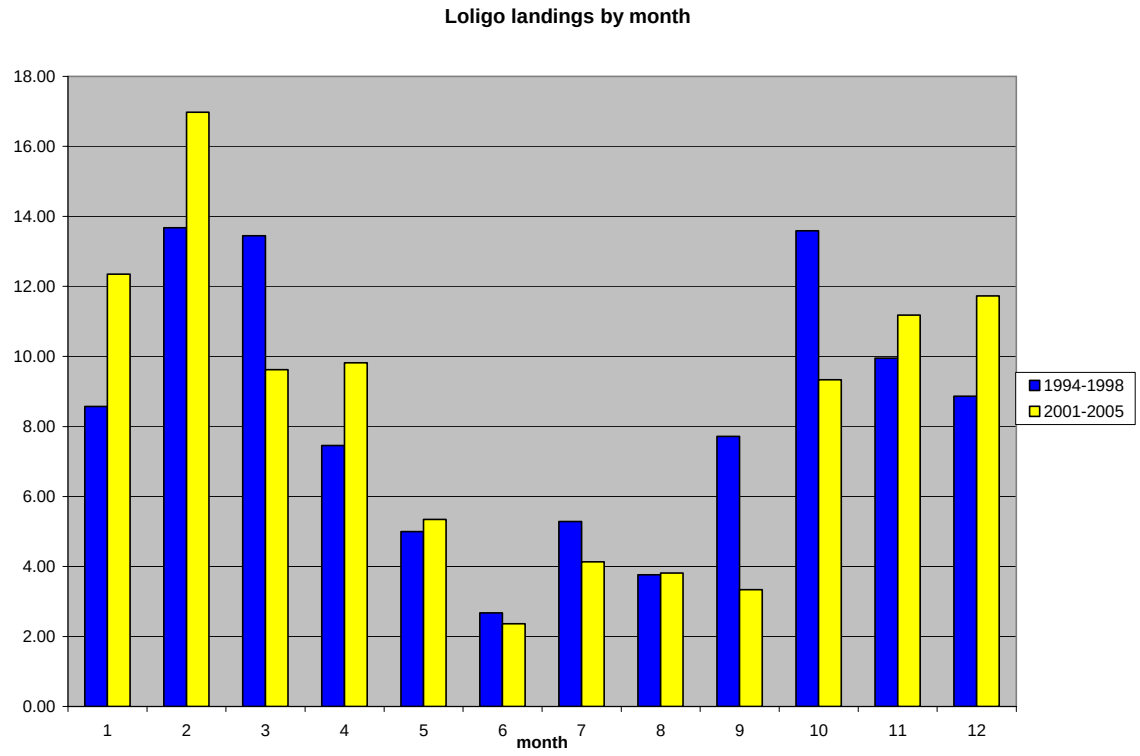

Figure 3. *Loligo* landings (percent) by month for the period 1994-1994 v. 2001-2005.

Loligo fishery performance by trimester for the period 2001-2005 is compared to two reference levels: the original trimester allocation percentages established in 2000 based on SAW 29 landings and the percent allocation based on the most recent unpublished NMFS weighout data for the period 1994-1998 in Table 45 and Figure 4. The fishery under the quarterly system has

resulted in trimester 1 landings which exceeded the original allocation amount based on 1994-1998 landings (48.8% v 42%) and lower landings relative to the base period for both trimesters 2 (15.6% v 18%) and 3 (35.65% v 40%).

Table 45. *Loligo* landings for 2001-2005 by trimester based on unpublished NMFS Dealer reports compared to the 2000 trimester allocation percentages (based on 1994-1998 landings in SAW 29), and revised allocation percentages based on most recent NMFS weighout data for 1994-1998.

Trimester	Pounds landed	Percent	2000 Allocation Percent	1994-1998 Allocation Percent based on updated NMFS Dealer Report data
Period 1	80737419	48.8	42	43.15
Period 2	25905856	15.6	18	16.73
Period 3	58905966	35.6	40	40.13
SUM	165549241	100.0	100	100.00

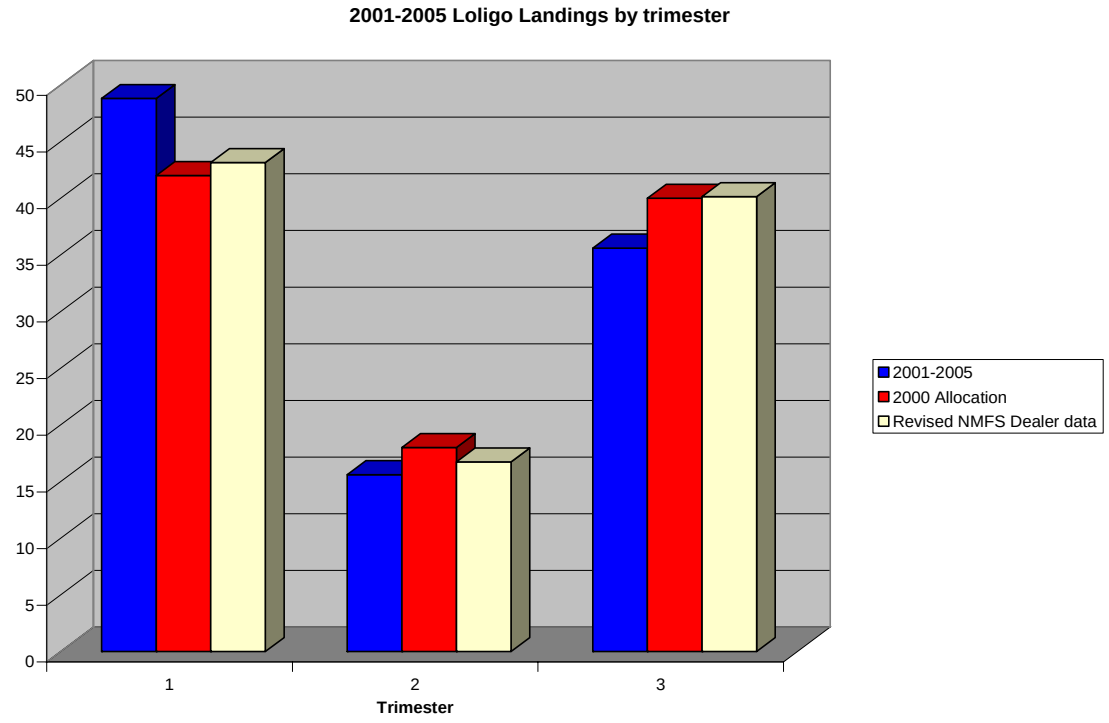

Figure 4. Comparison of *Loligo* landings by trimester for 2001-2005 v original 1994-1998 base period calculations from SAW 29 and updated NMFS weighout data.

As noted above, Table 45 also includes an updated calculation of *Loligo* landings by trimester based on the most recently updated NMFS weighout data for the period 1994-1998. These calculations differ from the original trimester allocation for two reasons. First, the original landings data from SAW 29 have been subjected to data audits and updates. Second, the SAW 29 data set for 1994-1998 included some 'unclassified squid'. The updated data include *Loligo* squid only and do not include any squid reported as 'unclassified squid'. The Council recommend that the most recent NMFS weighout data for the period 1994-1998 for *Loligo* squid only be utilized for calculating the trimester allocations for 2007 as follows: January - April (trimester 1) = 43%, May - August (trimester 2) = 17% and September - October (trimester 3) = 40%. The directed fishery during the first two trimester periods would be closed when 90% of the amount allocated to the period was landed and then a trip limit of 2,500 pounds would remain in effect until the quota period ends. Any underages from trimesters one and two will be applied to the next trimester and overages will be deducted from the third trimester. The directed fishery will be closed when 95% of the annual quota has been taken. The intent of the Council is for the fishery to operate at the 2,500 trip limit level for the remainder of the fishing year

Summary of Biological Effects of Trimester Allocation on Loligo Stock

The Council recommendation to change the allocation of the 2007 *Loligo* quota back to a trimester allocation scheme under alternatives 1 and 2 is not expected to cause overages since the annual quota controls fishing mortality. As noted above, the Council allocated the 2000 *Loligo* quota in trimesters based on the historical performance of the fishery during the period 1994-1998. The original allocation for the 2000 fishing year was 13,000 mt, but the annual quota was increased to 15,000 mt through an in-season adjustment (in response to available survey data which indicated that *Loligo* abundance had increased substantially in 2000). In 2000, the quota for the first trimester was exceeded by 27 % and the second trimester quota was exceeded by 155% and the annual quota was exceeded by 17% (Table 46).

Table 46. Summary of 2000 *Loligo* fishery landings, overages and revenues by trimester.

Trimester	Allocation (mt)	Landings (mt)	% Overage	Revenue ($millions)	Revenue ($/lb)
1	5460	- 6,912	27	10.7	0.70
2	2340	5,960	155	7.7	0.59
3	7200	4,608	-36	6.4	0.63
Total	15000	17,480	17	24.8	

Quota overages occurred in 2000 *Loligo* fishery for several reasons. First, 2000 was the first year that NMFS monitored and regulated the *Loligo* fishery on a seasonal basis. As a result, the infrastructure and protocol for quota monitoring and regulation in this fishery was in an initial stage of development. Secondly, during 2000 a loophole in the definition of trip limits for *Loligo* during directed fishery closures allowed vessels to make multiple trips in a single day, circumventing the intent of the Council to limit fishing activity for *Loligo* when the quota

allocation for a particular trimester was taken. This situation was exacerbated by the fact that *Loligo* were very abundant in near shore waters adjacent to Long Island during the summer of 2000 where the *Loligo* fleet was able land significant quantities of squid after the directed fishery closure in trimester period 2. In 2001, the Council closed the loop hole allowing multiple trips in a single calendar day. Therefore, the Council expects that the overages experienced in 2000 will not occur in 2007 if the trimester system is re-instituted. In fact, the Council anticipates that quota monitoring and control of overages in the fishery should improve relative to the quarterly system that has been in effect since 2001.

Montioring of the *Loligo* landings is done using dealer reports. Forcasting quota attainment is complicated by the variability in landings in this fishery, where very high amounts can be landed quickly. Prior to 2000, the quota for *Loligo* was specified as an annual quota. In 2000, the quota was subdivided into 3-trimester allocations and during 2001 - 2005 the annual quota for *Loligo* has been allocated into 4-quarter allocations. In an effort to improve the monitoring and management of the *Loligo* fishery, the Council recommended that the 2007 quota be allocated into trimesters. Managing the quota by trimesters, rather than quarters, results in allocations that are the same or higher than the quarterly allocations. Higher allocations may increase the length of time the fishery is open and allow closure projections to be based on more information and, perhaps, be more accurate. Additionally, managing by trimesters rather than quarters is administratively streamlined because three, rather than four, closures of the directed fishery could occur during a fishing year. However, there are variables that may hinder the success of trimesters that are beyond NMFS control, such as the late reporting of landings by dealers, especially as landings approach the level at which the directed fishery will close. The change back to trimester allocation of the annual quota under alternatives 1 and 2 is not expected to result in any additional negative biological effects on the *Loligo* stock due to quota overages, nor are additional negative impact non-targeted species expected since the fishery is ultimately governed by the overall quota (i.e., no increases in fishing effort are anticipated).

Implementation of seasonal Loligo quotas, after 1999, resulted in a major shift in monthly landings patterns (Table 47 and Figure 5). Prior to seasonal quota implementation, landings were more evenly distributed across all months of the year (Figure 5). Landings were lowest during May and June, highest during September-November and at similar medium levels during the other months. Post-implementation, landings increased at the beginning of each seasonal quota period, particularly at the start of the fishing year (January and February), due to the creation of seasonal derby fisheries which has resulted in seasonal closures every year (Table 43). Since 2001, landings have been increasing each year during January and February and, since 2003, landings have been increasing during April and May (Figure 5).

The proposal to allocate the annual quota into trimesters under Alternatives 1 and 2 will likely change the seasonal dynamics of the fishery. Changing the allocation system to trimesters under alternative 1 and 2 should have the effect of redistributing some of the quota previously taken in April to the summer fishery which will reopen in May under the trimester allocation system. The recent shift in landings to earlier parts of each quarter in this fishery have resulted, at least in part, to an increase in vessel activity in the *Loligo* fishery in an attempt to land a portion of the quota before the quarterly allocation has been taken. The effect of increased Loligo fishing effort during January and February will likely be to redistribute fishing effort from the April offshore fishery to Trimester II because the derby nature of the fishery is likely to result in

closure of the directed fishery prior to April.

Another factor which has affected the seasonal distribution of landings in the winter *Loligo* fishery is the Gear Restricted Areas (GRAs) that were implemented in 2001 to reduce scup discards. According to *Loligo* fishermen, the southern GRA (closed to trawl gear with codend mesh sizes less than 12.7 cm diamond (5 in.) during Jan.1-March 15), located offshore in the Mid-Atlantic Bight, resulted in the displacement of *Loligo* fishing effort during 2001-2004. However, this GRA should no longer have a major effect on Loligo fishing effort because it was moved 3 minutes landward after 2004 to allow Loligo fishing along its eastern boundary.

Table 47. *Loligo* landings (pounds) by month for the period 1999-2005 based on unpublished NMFS dealer reports. .

Year	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
1999	3487485	3072945	3807452	4299484	1389508	1211288	3002404	3832468	4160240	5445165	4829017	3590119
2000	3604873	5783871	5102694	747264	2853243	3799104	3570997	2916448	2053541	6707624	860887	524920
2001	1887142	2281861	4466284	3220611	1330651	1015859	1818343	1371242	1127772	3897555	4879538	4091563
2002	3439641	3696960	3526414	3352267	3621187	1003096	3889826	4064873	788269	6003333	1247871	2197846
2003	2619012	4476556	4063568	925763	618523	194124	110043	252334	2677321	2055318	4655867	3664192
2004	5464039	8029072	2531067	2781836	1795798	1066877	488502	480676	276325	1280029	3226759	6635550
2005	7032889	9621237	1344029	5977171	1482695	628429	531637	141141	654872	2210165	4502214	2833607

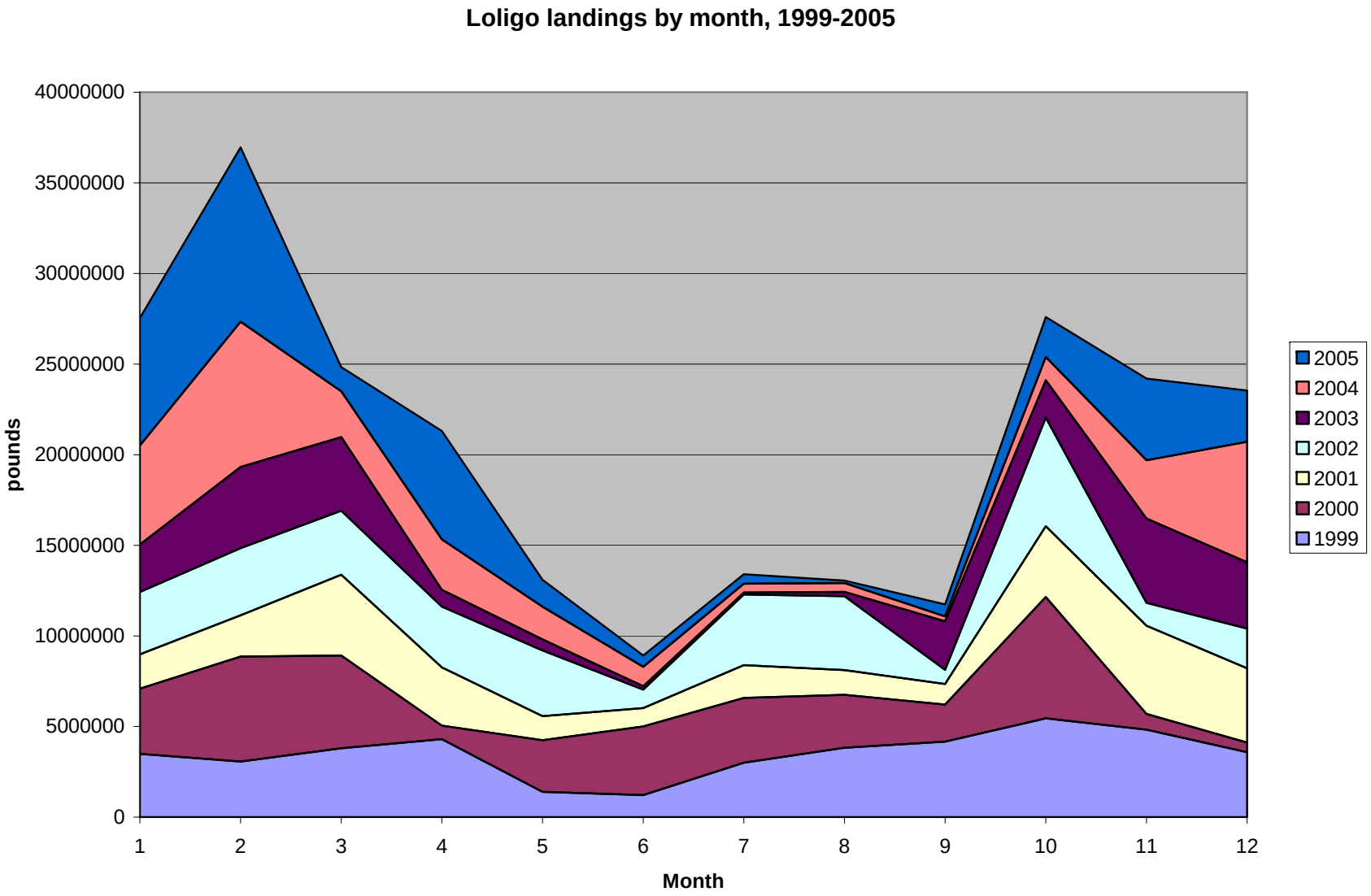

Figure 5. Loligo landings by month for the period 1999-2005.

Another issue concerning quarterly versus trimester allocation of quota is the potential impact on the *Loligo* stock due to the differing growth rates of seasonal cohorts in the stock relative to the seasonal changes in the landings distribution expected under trimesters. Brodziak and Macy (1996) noted that seasonal differences in growth exist between winter and summer cohorts of *Loligo*. *Loligo* grow rapidly and are sexually dimorphic with males growing faster and to larger size than females. *Loligo* squid from the "summer hatch" (June-October) grow more rapidly than individuals from the "winter hatch" (November-May) (NMFS 2002). Growth is highly variable among individuals (Brodziak and Macy 1996) and samples (Macy and Brodziak 2001). Variation among samples may be due to different sampling locations, environmental conditions in different years, seasonal effects, different hatch dates, or all of these factors (Macy and Brodziak 2001). SARC 34 provided preliminary estimates of yield per recruit reference points for *Loligo* using model inputs specific to monthly cohorts. Growth differences between monthly cohorts had a noticeable effect on the monthly yield per recruit estimates. However, the SARC noted that while the model provided some useful insights into the dynamics of *Loligo*, it was not appropriate for management use until the relative strength of each monthly cohort can be incorporated into the model. Therefore, the effect of allocating the annual quota into trimesters instead of quarters (i.e., maintaining the status quo) on the dynamics of the *Loligo* stock cannot be determined given current information.

In summary, the Council evaluated the proposal to allocate the *Loligo* quota in 2007 into three quota periods (trimesters) in an effort to improve the monitoring and management of the *Loligo* fishery. Managing the quota by trimesters, rather than quarters, results in allocations that are the same or higher than the quarterly allocations. Higher allocations may increase the length of time the fishery is open and allow closure projections to be based on more information and, perhaps, be more accurate. Additionally, managing by trimesters rather than quarters is administratively streamlined because three, rather than four, closures of the directed fishery could occur during a fishing year.

10,000 Pound Trip limit for Illex Vessels during August Directed Loligo Fishery Closure

Alternatives 1 and 2 contain a provision that would allow *Illex* moratorium vessels to retain up to 10,000 pounds of *Loligo* during directed *Loligo* fishery closures in August 2007 provided they meet the following criteria: they 1) possess an *Illex* moratorium permit, 2) are fishing seaward of *Loligo* mesh exemption line (approximates the 50 fathom contour) and 3) possess a minimum of 10,000 pounds of *Illex* on board.

The 2,500 pound trip limit for *Loligo* during directed *Loligo* fishery closures creates a compliance problem for *Illex* squid fishery vessels which occasionally take higher levels of *Loligo* incidental to the pursuit of *Illex* squid. During the months of June, July, August, and September otter trawl vessels participating in the directed fishery for *Illex* are be exempt from the *Loligo* minimum mesh requirements when they possess *Loligo* if they fish for *Illex* seaward of a line approximating the 50 fathom depth contour. This mesh exemption was included Amendment 5 because of concerns raised by fishermen that a small bycatch of *Loligo* can be expected in the *Illex* fishery. Industry advisors testified that the *Loligo* bycatch is very small and that almost all of the *Illex* fishing during this period occurs outside of the 50 fathom depth contour.

However, on developing these specifications, members of the directed *Illex* industry testified at Council meetings that the 2,500 *Loligo* trip limit during periods of closure of the directed *Loligo* fishery has caused compliance problems for vessels operating in the directed *Illex* fishery. The measure proposed under alternatives 1 and 2 would build on the current mesh exemption but would be limited to the month of August only. Under the proposed measure, vessels which possess *Illex* squid moratorium permits fishing east of the 50 fathom contour would be permitted to possess *Loligo* in an amount not to exceed 10,000 pounds, provided that the total weight of *Illex* on board was at least 10,000 pounds (during a period of closure of the directed *Loligo* fishery during August 2007). The Amendment 9 DSEIS indicated that the discard to kept ratios of *L. pealeii* and the percentage of trips which exceeded the closure period trip limit were highest during Loligo fishery closures which occurred in June through October and were primarily associated with the *Illex* fishery . Therefore, an increase in the closure period trip limit to 5,000 lbs during June through October would be beneficial to the *L. pealeii* stock. Regulatory discards are difficult to estimate accurately and an increased trip limit would allow potential discards to be landed, resulting in a more accurate quantification of fishery removals.

Rationale for the proposed trip limit under Alternatives 1 and 2

The issue of incidental takes of *Loligo* squid in the *Illex* fishery was identified when it was noted that substantial quantities of *Loligo* discards were reported in vessel trip reports from the directed *Illex* fishery during *Loligo* directed fishery closures in the summer and fall of 2000. Analyses developed for Amendment 9 indicated that these two species co-occur during September-November on the *Illex* fishing grounds (depths > 50 fathoms) and that *Loligo* landings on the Illex fishing grounds were low during June-August (6-9%) but increased during September and October. The Council has discussed a number of options to reduce potential regulatory discards of *Loligo* in the *Illex* fishery including multiple day trip limits of *Loligo* for *Illex* vessels (i.e., 2500 pounds times the number of days at sea), season and area restrictions in the *Illex* fishery and a simple increased fixed trip limit for *Illex* vessels during periods of closure of the directed *Loligo* fishery. A fixed 10,000 pound trip limit during August for vessels involved in the *Illex* fishery seaward of the 50 fathom contour is proposed under alternatives 1 and 2. The purpose of this measure is to allow for the retention of *Loligo* taken incidentally in the *Illex* fishery that would otherwise have to be discarded dead during periods of a directed *Loligo* fishery closure. The Council chose to increase the trip limit to 10,000 pounds because this level accounted for greater than 93% of observed discards observed during previous closures of the *Loligo* fishery. Although overlap of the two species is known to occur during the period September-November, the proposed action is limited to August because 1) it is anticipated that this is the month that the directed *Loligo* fishery will most likely be closed during the period that the two species overlap, 2) the *Loligo* fishery will likely be open for September and, most, if not all of October and 3) the *Illex* fishery usually ends by late October or early November. The area (i.e., seaward of the 50 fathom contour) was chosen to build on the current mesh exemption program.

Impact of the proposed trip limit increase

Overall, since the annual quota is the chief mechanism used to control landings in the *Loligo* fishery, the *Illex* fishery exemption from the 2500 pound trip limit during periods of closure of the directed *Loligo* fishery during August should not result in an overage for the fishing year. However, the bycatch allowance in the *Illex* fishery could result in an overage in quota period two (second trimester) of the *Loligo* fishery and/or reduce the amount of *Loligo* available for the quota period three (third trimester).

To estimate the possible impact of the 10,000 pound *Loligo* trip limit for *Illex* vessels during August closures under alternatives 1 and 2, estimates of potential *Loligo* landings under this measure were estimated under two scenarios. Following the closure of the directed fishery, there would be quota remaining to allow for landings of incidental catch. This amount is referred to as the bycatch quota. The first scenario is based on the worst case and assumes that the entire month of August would be closed and that all *Illex* trips in August would land the maximum allowable level of 10,000 pounds of *Loligo*. The second case assumes that the directed *Loligo* fishery would be closed for the entire month of August but that *Illex* trips during that period would land the average amount observed in August during the period 1998-2004 (i.e., 2,592 lbs). Estimates of *Loligo* landings for both scenarios are given in Table 48 and are based on fishing effort (number of *Illex* trips greater than 10,000 pounds) observed during August for the period 2001-2005. Under the worst case scenario, estimates of *Loligo* landings (expressed as a percentage of bycatch quota available after closure of the fishery - i.e., 637,129 pounds) during an August closure ranged from 16% of the bycatch amount to 206%. Based on the median number of directed *Illex* trips observed for the period 2001-2005 (excluding 2002 when the Loligo fishery was closed for half of August), estimates of *Loligo* landings under the worst case scenario would be expected to equal, on average, 84% of the bycatch quota (median = 57%) available after closure of the fishery.

In the second analysis, assuming that *Illex* vessels would land on average 2,592 pounds of *Loligo* per trip in August, estimates of *Loligo* landings (expressed as a percentage of bycatch quota available after closure of the fishery - i.e., 637,129 pounds) during an August closure ranged from 4 % of the bycatch amount to 53 %. Based on the median number of directed *Illex* trips observed for the period 2001-2005, estimates of *Loligo* landings under the average *Loligo* landings scenario would be expected to equal, on average,about 22% of the bycatch quota available after closure of the fishery. The median *Loligo* landings overage for quota period 2 under this measure is equal to 15% (under the average landings scenario). Therefore, under the average Loligo landings scenario for the Illex fishery and the worst case landings scenario, the Loligo bycatch quota amount remaining after closure of the Loligo fishery is estimated at 22% to 84%, respectively.

The probability that the estimated levels of landings by *Illex* vessels in August will cause an overage during trimester 2 depends on the possibility of a Loligo fishery closure during trimester 2 and prior to August as well as the additional amount of *Loligo* that will be landed by non-*Illex* vessels during an August *Loligo* fishery closure. In general, fishery performance data for the *Loligo* fishery indicate that during years with no Loligo fishery closures during trimester 2, during May-August of 2003 and 2004 Loligo landings in the Loligo fishery were 18% and 60%, respectively, of the proposed Trimester 2 quota (average = 39%). Therefore, the likelihood of a

trimester 2 quota overage is low. If an overage occurs, the overage amount would be deducted from the third quota period and could have economic consequences for vessel operating in quota period 3 (see socioeconomic impact section below).

Table 48. Estimates of *Loligo* landings under alternatives 1 and 2 based on worst case and average observed *Loligo* bycatch levels in the *Illex* fishery during August 2001-2005.

Year	No. Trips	Worst Case (lbs)	Percent Trim. 2 Bycatch Quota	Average Case (lbs)	Percent Trim. 2 Bycatch Quota
2001	10	100,000	16	25,920	4
2003	22	220,000	35	57,024	9
2004	131	1,310,000	206	339,552	53
2005	50	500,000	78	129,600	20
Mean	53	532,500	84	138,024	22
Median	36	360,000	57	93,312	15

Clarification of Incidental Trip limits

Amendment 5 to the Atlantic Mackerel, Squid and Butterfish FMP established a trip limit of 2,500 pounds when the directed fishery for *Loligo* was closed at any time during the fishing year. The intent of the Council in establishing a trip limit of 2,500 pounds was to restrict landings to this amount on a per trip basis. The Council did not anticipate vessels making more than one trip per day. A major concern of the Council was the unanticipated practice of vessels making multiple trips in a single day during directed fishery closures in 2000. This practice occurred during the second trimester when large concentrations of *Loligo* squid were located relatively close to shore. Due to their close proximity to landing facilities, vessels were landing multiple trips of 2,500 pounds of *Loligo* in a single day. The result was that the second trimester quota was exceeded by a considerable amount (by about 40%) in 2000. To rectify this situation, the Council recommended that additional language be added in the 2001 annual specifications that would prohibit vessels from landing more than the trip limit specified during any single day during directed fishery closures. A day was defined as a 24 hour period beginning at 0001 hrs and ending at 2400 hrs on the same calendar date. The intent of the Council was to have this definition of a trip limit apply to *Loligo* as well as the other species managed under this FMP (i.e., *Illex*, butterfish, and Atlantic mackerel). During the 2007 quota setting meetings, it was brought to the attention of the Council that the regulatory language change that limited vessels to landing no more than the amount specified in one calendar day was made only for periods when the directed *Loligo* fishery is closed. As a result, non-moratorium vessels which possess Squid Mackerel Butterfish incidental permits currently can land more than one trip of 2,500 pounds in one calendar. The Council intended to make the limit of landing on trip per calendar day to apply to all vessels, including incidental catch permit holders during periods when the directed *Loligo* fishery is open. As a result, under alternatives 1 and 2 the Council proposes a regulatory language change that would limit open access incidental catch permit holders to landing no more than the incidental catch amount specified for *Loligo* squid in one calendar day.

Overall, this clarification of the current regulations should result in a reduction in *Loligo* landings by non-moratorium incidental permit holders and reduce the chances of that quota overages will occur. Therefore, this measure should confer positive biological benefits to the *Loligo* stock. In addition, this measure should result in a reduction in fishing effort by this group (incidental permit holders) which should reduce the incidental take of species identified in Table 40.

7.4.2 Impacts on Habitat

Loligo are taken with a number of gears, but the gear used of concern relative to habitat are bottom otter trawls which account for most of the *Loligo* landings in any given year. Because all three alternatives considered for 2007 in terms of annual quota represent the 2004-2006 status quo specifications for *Loligo*, they should not result in any increase in the magnitude of fishing effort in this fishery relative to the status quo. However, alternatives 1 and 2 would implement a trimester system of quota allocation, which could redistribute fishing effort seasonally, but the degree to which this would occur can't be estimated. However, the trimester allocation system would not be expected to redistribute fishing effort by gear type. In addition, alternative 3 would maintain the status quo in terms of both the quota and seasonal allocation, so none of the alternatives considered would be expected to redistribute fishing effort by gear type. Therefore, in terms of magnitude and seasonal allocation of quota, none of the alternatives considered are expected to increase any existing impacts on EFH caused by this fishery.

In addition to the quota specification and seasonal allocation of the quota, alternatives 1 and 2 contain two additional measures. The first is a 10,000 pound *Loligo* possession allowance for *Illex* moratorium vessels during August closures of the directed *Loligo* fishery. This measure would allow *Illex* moratorium vessels to retain up to 10,000 pounds of *Loligo* taken as bycatch in the course of their normal fishing operations in the directed *Illex* fishery if a closure of the directed *Loligo* fishery should occur in August of 2007. This measure is intended to allow *Illex* moratorium vessels to remain in compliance with *Loligo* possession limits and, since this measure is not expected to alter normal *Illex* fishing practices, it is not expected to increase or redistribute fishing effort by gear type. Alternatives 1 and 2 also include a clarification of the trip limit specification for squid, mackerel, butterfish incidental permit vessels which would limit them to landing no more than the incidental amount specified in one calendar day. Overall, this clarification of the current regulations should result in a reduction in *Loligo* fishing effort incidental catch permit holders and therefore, this measure should not increase any existing impacts on EFH caused by this fishery.

7.4.3 Impacts on Endangered and Other Protected Species

The basic interactions between the *Loligo* fishery and protected resources are discussed in section 6.4 . As discussed in that section, these fisheries are listed as category 1 fisheries under MMPA and the three species of primary concern include common dolphins and pilot whales. All incidental takes of common dolphins attributed to the *Loligo* fishery were observed during the first quarter of the year (Jan-Mar), exclusively in the offshore fishery. The estimated fishery-related mortality of common dolphins attributable to the fall/winter offshore fishery was 0 between 1997-1998, 49 in 1999 (CV=0.97), 273 in 2000 (CV=0.57), 126 in 2001 (CV=1.09) and 0 in 2002-2003. The average annual mortality between 1999-2003 was 90 common dolphins

(CV=0.47). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

Only one pilot whale incidental take has been observed in *Loligo* squid fishing operations since 1996. The one take was observed in 1999 in the offshore fishery. No pilot whale takes have been observed in the inshore fishery. The estimated fishery-related mortality of pilot whales attributable to the fall/winter offshore fishery was 0 between 1996 and 1998, 49 in 1999 (CV=0.97) and 0 between 2000 and 2003. The average annual mortality between 1999-2003 was 10 pilot whales (CV=0.97). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

The NMFS has convened a take reduction team which will develop measures to reduce the take of common dolphins and pilot whales in offshore Atlantic trawl fisheries, including the *Loligo* fishery. The first meeting of the Atlantic Trawl Take Reduction Team took place in September 2006.

The ESA-listed species include leatherback and loggerhead sea turtles. A single leatherback sea turtle capture has been documented on observed SMB fishing trips according to the NMFS Observer Database. The animal was caught in a bottom otter trawl net in October 2001 on a trip for which *Loligo* was recorded as the target species. The animal was alive when captured and was released. No information is available on the subsequent survival of the turtle. There are no mortality estimates for leatherback turtles that are attributed to the *Loligo* fishery. A loggerhead capture was observed once in each year of 1995, 1996, and 1997 on *Loligo* trips. In every case the animal was alive when captured and no injuries were reported. In 2002, a loggerhead mortality that was likely the result of capture during a *Loligo* haul was observed. In 2004, a loggerhead was resuscitated after capture on an observed *Loligo* haul, and was tagged and released alive. There are no mortality estimates for loggerhead turtles that are attributed to the *Loligo* fishery.

While the significance of the impact on these protected species by the *Loligo* fishery is currently unknown, the quota specification of 17,000 mt under alternatives 1-3 is not expected to increase fishing effort or redistribute effort by gear type. As such, the implementation of this quota level (i.e., 17,000 mt) is not expected to impact the protected species described above, and in section 6.4, relative to 2004-2006 specifications for *Loligo.* In addition, alternatives 1 and 2 would implement a trimester system of quota allocation which will likely alter the seasonality of the *Loligo* fishery. Thus, while the overall quota does not change under any of the alternatives considered, the seasonal distribution of fishing effort could change under alternatives 1 and 2. However, the degree to which this would impact the protected species described above cannot be determined given current information.

In addition to the quota specification and seasonal allocation of the quota, alternatives 1 and 2 contain two additional measures. The first is a 10,000 pound *Loligo* possession allowance for *Illex* moratorium vessels during August closures of the directed *Loligo* fishery. This measure would allow *Illex* moratorium vessels to retain up to 10,000 pounds of *Loligo* taken as bycatch in the course of their normal fishing operations in the directed *Illex* fishery if a closure of the directed *Loligo* fishery should occur in August of 2007. This measure is intended to allow *Illex* moratorium vessels to remain in compliance with *Loligo* possession limits and, since this

measure is not expected to alter normal *Illex* fishing practices, it is not expected to increase or redistribute fishing effort by gear type. Therefore, this proposed measure is not expected to affect the protected resources described in Section 6.4. Alternatives 1 and 2 also include a clarification of the trip limit specification for squid, mackerel, butterfish incidental permit vessels which would limit them to landing no more than the incidental amount specified in one calendar day. Overall, this clarification of the current regulations should result in a reduction in *Loligo* fishing effort incidental catch permit holders and therefore, this measure should reduce the chances of an incidental take of the protected resources described above and in section 6.4 by this group of vessels.

7.4.4 Impacts on Human Communities

Annual quota

The alternatives considered for *Loligo* squid are fully described in section 5.4. The specifications under all three alternatives would be Max OY =26,000 mt, ABC, IOY, DAH, and DAP = 17,000 mt and JVP and TALFF = 0 mt with up to 3% of the ABC could be set-aside for scientific research. In terms of the annual quota, these specifications represent the 2004-2006 status quo (no action - status quo). As noted above, the recommended specifications under alternatives 1, 2 and 3 are consistent with the overfishing definition adopted in Amendment 8. Thus, the prosecution of the *Loligo* fishery at this level should provide for a long term, sustainable fishery. This, in turn, should provide long term benefits which will positively affect the vessel owners, crews, dealers, processors or fishing communities associated with the ports given in Tables 17 and 18 in the long term.

Seasonal allocation of quota

Beginning in 2000 when restrictive *Loligo* quotas were first implemented, the annual *Loligo* quota was allocated seasonally to three four month quota periods (trimesters) based on the proportion of landings occurring in each trimester from 1994-1998 using landings data from SAW 29. Based on the seasonal distribution of landings during this time period, the quota for January-April was 5,460 mt (42% of the total), the quota for May-August was 2,340 mt (18% of the total), and the quota for September-December was 5200 mt (40% of the total). The directed fishery during the first two trimester periods was to be closed when 90% of the amount allocated to the period was landed and then a trip limit of 2,500 pounds was to remain in effect until the quota period ended. Any underages from trimesters one and two were to be applied to the next trimester and overages were to be deducted from trimester three. The seasonal distribution of the annual *Loligo* quota was changed to a quarterly allocation system in 2001 (and subsequent years since then) based on the quarterly distribution of *Loligo* landings over the same time period (i.e., 1994-1998) and using the SAW 29 data set. Based on this criteria, the 2001 quota allocations among quarters were: Quarter 1: 5,649.1 mt (33.2%), Quarter 2: 2,993.7 mt, (17.6%),Quarter 3: 2,941 mt (17.3 %),Quarter 4: 5,416.2 mt (31.9 %). The annual *Loligo* quota and seasonal allocation rules have remained in unchanged since then (i.e., they have been in effect for fishing years 2001-2006).

The Council recommended that the most recent NMFS weighout data for the period 1994-1998 for *Loligo* squid be utilized for calculating the trimester allocations for the 2007 fishing year as

follows: January - April (trimester 1) = 43%, May - August (trimester 2) = 17% and September - October (trimester 3) = 40%. The directed fishery during the first two trimester periods would be closed when 90% of the amount allocated to the period was landed and then a trip limit of 2,500 pounds would remain in effect until the quota period ends. Any underages from trimesters one and two will be applied to the next trimester and overages will be deducted from the third trimester. The directed fishery will be closed when 95% of the annual quota has been taken. The intent of the Council is for the fishery to operate at the 2,500 trip limit level for the remainder of the fishing year.

The Council recommendation to change the allocation of the 2007 *Loligo* quota back to a trimester allocation scheme under alternatives 1 and 2 is not expected to cause an overall overage of the annual quota. To the contrary, having fewer quota periods to monitor should allow NMFS to monitor the quota more effectively and this should result in better control of *Loligo* fishery removals. However, the seasonal distribution of will obviously be affected by the change back to a trimester allocation of the *Loligo* quota. The periods most likely affected would include April-May and August-September. Under the quarterly system April is the beginning of quarter 2 and therefore this month triggers the reopening of the second quarter directed fishery. Under the trimester system, April is the last month of trimester 1 and therefore may be subject to a directed *Loligo* fishery closure. Therefore, any vessels which took the predominance of their *Loligo* landings in April only could be disadvantaged relative to the quarterly system under alternative 3 (status quo seasonal allocation) if they are unable to redirect their fishing effort to an earlier part of the fishing year. A similar situation exists for July (beginning of a quarter and toward end of trimester 2). Conversely, vessels which landed *Loligo* predominantly in May and September would be appear to accrue positive benefits under alternatives 1 and 2 (trimester system) versus alternative 3 (quarterly system).

Alternative 3 would maintain the status quo allocation of the annual quota (i.e., quarterly) and therefore would not result any increases or redistribution of fishing effort compared to the 2004-2006 specifications.

10,000 Pound Trip limit for Illex Vessels during August Directed Loligo Fishery Closure

Alternatives 1 and 2 contain a provision that would allow *Illex* moratorium vessels to retain up to 10,000 pounds of *Loligo* during directed *Loligo* fishery closures in August 2007 provided they meet the following criteria: they 1) possess an *Illex* moratorium permit, 2) are fishing seaward of *Loligo* mesh exemption line (approximates the 50 fathom contour) and 3) possess a minimum of 10,000 pounds of *Illex* on board. The measure proposed under alternatives 1 and 2 would build on the current mesh exemption but would be limited to the month of August only. Under the proposed measure, vessels which possess *Illex* squid moratorium permits fishing east of the 50 fathom contour would be permitted to possess *Loligo* in an amount not to exceed 10,000 pounds, provided that the total weight of *Illex* on board was at least 10,000 pounds (during a period of closure of the directed *Loligo* fishery during August).

Overall, since the annual quota is the chief mechanism used to control landings in the *Loligo* fishery, the *Illex* fishery exemption from the 2500 pound trip limit during periods of closure of the directed *Loligo* fishery during August should not result in any overage for the fishing year. However, the bycatch allowance in the *Illex* fishery could result in an overage in quota period

two (second trimester) of the *Loligo* fishery and/or reduce the amount of *Loligo* available for the quota period three (third trimester). To estimate the possible impact of the 10,000 pound *Loligo* trip limit for *Illex* vessels during August closures under alternatives 1 and 2, estimates of potential *Loligo* landings under this measure were estimated under two scenarios. The first scenario is based on the worst case and assumes that the entire month of August would be closed and that all *Illex* trips in August would land the maximum allowable level of 10,000 pounds of *Loligo*. The second case assumes that the directed *Loligo* fishery would be closed for the entire month of August but that *Illex* trips during that period would land the average amount observed in August during the period 1998-2004 (i.e., 2,592 lbs). Estimates of *Loligo* landings for both scenarios are given in Table 48 and are based on fishing effort (number of *Illex* trips greater than 10,000 pounds) observed during August for the period 2001-2005. Under the worst case scenario, estimates of *Loligo* landings (expressed as a percentage of bycatch quota available after closure of the fishery - i.e., 637,129 pounds) during an August closure ranged from 11% of the bycatch amount to 204%. Based on the median number of directed *Illex* trips observed for the period 2001-2005, estimates of *Loligo* landings under the worst case scenario would be expected to equal 35 percent of the bycatch quota available after closure of the fishery. Alternately, assuming that *Illex* would land on average 2,592 pounds of *Loligo* per trip in August, estimates of *Loligo* landings (expressed as a percentage of bycatch quota available after closure of the fishery - i.e., 637,129 pounds) during an August closure ranged from 3 % of the bycatch amount to 53 %. Based on the median number of directed *Illex* trips observed for the period 2001-2005, estimates of *Loligo* landings under the average *Loligo* landings scenario would be expected to equal about 9 percent of the bycatch quota available after closure of the fishery. Therefore, the *Loligo* landings under this measure, on average, would be expected to amount to 9% (under the average landings scenario) to 35% (under the worst case scenario) of the amount available after the directed fishery is closed.

The probability that these levels of landings by *Illex* vessels in August will cause an overage depends on the additional amounts of *Loligo* that will be landed by non-*Illex* vessels during an August fishery closure. In general, fishery performance data for the *Loligo* fishery indicate that since 2001, landings during the summer months have tended to be less than was observed during the unregulated fishery (i.e., during the period 1994-1998; see Figure 3), so the chance of a closure appears relatively low compared to other times of the year given recent fishing patterns. However, if a closure does occur and non-moratorium *Illex* vessels land all of the bycatch quota available, then additional landings due to this measure would be expected to be in a range of 57,000 to 220,000 pounds (based on the median number of *Illex* trips in August for the period 2001-2005) and the average observed landings of *Loligo* per trip and the assumed worst case. The overage amount would be deducted from the quota period 3 allocation and would equal 0.4% to 1.5 % of the quota period 3 allocation. The overage expected assuming the worst case median scenario (1.5 %) would not be expected to result in an overage for the year (since the overall quota controls fishing mortality), but this amount would be deducted from the third quota period and could have economic consequences for vessel operating in quota period 3. In 2005, there were 339 vessels which landed Loligo. During the second trimester of 2005 there were 83 vessels which landed *Loligo* during trimester 2 and 112 vessels which landed *Loligo* during the third trimester. The amount of revenue foregone by vessels in the third trimester due to the additional amount that might be taken under the 10% *Illex* rule in August would equal $170,558 under the worst case scenario or about $1500 per vessel.

Clarification of Incidental Trip limits

Amendment 5 to the Atlantic Mackerel, Squid and Butterfish FMP established a trip limit of 2,500 pounds when the directed fishery for *Loligo* was closed at any time during the fishing year. The intent of the Council in establishing a trip limit of 2,500 pounds was to restrict landings to this amount on a per trip basis. The Council did not anticipate vessels making more than one trip per day. A major concern of the Council was the unanticipated practice of vessels making multiple trips in a single day in 2000. This practice occurred during the second trimester when large concentrations of *Loligo* squid were located relatively close to shore. Due to their close proximity to landing facilities, vessels were landing multiple trips of 2,500 pounds of *Loligo* in a single day. The result was that the second trimester quota was exceeded by a considerable amount (about 40%) in 2000. To rectify this situation, the Council recommended that additional language be added in the 2001 annual specifications that would prohibit vessels from landing more than the trip limit specified during any single day. A day was defined as a 24 hour period beginning at 0001 hrs and ending at 2400 hrs on the same calendar date. The intent of the Council was to have this definition of a trip limit apply to *Loligo* as well as the other species managed under this FMP (i.e., *Illex*, butterfish, and Atlantic mackerel). During the 2007 quota setting meetings, it was brought to the attention of the Council that the regulatory language change that limited vessels to landing no more than the amount specified in one calendar day was made only for periods when the directed *Loligo* fishery is closed. As a result, non-moratorium vessels which possess Squid Mackerel Butterfish incidental permits currently can land more than one trip of 2,500 pounds in one calendar. The Council intended to make the limit of landing on trip per calendar day to apply to all vessels, including incidental catch permit holders during periods when the directed *Loligo* fishery is open. As a result, under alternatives 1 and 2 the Council proposes a regulatory language change that would limit open access incidental catch permit holders to landing no more than the incidental catch amount specified for *Loligo* squid in one calendar day.

Overall, this clarification of the current regulations should result in a reduction in *Loligo* landings by non-moratorium vessels in the Loligo fishery. In 2005, there were 100 vessels which landed 73 mt of *Loligo* squid which possessed an incidental permit only. All of these vessels could potentially experience a reduction in the landings and revenue as a result of this measure. However, the amount of *Loligo* revenues losses experienced by this group of vessels would be accrued (i.e., would be a net gain) for the 220 moratorium permit holders which landed *Loligo* squid in 2005. Hence, overall no loss of revenue for the fishery as a whole is expected as a result of this measure.

7.5 Research Set-Asides (RSA) Recommendations

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 (RSA) from the 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. Through the set aside program, the Council encourages collaborative efforts between the public, research institutions, and government in broadening the scientific base upon which management decisions are made. Reserving a small portion of the annual harvest of a species to subsidize the research costs of vessel operations and scientific expertise is considered an important investment in the future of the nation's fisheries.

An additional benefit of this program is the assurance that new data collected by non-governmental entities will receive the peer review and analysis necessary to be utilized in improving the management of public fisheries resources. The annual research set-aside amount may vary between 0 and 3% of each species' quota. For those species that have both a commercial quota and a recreational harvest limit, the set-aside calculation shall be made from the combined total allowable landing level.

For 2007, the Council recommended that up to 3% of the annual of quota be set aside for *Loligo* for scientific research. However, since the Council took action to recommend a 3% research set aside for 2007, the final recommendations for project funding under the research set aside program have been made. As such, two projects which requested a total of 277.6 mt of *Loligo* were approved. Therefore, the RSA amount specified for *Loligo* for 2007 could range from 277.6 to 510 mt.

Table RSA-1. Proposed Research Quota Set-asides, in mt, for *Loligo* squid for the Fishing Year January 1 through December 31, 2007.

Specifications	*Loligo* (mt)	
	Approved projects	Maximum allowable
Research Set-aside	227.6	510
Remaining Quota	16,722.4	16,490
Total	17,000	17,000

Two research projects (Projects 06-RSA-001 and 06-RSA-002: see Appendix 1) were approved by NMFS for 2007 that would require an exemption from some of the current or proposed regulations for *Loligo*. The following analysis was prepared in response to the need for an analysis of the impacts of the *Loligo* research set-aside on the human environment pursuant to NEPA. If both of the approved research projects are conducted, researchers could be permitted to fish for *Loligo* squid and be allowed to retain landings of *Loligo* squid in amounts greater than 2,500 pounds during a closure of the directed *Loligo* squid fishery. As noted above, the total amount of *Loligo* requested for the two approved projects is 277.6 mt. In addition to *Loligo*, the two approved projects have requested RSA amounts for summer flounder and scup (among other

species). It's possible that there may not be enough RSA quota available for summer flounder and scup to fulfill the required RSA amount requested for those two species because of reductions that may be necessary in the overall quota both species. As a result, the RSA amount for *Loligo* for the two approved projects may be increased above the amounts requested to offset any reductions necessary in RSA amounts specified for summer flounder and/or scup. These increases may not result in an RSA that exceeds the maximum RSA amount specified by the Council for *Loligo* (i.e., 3% of the annual quota or 510 mt). The level of RSA amounts and their associated environmental impacts for summer flounder and scup are analyzed in the Environmental Assessment for the 2007 Specifications for Summer Flounder, Scup and Black Sea Bass.

7.5.1 Impacts on Managed Resource and Non-Target Species

As noted in the above table, the amount of research quota set-aside relative to the overall annual quotas for *Loligo* squid is minimal. Therefore, given the limited scope and duration of the research project, it is unlikely that the retention of *Loligo* squid landings in amounts greater than 2,500 pounds during a closure of the directed *Loligo* squid fishery would have negative biological impacts since fishing mortality on the *Loligo* stock is controlled by the overall quota (which includes the RSA amounts specified). A more detailed description of each of the proposed exemptions is given below and additional descriptions of the stocks and their habitats can be found under sections 4.0 and 5.0 above.

For 2007, the Council is proposing to allocate the annual *Loligo* squid quota into three four month quota periods (Table RSA-2). Current regulations specify that after a seasonal quota is attained, the directed *Loligo* squid fishery is closed and only an incidental catch amount of 2,500 lb per calendar day may be retained. Both research projects funded may requested an exemption from this 2,500 lb limit if the survey transect or mesh selectivity work is conducted during a period of directed *Loligo* fishery closure. This would allow research vessels to land *Loligo* squid in amounts greater than 2,500 lb per calendar day during a closure of the directed *Loligo* squid fishery.

Table RSA-2. *Loligo* squid seasonal allocations.

Trimester		Percent	Approved Projects	Maximum Research Set-aside
I	(Jan-Apr)	43	7,190.6	7,090.7
II	(May-Aug)	17	2,842.8	2,803.3
III	(Sep-Dec)	40	2,289.0	6,596.0
Total		100	16,722.4	16,490

The annual quota established for *Loligo* squid is the chief mechanism used to control fishing mortality. The research set-aside quota is deducted from the annual quota prior to the allocation of the quota into seasonal allocations. The total allowable landings for the 2007 *Loligo* squid fishery are 17,000 mt and up to 510 mt of which may be used as research set-aside. The research set-aside amounts (277.6 mt up to a maximum of 510 mt) are deducted from the overall *Loligo* squid quota prior to dividing the quota into seasonal allocations (Table RSA-2). Research quota harvested after a seasonal closure of the directed fishery will not count towards that season's quota, but instead will count towards the overall *Loligo* squid quota for the entire year. This will prevent total quota overages, and thus possible negative biological impacts from occurring as the result of research quota harvested after the directed fishery has closed. The amount of *Loligo* squid set-aside is minimal and the maximum 510 mt set-aside, whether harvested through research projects or through the normal prosecution of the *Loligo* squid fishery, may have occurred with or without the research set aside program. Therefore, the harvesting of *Loligo* squid after a closure of the directed fishery is not expected to have negative biological impacts on the *Loligo* squid population or non-target species described in Table 40.

7.5.2 Impacts on Habitat

The recommended RSA levels are given in Table RSA-1. Through the use of the research quota set-aside, the basic fishing operations for *Loligo* squid are expected to remain the same. In addition, the RSA specification should not result in an increase in fishing effort or redistribute effort by gear type. Therefore, the overall impact to essential fish habitat is not expected to change. It should be noted, however, that fishing activities under the RSA program may occur in times outside those of the normal directed fisheries. The resulting impacts to EFH of these RSA fishing activities, if any, are not precisely known but are believed to be minimal. This conclusion is based on the fact that the RSA amount represents only up to 3% of the quota and it is likely that this relatively small portion of the fishery will be prosecuted in the same location as the normal non-RSA fishery.

7.5.3 Impacts on Endangered and Other Protected Species

There are numerous species which inhabit the management unit of this FMP that are afforded protection under the ESA and/or the MMPA. Through the use of the research quota set-aside, the basic fishing operations for *Loligo* are expected to remain the same. It should be noted, however, that fishing activities under the RSA program may occur in areas and/or times outside those of the normal directed fisheries. The degree of the resulting impacts on protected resources of these RSA fishing activities, if any, are not precisely known but are believed to be minimal. Therefore, the overall impact to species afforded protection under the ESA and the MMPA are not expected to change. A complete description of these species and a discussion of the potential impacts the *Loligo* squid fishery may have on them can be found in section 6.4.

7.5.4 Impacts on Human Communities

Under this program, successful applicants receive a share of the annual quota for the purpose of conducting scientific research. The Nation receives a benefit in that data or other information about that fishery is obtained for management or stock assessment purposes that would not be obtained otherwise. In fisheries where the entire quota would be taken and the fishery is

prematurely closed (i.e., the quota is constraining), the economic and social costs of the program are shared among the non-RSA participants in the fishery. That is, each participant in a fishery that utilizes a resource that is limited by the annual quota relinquishes a share of the amount of quota retained in the RSA quota.

In 2005, there were 339 vessels which participated in the *Loligo* fishery. Assuming the same number of vessels participate in the 2007 *Loligo* fishery as in 2005, the cost of the RSA for *Loligo* would be shared among a maximum of 337 vessels (assuming only two vessels are awarded the entire RSA amount). In this example, the average non-RSA vessel would forego 0.8 mt of *Loligo* to the RSA quota category (valued at $1358) based on the amount allocated for the two approved research projects. The total revenue amount foregone to the RSA quota category would be valued at $865,746 if the entire 3% RSA was allocated (or $2,568 per non-RSA vessel).

As discussed above, researchers have requested the retention of *Loligo* squid landings in amounts greater than 2,500 pounds during a closure of the directed *Loligo* squid fishery. Because the amount of set-aside quota is limited, these exemptions are expected to have only minimal economic and social impacts. A detailed description of the fishing activities, economic environment, and participants in these fisheries can be found under section 6.0.

Under the research quota set-aside program, vessels that do not possess a limited access *Loligo* squid permit may participate in research projects. Therefore, it is possible that research participants, outside the scope of vessels possessing limited access *Loligo* squid permits, may harvest *Loligo* squid in amounts greater than is currently permitted under the open access incidental catch *Loligo* squid permit (2,500 lb per trip). This could have an economic impact on limited access *Loligo* squid permit holders because it is possible that a small portion of the annual quota may be redistributed to vessels that might not ordinarily participate in this fishery. However, because the research set-aside quota is of a limited amount, the overall economic impacts to limited access permitted vessel owners and their crews will be minimal. No negative economic or social impacts for dealers or processors under this scenario are expected.

Because some vessels may be harvesting *Loligo* squid in amounts greater than 2,500 lb per calendar day during a seasonal closure of the directed *Loligo* squid fishery, vessels could receive higher prices for their catch than would ordinarily occur during the regular opening of the fishery. This could provide positive economic impacts for the vessel owners and crews participating in research projects. Also, dealers and processors intent on maintaining a steady inventory of fresh *Loligo* squid may benefit.

7.6 CUMULATIVE IMPACTS OF PREFERRED ALTERNATIVE ON IDENTIFIED VECs

The biological, economic and social impacts of the proposed specifications (preferred alternatives) for 2007 action for *Loligo*, *Illex*, butterfish and Atlantic mackerel are expected to be minimal since they maintain the status quo relative to previous quotas. In the case of butterfish, positive biological impacts are expected since the preferred alternative should prevent overfishing and allow for stock rebuilding. The reduced quota compared to years prior to 2005 could have short term negative impacts on the vessels participating in the butterfish fishery.

However, these short term effects are necessary to conserve the stock and will result in longer term economic and social benefits when the stock increases in size. The proposed specifications are considered the most reasonable to achieve the fishery conservation objectives while minimizing the impacts on fishing communities as per the objectives of the FMP. A summary of the environmental consequences for each of the alternatives considered is given in the Table ES-1 (see Executive Summary).

7.6.1 Introduction; Definition of Cumulative Effects

A cumulative impact analysis is required by the Council on Environmental Quality's (CEQ) regulation for implementation of 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 section 1508.7)." A formal cumulative impact assessment is not necessarily required as part of an Environmental Assessment under NEPA as long as the significance of cumulative impacts has been considered (U.S. EPA 1999). The following remarks address the significance of the expected cumulative impacts as they relate to the federally managed Atlantic mackerel, squid and butterfish fisheries.

The cumulative impacts of past, present, and future Federal fishery management actions (including the specification recommendations in this document) should generally be positive. The mandates of the MSFCMA, as currently amended by the SFA, and the NEPA require that management actions be taken only after consideration of impacts to the biological, physical, economic, and social dimensions of the human environment. Therefore, it is expected that under the current management regime, the long term cumulative impacts of federal fishery management actions under this FMP and annual specifications process will contribute toward improving the human environment.

In terms of past actions for these fisheries, habitat and socioeconomic impacts, the temporal scope of this analysis is primarily focused on actions that have taken place since 1976, when these fisheries began to be managed under the MSFCMA. For endangered and other protected species, the context is largely focused on the 1980s and 1990s, when NMFS began generating stock assessments for marine mammals and turtles that inhabit waters of the U.S. EEZ. In terms of future actions, the analysis considers the period between the effective date of these specifications (January 1, 2007) and 2009, the year in which Amendment 11 is expected to be completed.

The geographic scope of the analysis of impacts to fish species and habitat for this action is the range of the fisheries in the Western Atlantic Ocean, as described in the Affected Environment and Environmental Consequences sections of the document. For endangered and protected species the geographic range is the total range of each species. The geographic range for socioeconomic impacts is defined as those fishing communities bordering the range of the fisheries for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish which occur primarily from the U.S.- Canada border to Cape Hatteras, although the management unit includes all the coastal states from Maine to Florida.

The earliest management actions implemented under this FMP were designed to control the extensive foreign fisheries that existed in US waters prior to the passage of the MSFCMA. These management actions 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 example, reported foreign mackerel landings in US waters declined from an unregulated level of 385,000 mt in 1972 to less than 400 mt from 1978-1980 under the MSFCMA (the foreign mackerel, squid and butterfish fisheries were restricted by to certain areas or "windows"). Similarly, the foreign catch of *Loligo* was reduced from 21,000 mt in 1976 to 9,355 mt in 1978. By 1982, foreign *Loligo* catches had again risen above 20,000 mt. At this time, US management of the squid resources focused on the Americanization of these fisheries. This process began with the development of joint ventures between US fishermen and foreign concerns. Foreign allocations were reduced from 20,350 mt during 1982-83 to 5,550 mt during 1983-84. The foreign catch of *Loligo* fell below 5,000 mt by 1986, to 2 mt in 1987 and finally to zero in 1990. 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. The domestic fishery for *Illex* increased steadily during the 1980's as foreign fishing was eliminated in the US EEZ. Reported foreign catches of butterfish increased from 750 mt in 1965 to 15,000 mt in 1969, and then to about 18,000 mt in 1973. With the advent of extended jurisdiction in US waters, reported foreign landings declined sharply from 10,353 mt in 1976 to 1,326 mt in 1978. Foreign landings of butterfish were slowly phased out by 1987.

Other past actions which had a major impact on the fishery included: the implementation of a limited access program in Amendment 5 to control capacity in the *Loligo*, butterfish, and *Illex* fisheries; revision of the overfishing definitions for all four managed species in Amendment 6; modification of vessel upgrade rules in Amendment 7; and implementation of overfishing control rules and other measures (including a framework adjustment procedure) to bring the FMP into compliance with the SFA in Amendment.

Future actions include the development of Amendment 9 which could extend the moratorium on entry to the commercial *Illex* fishery, allow for specification of management measures for multiple years, revise the current overfishing definition for *Loligo* squid, implement management alternatives for Atlantic mackerel, squid, and butterfish to prevent, mitigate or minimize adverse effects from fishing to bring the FMP into compliance with Section 303(a)(7) of the SFA, 5) implement measures to reduce discards in these fisheries and identify essential fish habitat for *Loligo* squid eggs. The Council is also developing a stock rebuilding plan for butterfish in Amendment 10 and considering the development of limited or controlled access program for the commercial Atlantic mackerel fishery in Amendment 11. Finally, the NMFS has convened an Atlantic Trawl Gear Take Reduction Team (ATGTRT) as part of a settlement agreement between the Center for Biological Diversity and NMFS to address the incidental mortality and serious injury of long-finned pilot whales, short-finned pilot whales, common dolphins and white sided dolphins in several trawl gear fisheries operating in the Atlantic Ocean. As noted in section 6.4 of this EA, takes of pilot whales, common dolphins and white-sided dolphins have occurred in fisheries operating under the Atlantic Mackerel, Squid, and Butterfish FMP as well as in mid-water and bottom trawl fisheries in the Northeast. The charge to the ATGTRT is to develop a take reduction plan (TRP) within 11 months that, once implemented, will achieve the long-term goal of the MMPA of reducing serious injury and mortality of

affected stocks to a level approaching a zero mortality rate goal (ZMRG) (which is 10% of the Potential Biological Removal (PBR) of each stock). The measures developed under the ATGRP should help to mitigate the probability of any additional interactions between the Atlantic mackerel, squid and butterfish fisheries and pilot whales, white sided dolphins and common dolphins. Additional background information on the ATGTRT is available at the following website: http://www.nero.noaa.gov/prot_res/atgtrp/index.html

In addition to the direct effects on the environment from fishing, the cumulative effects to the physical and biological dimensions of the environment may also come from non-fishing activities. Non-fishing activities, in this sense, relate to habitat loss from human interaction and alteration or natural disturbances. These activities are widespread and can have localized impacts to habitat such as accretion of sediments from at-sea disposal areas, oil and mineral resource exploration, aquaculture, construction of at-sea wind farms, bulk transportation of petrochemicals and significant storm events. In addition to guidelines mandated by the MSFMCA, NMFS reviews some of these types of effects during the review process required by Section 404 of the Clean water Act and Section 10 of the Rivers and Harbors Act for certain activities that are regulated by Federal, state, and local authority. The jurisdiction of these activities is in "waters of the United States" and includes both riverine and marine habitats. A database which could facilitate documentation regarding cumulative impacts of non-fishing activities on the physical and biological habitat in the management unit covered by this FMP is not available at this time. The development of a habitat and effect database would expedite the review process and outline areas of increased disturbance. Inter-agency coordination would also prove beneficial.

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 MSFMCA. 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. For Atlantic mackerel, the full development of the domestic fishery is still ongoing. 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 recently received a preliminary capacity analysis which indicated that the currently active mackerel fleet appears capable of taking the long term sustainable yield for the fishery. As a result, the Council recently voted to develop a controlled access plan in Amendment 11 to control additional expansion of harvest capacity in the Atlantic mackerel fishery.

The cumulative impacts of this FMP were last fully addressed in the EIS for Amendment 8 and are currently being re-addressed in the draft Amendment 9 which is currently under development. All four species in the management unit are managed primarily via annual quotas to control fishing mortality. This FMP requires a specifications process which allows for the review and modifications to management measures specified in the FMP on an annual basis which allows for review. 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 regulatory process. As noted above, the cumulative impact of this FMP and annual specification process has been positive since its implementation after passage of the Magnuson Act. Three of the four species in the management are not overfished. The general impacts have been positive to both the resources and communities that depend on them. For example, limited access and control of fishing effort through implementation of the annual quotas has had a positive impact on non-target species since the modern fishery is being prosecuted at much lower levels of fishing effort compared to the historical foreign fishery. The foreign fishery was known to take significant numbers of marine mammals including common dolphin, white sided dolphin and pilot whales. Since the current US fishery is being prosecuted at lower levels compared to the historical foreign fishery, positive benefits have been realized in the form of reduced takes of the marine mammals described in section 6.4 compared to the historical fisheries.

Through development of the FMP and its amendments and the subsequent annual specification process, the Council continues to manage these resources in accordance with the National Standards required under the Magnuson-Stevens Act. 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. The Council uses the best scientific information available (National Standard 2) and manages these two resources throughout their range (National Standard 3). The management measures do not discriminate between residents of different states (National Standard 4), they do not have economic allocation as its sole purpose (National Standard 5), The measures account for variations in fisheries (National Standard 6), avoid unnecessary duplication (National Standard 7), they take into account The fishing communities (National Standard 8), address bycatch in these fisheries (National Standard 9) and promote safety at sea (National Standard 10). By continuing to meet the National Standards requirements of the Magnuson-Stevens Act through future FMP amendments and actions, The Council will insure that cumulative impacts of these actions will remain overwhelmingly positive for the ports and communities that depend on these fisheries, as well as the Nation as a whole.

The cumulative effects of the proposed quotas will be examined for the following five valued economic components (VECs): targeted species, non-targeted species, protected species, habitat, and communities.

7.6.2 Target Fisheries and Managed Resources

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. Atlantic mackerel were overfished prior to management and then were subsequently rebuilt under the FMP and it's Amendments. *Loligo* were considered overfished in 2000 but remedial action by the Council in subsequent years (i.e., reduced quotas) resulted in stock rebuilding to the point that the species in no longer consider overfished. *Illex* and mackerel have never been designated as overfished since passage of the SFA. In the case of butterfish, the species was recently designated as overfished and the Council is developing a

remedial action through the development of Amendment 10 which will outline a stock rebuilding strategy for this stock. The measures taken as part of the annual specifications process in 2006 and proposed for 2007 should contribute to this rebuilding effort (see the discussion on biological impacts of the butterfish alternatives in section 7.0).

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 these four species 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 described in section 3.0. 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. 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 are generally not quantifiable at present. Nonetheless, 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, which in many cases, resulted in overfishing . 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 overfishing of these stocks, most notably in the case of Atlantic mackerel. In addition, the foreign fishery landings for the other three species in the management unit also reached unsustainable levels prior to FMP development and implementation. 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 definitions 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.

The quotas and other measures under the preferred alternatives for 2007 serve to achieve the objectives of the FMP. The impacts on the environment for each of these alternatives are described in section 7.0. The quotas proposed under the preferred alternative for each species were developed to achieve the primary goal of the FMP and SFA which is to prevent overfishing. They are also intended to provide for the greatest overall benefit to the nation. These measures in conjunction with previous actions including establishment of limited access for the squids and butterfish in Amendment 5 and overfishing definitions in Amendment 8 help maximize social and economic benefits from these resources for both the industry and the nation. Future actions such as extension of the *Illex* moratorium in Amendment 9 and the development of a controlled access plan for the Atlantic mackerel fishery in Amendment 11 should continue

to allow the Council to manage these resources such that the objectives of the SFA continue to be met.

7.6.3 Non-target Species

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 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.

None of the management measures by the Council for 2007 under the preferred alternatives will promote or result in increased levels of bycatch relative to the status quo. The proposed measure that would allow Illex moratorium vessels to retain up to 10,000 pounds of *Loligo* during August directed Loligo fishery closures should help to reduce regulatory discards in the *Illex* fishery. Past measures implemented under this FMP which help to control or reduce discards of non-target species in these fisheries include 1) limited entry and quotas which are intended to control or reduce fishing effort, 2) incidental catch allowances for non-moratorium vessels and all vessels during directed fishery closures and 3) minimum mesh requirements. The measures proposed under the preferred alternative for each species, in conjunction with these past actions, should maintain or reduce historical levels of bycatch and discards in these fisheries. The Council is considering a number of additional measures to address discards in these fisheries in Amendment 9, including modification of the *Illex* exemption from the *Loligo* minimum mesh requirement, establishment of small mesh gear restricted areas, increase in the minimum mesh size for *Loligo*, implementation of gear modifications in the *Loligo* fishery to reduce bycatch, and modification of the incidental catch allowance for the *Loligo* fishery. All of these measures, in conjunction with the preferred alternatives proposed by the Council for 2007, should result in a reduction in bycatch and discards of non-target species in these fisheries.

7.6.4 Protected Species

There are numerous species which inhabit the environment within the management unit of this FMP that are afforded protection under the ESA of 1973 and/or the Marine Mammal Protection 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 ESA, the

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 6.4.

As noted above, none of the management measures for 2007 under the preferred alternatives will promote or result in increased levels of bycatch relative to the no action, since the specifications under the preferred alternatives are either equal to or less than the 2006 status quo. 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 6.4, 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. Other proposed future actions by the Council which should have positive benefits relative to marine mammal stocks are the extension of the moratorium on entry to the *Illex* fishery in Amendment 9 and the controlled access plan for Atlantic mackerel being considered for Amendment 11. Both of these actions will control entry of new fishing effort into these fisheries. The cumulative effect of the proposed measures for 2007 in conjunction with past and future management actions under the FMP and take reduction measures developed under the MMPA should reduce the impact of these fisheries on marine mammal stocks including common dolphin, white sided dolphin, and pilot whales.

7.6.5 Essential Fish 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

Otter trawls are the principal gear used in these fisheries. 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.

Stevenson *et al.* (2003) performed an evaluation of the potential impacts of otter trawls using the following information: 1) the EFH designations adopted by the Mid-Atlantic, New England, and South Atlantic Fishery Management Councils; 2) the results of a Fishing Gear Effects Workshop convened in October 2001; 3) the information provided in this report, including the results of existing scientific studies, and the geographic distribution of bottom otter trawl use in the Northeast region; and 4) the habitats utilized by each species and life stage as indicated in their EFH designations and supplemented by other references. First, the habitat's value to each species and life stage was characterized to the extent possible, based on its function in providing shelter, food and/or the right conditions for reproduction. For example, if the habitat provided shelter from predators for juvenile or other life stages, gear impacts that could reduce shelter were of greater concern. In cases where a food source was closely associated with the benthos (*e.g.* infauna), the ability of a species to use alternative food sources was evaluated. Additionally, since benthic prey populations may also be adversely affected by fishing, gear impacts that could affect the availability of prey for bottom-feeding species or life stages were of greater concern than if the species or life stages were piscivorous. In most cases habitat usage was determined from the information provided in the EFH Source Documents (NOAA Technical Memorandum NMFS-NE issues 123-153) with additional information from Collette and Klein-MacPhee (2002).

Based upon this qualitative draft assessment approach, Stevenson *et al.* (2003) indicated that otter trawls potentially have a high adverse impact on 18 life stages for 8 species, predominantly juveniles and adults; moderate impacts on 40 life stages of 21 species, predominantly juveniles, adults, and spawning adults; low impacts on about 30 life stages for 14 species, predominantly juveniles, adults, and spawning adults; no impacts on one life stage of one species, halibut eggs; and are not applicable to 67 life stages of 28 species, predominantly eggs and larvae.

While the otter trawls utilized in this fishery have the potential to adversely affect EFH, available effort analyses are currently insufficient to predict the extent of adverse impacts from this fishery. However, since the preferred alternatives either maintain the status quo or are likely to reduce fishing effort, they should not result in an increase in fishing effort or redistribute effort by gear type. Therefore, these alternatives are not expected to increase any existing impacts on EFH caused by this fishery relative to the status quo. As noted above, the past actions in the FMP in conjunction with the measures proposed for 2007 have had the cumulative effect of controlling fishing effort through limited access programs and quotas. The Council is currently developing Amendment 9 which includes measures which address 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 Atlantic mackerel, squid and butterfish fisheries on EFH in Amendment 9. The Council anticipates that the measures proposed for 2007, in conjunction with past actions and those being developed in Amendment 9 should control or reduce impacts of these fisheries on EFH.

7.6.6 Human 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 that report which is available upon request from the Council. Through implementation of the FMP for these species the Council seeks to achieve the primary objective of the Magnuson-Stevens Act which is to achieve optimum yield from these fisheries.

As noted above, a major goal of this FMP has been to develop the domestic fisheries for these species in a controlled manner. Prior to FMP development, the foreign prosecution of these fisheries occurred at much higher levels of fishing effort, which in many cases, resulted in overfishing. Thus, the first cumulative effect of the FMP has been to end foreign exploitation of these resources and to guide the development of the domestic harvest and processing fishery infrastructure. Part of this fishery rationalization process included the development of limited access programs to control capitalization while maintaining harvests at levels that are sustainable. In addition, by meeting the National Standards prescribed in the SFA, the Council has strived to meet one of the primary objectives of the act - to achieve optimum yield in each fishery. The proposed specifications for 2007, in conjunction with the past and future actions described above, will have positive cumulative impacts for the communities which depend on these resources. While the preferred alternative for butterfish could have short term negative effects on these communities because of reduced quota compared to years prior to 2005, the long term effects should be positive as the stock is rebuilt and harvests return to sustainable levels.

7.6.7 Summary of cumulative impacts

The impacts of the preferred alternatives on the biological, physical, and human environment are described in section 7. The 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/FRFA 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 not expected to result in significant cumulative impacts on the biological, physical, and human components of the environment. However, several negative impacts could result from the proposed actions in 2007. First, the butterfish quota represents a reduction compared to years prior to 2002 but it does not compared to the most recent three years for which data are available. Therefore, there could be some short term negative economic effects relative to fishery as it existed prior to 2002, but in the long term the benefits are expected to be positive since stock rebuilding is expected under this alternative. In addition, these fisheries are known to have had historical interactions with marine mammals.

These fisheries have been well managed since implementation of the FMP in the early 1980s. With the exception of butterfish, all of the resources managed under this FMP 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. As noted above, the historical development of the FMP resulted in a number of actions which have impacted these fisheries. The cumulative effects of past actions in conjunction with the

proposed measures for 2007 and possible future actions are discussed above. Within the construct of that analysis, the Council has concluded that no significant impacts will result from the specifications proposed for 2007.

8.0 APPLICABLE LAW

8.1 Magnuson-Stevens Fishery Conservation and Management Act

This action is being taken in conformance with the Atlantic Mackerel, Squid and Butterfish FMP, which requires that specifications be set for this fishery on an annual basis. Amendment 8 to the FMP established the overfishing definitions which form the basis for the annual specifications; this Amendment was approved on April 28, 1999 and was found to be fully in compliance with all national standards and other required provisions of the Magnuson-Stevens Act. Nothing in this action changes the findings in Amendment 8 that this Amendment complies with the Magnuson-Stevens Act.

8.1.1 Essential Fish Habitat Assessment

Atlantic mackerel, squid and butterfish have EFH designated in many of the same habitats that have been designated as EFH for most of the groundfish within the Northeast Multispecies FMP, including: Atlantic cod, haddock, monkfish, ocean pout, American plaice, pollock, redfish, white hake, windowpane flounder, winter flounder, witch flounder, yellowtail flounder, Atlantic halibut and Atlantic sea scallops. Broadly, EFH is designated as the bottom habitats consisting of varying substrates (depending upon species) within the Gulf of Maine, Georges Bank, and the continental shelf off southern New England and the mid-Atlantic south to Cape Hatteras for the juveniles and adults of these groundfish. In general, these areas are the same as those designated for Atlantic mackerel, squid and butterfish, including substrate/bottom habitat.

Fishing activities for Atlantic mackerel, squid and butterfish occur in these EFH areas. The primary gear utilized to harvest these species is the bottom otter trawl, although a significant portion of the Atlantic mackerel landings are taken with mid-water otter trawls. Since the otter trawl most prevalent in these fisheries is the bottom- tending mobile gear type, it is most likely to be associated with adverse impacts to bottom habitat. The primary impact associated with this type of gear is reduction of habitat complexity (Auster and Langton, 1998).

Amendment 8 included overfishing definitions which are the same or more conservative than overfishing definitions from previous Amendments. As a result, the quota specifications resulting from these new overfishing definitions are the same or lower than in previous years. This should effectively result in the same or reduced gear impacts to bottom habitats by reducing or maintaining the harvest of the managed species within this FMP. Any reductions in harvesting effort may indirectly benefit EFH by creating an overall reduction of disturbance by a gear type that impacts bottom habitats. Other management actions already in place should control redirection of effort into other bottom habitats (including, but not limited to stock rebuilding programs for other species that are designated as overfished, limited access programs to control entry of new fishing effort, and measures such as days-at sea limits, quotas, seasons and trip limits that tend to limit fishing effort in this and other managed fisheries throughout the Northwest Atlantic Ocean under US jurisdiction).

The quotas under the preferred alternatives proposed in this action maintain the status quo relative to 2006 specifications. Therefore, the Council has concluded that the 2007 quota specifications proposed for Atlantic mackerel, squid and butterfish will have no more adverse impacts on EFH than those than may currently exist. As noted in previous sections, the Council is currently developing a draft of Amendment 9 which includes measures which address gear impacts from these fisheries on essential fish habitat. As a result, the Council will present a more thorough analysis of the effects of gears used in the Atlantic mackerel, squid and butterfish fisheries on Essential Fish Habitat in Amendment 9.

8.2 NEPA

8.2.1 Finding of No Significant Impact (FONSI)

National Oceanic and Atmospheric Administration Administrative Order 216-6 (May 20, 18.28.28.2) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality regulations at 40 C.F.R. '1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQs context and intensity criteria. These include:

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

None of the proposed specifications of IOY for 2007 are expected to jeopardize the sustainability of any target species affected by the action (see sections 7.1.1, 7.2.1, 7.3.1, and 7.4.1 of this document). All of the proposed quota specifications under the preferred alternatives for each species are consistent with the FMP overfishing definitions. The overfishing definitions for these species are based primarily on maintaining fishing mortality levels below the levels which are sustainable in the long term (i.e., below a fishing mortality rate which produces maximum sustainable yield). As such, the proposed action action will ensure the long-term sustainability of harvests from the Atlantic mackerel, *Illex* and *Loligo* squid, and butterfish stocks.

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

The proposed action is not expected to jeopardize the sustainability of any non-target species (see sections 7.1.1, 7.2.1, 7.3.1, and 7.4.1 of this document). The proposed measures maintain the quota specifications of IOY for the upcoming fishing year for Atlantic mackerel, *Loligo*, *Illex* and butterfish. None of these specifications of are expected to result in increased fishing effort. In addition, none of the measures are expected to alter fishing methods or the temporal and/or spatial distribution of fishing activities. Therefore, none of the proposed actions are expected to jeopardize the sustainability of non-target species relative to the 2006 specifications.

3) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?

The proposed action is not expected to cause damage to the ocean, coastal habitats, and/or EFH as defined under the Magnuson-Stevens Act and identified in the FMP (see sections 7.1.2, 7.2.2, 7.3.2, and 7.4.2 of this document). In general, bottom-tending mobile gear, primarily otter trawls, have the potential to adversely affect EFH for the species managed under this FMP. Overall, the measures proposed in this action are expected to have effects ranging from a reduction in adverse effects to no more than minimal adverse impacts to any EFH associated with the fishing activities managed under the FMP.

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

This action proposes to continue the 2006 commercial quotas for Atlantic mackerel, *Loligo, Illex* squid and butterfish in 2007. While the proposed change from quarterly seasonal allocation to trimesters in the *Loligo* fishery could affect the spatial and/or temporal distribution of fishing effort, these changes are not expected to be significant. None of the other measures substantially alter the manner in which the industry conducts fishing activities for the target species. Therefore, no changes in fishing behavior that would affect safety are anticipated (see section 7.0 of this document). The overall effect of the proposed actions on these fisheries, including the communities in which they operate, will not adversely impact public health or safety. NMFS will consider comments received concerning safety and public health issues.

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

The Atlantic mackerel, *Loligo, Illex* and butterfish fisheries are known to interact with common and white sided dolphins and pilot whales. This action proposes to continue the commercial quotas and most other management measures in 2007 which are already in place for 2006 for this species complex. As a result, fishing effort is not expected to increase in magnitude under the proposed specifications of IOY. In addition, none of the proposed specifications of IOY are expected to substantially alter fishing methods, activities or the spatial and/or temporal distribution of fishing effort (see sections 7.1.3, 7.2.3, 7.3.3, and 7.4.3 of this document).. Therefore, this action is not expected to have increased negative effects on common and white sided dolphin and pilot whales. The Atlantic mackerel, *Illex* and butterfish fisheries are not known to interact with any endangered or threatened species or their critical habitat. The *Loligo* fishery has been known to have interactions with loggerhead and leatherback sea turtles as discussed in section 6.4 and section 7.4.3. The proposed action is not expected to increase fishing effort or substantially alter fishing patterns in a manner that would adversely affect either of these endangered species of sea turtles.

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

This action proposes to continue the specification of IOY (commercial quotas)in 2007 which are already in place for 2006 for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish. These fisheries are prosecuted using bottom otter trawls which have the potential to impact bottom habitats. In addition, a number of non-target species are taken incidentally to the prosecution of these fisheries. However, fishing effort is not expected to increase in magnitude under the proposed specification of IOY action (see section 7.0 of this document). In addition, none of the proposed specifications are expected to substantially alter fishing methods, activities or the spatial and/or temporal distribution of fishing effort. Therefore, the proposed action is not expected to have a substantial impact on biodiversity and ecosystem function within the affected area.

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

This action proposes to continue the specifications of IOY in 2007 which are already in place for 2006 for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish. These fisheries are prosecuted using bottom otter trawls which have the potential to impact bottom habitats. In addition, a number of non-target species are taken incidentally to the prosecution of these fisheries. However, fishing effort is not expected to increase in magnitude under the proposed action. In addition, none of the proposed specifications are expected to alter fishing methods, activities or the spatial and/or temporal distribution of fishing effort. As noted in section 7.0 of the EA, the proposed action is not expected to have any substantial natural or physical effects within the affected area. Therefore, there are no social or economic impacts interrelated with significant natural or physical environmental impacts that are expected.

8) Are the effects on the quality of the human environment likely to be highly controversial?

The impacts of the proposed measures on the human environment are described in section 7.0 of this EA. The proposed action would continue the 2006 IOY specifications for Atlantic mackerel, *Illex* squid and butterfish in 2007. Maintaining the 2006 status quo specifications in 2007 is not expected to be highly controversial. The proposed action is based on measures contained in the FMP which have been in place for many years. In addition, the scientific information upon which the annual quotas are based has been peer reviewed and is the most recent information available. Since the quotas are based on the best information available and have already in place in previous years, the proposed action is the not expected to be highly controversial.

9) Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?

This action proposes to maintain the 2006 specifications of IOY for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish in 2007. These fisheries are prosecuted primarily using bottom otter trawls in the open ocean throughout the Mid-Atlantic Bight and New England. Most of the fishing effort in these fisheries occurs over featureless sand and sand/mud bottoms along the Atlantic Coast. These fisheries are not known to be prosecuted in any unique areas such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or

ecologically critical areas. Therefore, the proposed action is not expected to have a substantial impact on any of these areas (see section 7.0 of this document).

10) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

This action proposes to continue the specification of IOY in 2007 which are already in place for 2006 for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish. As a result, fishing effort is not expected to increase in magnitude under the proposed action. In addition, none of the proposed specifications are expected to substantially alter fishing methods, activities. While the proposed change from quarterly seasonal allocation to trimesters in the *Loligo* fishery could affect the spatial and/or temporal distribution of fishing effort, these changes are not expected to be significant. As a result, the effects on the human environment of the proposed specifications for 2007 are expected to be minimal or non-existent compared to the 2006 specifications. The effects on the human environment as a result of implementing the 2007 specifications for these species are not highly uncertain nor do they involve unique or uncertain risks (see section 7.0 of this document).

11) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

The impacts of the preferred alternatives on the biological, physical, and human environment are described in section 7.0. The 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 benefits from improved fishery efficiency is most likely to affect participants in these fisheries. These benefits are addressed in the RIR/FRFA 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 not expected to result in significant cumulative impacts on the biological, physical, and human components of the environment.

12) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

This action proposes to maintain the 2006 specifications of IOY for Atlantic mackerel, *Loligo*, *Illex* squid and butterfish in 2007 and implement several changes including the seasonal allocation of the *Loligo* quota and increase the *Loligo* bycatch allowance for *Illex* moratorium vessels during August. These fisheries are prosecuted primarily using bottom otter trawls in the open ocean throughout the Mid-Atlantic Bight and New England. Most of the fishing effort in these fisheries occurs over featureless sand and sand/mud bottoms along the Atlantic Coast. These fisheries are not known to be prosecuted in any areas that might affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause the loss or destruction of significant scientific, cultural or historical resources (sections 6.0 and 7.0 of this document). Therefore, the proposed action is not expected to affect on any of these areas.

13) Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

These fisheries are prosecuted primarily using bottom otter trawls in the open ocean throughout the Mid-Atlantic Bight and New England. There is no evidence or indication that these fisheries have ever resulted in the introduction or spread of nonindigenous species in the past. This action proposes to maintain the 2006 specifications of IOY for Atlantic mackerel, *Loligo*, *Illex* squid and butterfish in 2007. As a result, fishing effort is not expected to increase in magnitude under the proposed action. In addition, none of the proposed specifications are expected to substantially alter fishing methods, activities or the spatial and/or temporal distribution of fishing effort significantly (see section 7.0 of this document). Therefore, it is highly unlikely that the proposed specifications would be expected to result in the introduction or spread of a non-indigenous species.

14) Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

This action proposes to maintain the 2006 specifications of IOY for Atlantic mackerel, *Illex* squid and butterfish in 2007. As a result, fishing effort is not expected to increase in magnitude under the proposed action (see section 7.0 of this document). In addition, none of the proposed specifications are expected to substantially alter fishing methods, activities or the spatial and/or temporal distribution of fishing effort significantly. Maintaining the 2006 status quo in 2007 is not likely to establish a precedent for future actions because the status quo is being maintained. When new stock assessment or other biological information about these species becomes available in the future, then the annual specifications will be adjusted according to the overfishing definitions contained in the FMP.

15) Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

This action proposes to continue the specifications of IOY in 2007 which are already in place for 2006 for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish. As a result, fishing effort is not expected to increase in magnitude under the proposed action. In addition, none of the proposed specifications are expected to substantially alter fishing methods, activities or the spatial and/or temporal distribution of fishing effort significantly. Since no changes are expected to the previous specifications as a result of the proposed action, it is not expected that they would threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment. In fact, the proposed measures have been found to be consistent with other applicable laws (see sections 8.3 - 8.11 below).

16) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

This action proposes to maintain the 2006 specifications for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish in 2007. As a result, fishing effort is not expected to increase in magnitude under the proposed action. In addition, none of the proposed specifications are expected to

substantially alter fishing methods, activities or the spatial and/or temporal distribution of fishing effort significantly. The synergistic interaction of improvements in the efficiency of the fishery through implementation of annual quotas based on the overfishing definitions contained in the FMP 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 benefits from improved fishery efficiency are most likely to affect participants in these fisheries positively in the long term. These benefits are addressed in the RIR/FRFA 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 impacts of the preferred alternatives on the biological, physical, and human environment are described in section 7. The cumulative effects of the proposed action on target and non-target species are detailed in section 7.6 of the EA. The proposed measures are not expected to alter fishing methods or activities, nor is maintaining the status quo expected to result in an increase in fishing effort. As such, the proposed actions together with past and future actions are not expected to result in significant cumulative impacts on the biological, physical, and human components of the environment.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for 2007 Atlantic Mackerel, Squid and Butterfish fisheries, it is hereby determined that the proposed specifications for 2007 will not significantly impact the quality of the human environment as described above and in the supporting Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an EIS for this action is not necessary.

_____ _____

Assistant Administrator for Fisheries, NOAA Date

8.3 Marine Mammal Protection Act

The numerous species which inhabit the management unit of this FMP that are afforded protection under the Marine Mammal Protection Act of 1972 (MMPA) are described in Section 6.4. Four species of marine mammals are known to interact with the Atlantic mackerel, squid and butterfish fisheries - long and short finned pilot whales, common dolphin and white sided dolphin. This action proposes to continue the commercial quotas and other management measures in 2007 which are already in place for 2006 for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish. None of the specifications are expected to alter fishing methods or activities. The Council has reviewed the impacts of the proposed specifications for the 2007 Atlantic mackerel, squid and butterfish fisheries on marine mammals and concluded that the management actions proposed are consistent with the provisions of the MMPA and would not alter existing measures to protect the species likely to inhabit the management units of the subject fisheries. For further information on the potential impacts of the fishery and the proposed management action, see section 6.4.

8.4 Endangered Species Act

Section 7 of the ESA requires Federal agencies conducting, authorizing, or funding activities that affect threatened or endangered species to ensure that those effects do not jeopardize the continued existence of listed species. The Council has concluded that the proposed 2006 specifications for Atlantic mackerel, *Illex* and butterfish and the prosecution of the associated fisheries is not likely to result in jeopardy to any ESA-listed species under NOAA Fisheries Service jurisdiction, or alter or modify any critical habitat, based on the discussion in this document. For further information on the potential impacts of the fisheries and the proposed management action, see Section 6.4 of this document. NOAA Fisheries Service last completed an informal consultation under section 7 of the ESA on September 6, 2005.

8.5 Administrative Procedures Act (APA)

Section 553 of the Administrative Procedure Act establishes procedural requirements applicable to informal rulemaking by Federal agencies. The purpose of these requirements is to ensure public access to the Federal rulemaking process, and to give the public adequate notice and opportunity for comment. At this time, the Council is not requesting any abridgement of the rulemaking process for this action.

8.6 Paperwork Reduction Act (PRA)

The purpose of the PRA is to control and, to the extent possible, minimize the paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by or for the Federal Government. This action does not propose to modify any existing collections, or to add any new collections; therefore, no review under the PRA is necessary.

8.7 Coastal Zone Management Act

Section 307(c)(1) of the Federal CZMA of 1972 requires that all Federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. Pursuant to the CZMA regulations at 15 CFR 930.35, a negative determination may be made if there are no coastal effects and the subject action: (1) Is identified by a state agency on its list, as described in § 930.34(b), or through case-by-case monitoring of unlisted activities; or (2) which is the same as or is similar to activities for which consistency determinations have been prepared in the past; or (3) for which the Federal agency undertook a thorough consistency assessment and developed initial findings on the coastal effects of the activity. Accordingly, the Council has determined that this action would have no effect on any coastal use or resources of any state. Letters documenting the Council's negative determination, along with this document, were sent to the coastal zone management program offices of 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. A list of the specific state contacts and a copy of the letters are available upon request.

8.8 Section 515 (Data Quality Act)

Pursuant to NOAA guidelines implementing section 515 of Public Law 106-554 (the Data Quality Act), all information products released to the public must first undergo a Pre-Dissemination Review to ensure and maximize the quality, objectivity, utility, and integrity of the information (including statistical information) disseminated by or for Federal agencies. The following section addresses these requirements.

Utility

The information presented in this document is helpful to the intended users (the affected public) by presenting a clear description of the purpose and need of the proposed action, the measures proposed, and the impacts of those measures. A discussion of the reasons for selecting the proposed action is included so that intended users may have a full understanding of the proposed action and its implications.

Until a proposed rule is prepared and published, this document is the principal means by which the information contained herein is available to the public. The information provided in this document is based on the most recent available information from the relevant data sources. The development of this document and the decisions made by the Council to propose this action are the result of a multi-stage public process. Thus, the information pertaining to management measures contained in this document has been improved based on comments from the public, the fishing industry, members of the Council, and NOAA Fisheries Service.

The Federal Register notice that announces the proposed rule and the final rule and implementing regulations will be made available in printed publication, on the website for the Northeast Regional Office, and through the Regulations.gov website. The Federal Register documents will provide metric conversions for all measurements.

Integrity

Prior to dissemination, information associated with this action, independent of the specific intended distribution mechanism, is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information. All electronic information disseminated by NOAA Fisheries Service adheres to the standards set out in Appendix III, "Security of Automated Information Resources," of OMB Circular A-130; the Computer Security Act; and the Government Information Security Act. All confidential information (e.g., dealer purchase reports) is safeguarded pursuant to the Privacy Act; Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business, and financial information); the Confidentiality of Statistics provisions of the Magnuson-Stevens Act; and NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics.

Objectivity

For purposes of the Pre-Dissemination Review, this document is considered to be a "Natural Resource Plan." Accordingly, the document adheres to the published standards of the Magnuson-Stevens Act; the Operational Guidelines, Fishery Management Plan Process; the Essential Fish Habitat Guidelines; the National Standard Guidelines; and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act.

This information product uses information of known quality from sources acceptable to the relevant scientific and technical communities. Stock status (including estimates of biomass and fishing mortality) reported in this product are based on either assessments subject to peer-review through the Stock Assessment Review Committee or on updates of those assessments prepared by scientists of the Northeast Fisheries Science Center. Landing and revenue information is based on information collected through the Vessel Trip Report and Commercial Dealer databases. Information on catch composition, by tow, is based on reports collected by the NOAA Fisheries Service observer program and incorporated into the sea sampling or observer database systems. These reports are developed using an approved, scientifically valid sampling process. In addition to these sources, additional information is presented that has been accepted and published in peer-reviewed journals or by scientific organizations. Original analyses in this document were prepared using data from accepted sources, and the analyses have been reviewed by members of the Atlantic Mackerel, Squid and Butterfish Monitoring Committee.

Despite current data limitations, the conservation and management measures proposed for this action were selected based upon the best scientific information available. The analyses conducted in support of the proposed action were conducted using information from the most recent complete calendar years, through 2005. The data used in the analyses provide the best available information on the number of seafood dealers operating in the northeast, the number, amount, and value of fish purchases made by these dealers, the number of reports made annually by these dealers, and the types of permits held by these dealers. Specialists (including professional members of plan development teams, technical teams, committees, and Council staff) who worked with these data are familiar with the most current analytical techniques and with the available data and information relevant to these fisheries.

The policy choices are clearly articulated in section 5.0 of this document as well as the management alternatives considered in this action. The supporting science and analyses, upon which the policy choices are based, are summarized and described in section 6.0 of this document. All supporting materials, information, data, and analyses within this document have been, to the maximum extent practicable, properly referenced according to commonly accepted standards for scientific literature to ensure transparency.

The review process used in preparation of this document involves the responsible Council, the Northeast Fisheries Science Center, the Northeast Regional Office, and NOAA Fisheries Service Headquarters. The Center's technical review is conducted by senior level scientists with specialties in population dynamics, stock assessment methods, demersal resources, population biology, and the social sciences. The Council review process involves public meetings at which affected stakeholders have opportunity to provide comments on the document. Review by staff at the Regional Office is conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. Final approval of the action proposed in this document and clearance of any rules prepared to implement resulting regulations is conducted by staff at NOAA Fisheries Service Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget.

8.9 Regulatory Flexibility Analysis (RFA)

The purpose of the RFA is to reduce the impacts of burdensome regulations and recordkeeping requirements on small businesses. To achieve this goal, the RFA requires Federal agencies to describe and analyze the effects of proposed regulations, and possible alternatives, on small business entities. To this end, this document contains an IRFA, found at section 1.0 at the end of this document, which includes an assessment of the effects that the proposed action and other alternatives are expected to have on small entities.

8.10 E.O. 12866 (Regulatory Planning and Review)

The purpose of E.O 12866 is to enhance planning and coordination with respect to new and existing regulations. This E.O. requires the Office of Management and Budget (OMB) to review regulatory programs that are considered to be "significant." Section 2.0 at the end of this document represents the RIR, which includes an assessment of the costs and benefits of the proposed action, in accordance with the guidelines established by E.O. 12866. The analysis included in the RIR shows that this action is not a "significant regulatory action" because it will not affect in a material way the economy or a sector of the economy

8.11 E.O. 13132 (Federalism)

This E.O. established nine fundamental federalism principles for Federal agencies to follow when developing and implementing actions with federalism implications. The E.O. also lists a series of policy making criteria to which Federal agencies must adhere when formulating and implementing policies that have federalism implications. However, no federalism issues or implications have been identified relative to the measures proposed for the 2007 quota specifications for Atlantic mackerel, *Loligo* and *Illex*, and butterfish. This action does not

contain policies with federalism implications sufficient to warrant preparation of an assessment under E.O. 13132. The affected states have been closely involved in the development of the proposed management measures through their representation on the Council (all affected states are represented as voting members of at least one Regional Fishery Management Council). No comments were received from any state officials relative to any federalism implications that may be associated with this action.

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10.0 LIST OF AGENCIES AND PERSONS CONSULTED

In preparing this annual specifications analysis the Council consulted with the NMFS, New England and South Atlantic Fishery Management Councils, Fish and Wildlife Service, Department of State, and the states of Maine through Florida through their membership on the Mid-Atlantic, New England and /or South Atlantic Fishery Management Councils. In addition, states that are members within the management unit were be consulted through the Coastal Zone Management Program consistency process. Letters were sent to each of the following states (point of contact in parentheses) within the management unit reviewing the consistency of the proposed action relative to each state's Coastal Zone Management Program: Maine (Kathleen Leyden), New Hampshire (Brian Mazerski), Massachusetts (Joe Pelczarski), Rhode Island (Grover Fugate), Connecticut (Charles Evans), New York (William Barton), New Jersey (Mark Mauriello), Pennsylvania (Lawrence Toth), Delaware (Sarah Cooksey), Maryland (Gwynne Schultz), Virginia (Silvia Gazzera), North Carolina (Steven Benton), South Carolina (Chris Brooks), Georgia (Stuart Stevens) and Florida (Ralph Cantral).

11.0 LIST OF PREPARERS AND POINT OF CONTACT

This environmental assessment was prepared by the following members of the MAFMC staff: Richard J. Seagraves, James Armstrong, and Kathy Collins. Questions about this environmental assessment or additional copies may be obtained by contacting Richard J. Seagraves, Mid-Atlantic Fishery Management Council, 300 S. New Street, Dover, DE 19904-6790 (302-674-2331). This EA may also be accessed by visiting the Council's website at http://www.mafmc.org.

INITIAL REGULATORY FLEXIBILITY ANALYSIS (IRFA) & REGULATORY IMPACT REVIEW FOR THE 2007 CATCH SPECIFICATIONS FOR ATLANTIC MACKEREL, SQUID, AND BUTTERFISH

1. INTRODUCTION

The National Marine Fisheries Service (NMFS) requires the preparation of a Regulatory Impact Review (RIR) for all regulatory actions that either implement a new Fishery Management Plan (FMP) or significantly amend an existing plan or regulation. The 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 regulatory actions. The 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 the 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.

2.0 EVALUATION OF E.O.12866 SIGNIFICANCE

The proposed action does not constitute a significant regulatory action under Executive Order 12866 for the following reasons. (1) It will not have an annual effect on the economy of more than $100 million. Based on unpublished NMFS preliminary data (Maine-North Carolina) the total commercial value for the Atlantic mackerel, squid and butterfish fisheries combined was estimated at $48.7 million in 2005. The measures considered in this regulatory action will not affect total revenues generated by the commercial industry to the extent that a $100 million annual economic impact will occur. The proposed actions are necessary to maintain the harvest of Atlantic mackerel, squid and butterfish at sustainable levels. The proposed action benefits in a material way the economy, productivity, competition and jobs. The proposed action will not adversely affect, in the long-term, competition, jobs, the environment, public health or safety, or state, local, or tribal government communities. (2) The proposed actions 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 the Atlantic mackerel, squid and butterfish fisheries in the EEZ. (3) The proposed actions will not materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of their participants. (4) the proposed actions do not raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

The economic benefits of the Atlantic Mackerel, Squid and Butterfish FMP have been evaluated periodically as amendments to the FMP have been implemented. These analyses have been conducted at the time a major amendment is developed and interim actions (framework adjustments or quota specifications) may be presumed to leave the conclusions reached in the initial benefit-cost analyses unchanged provided the original conservation and economic objectives of the plan are being met.

Amendment 8 implemented overfishing definitions which are the same or more conservative

than overfishing definitions from previous Amendments. As a result, the quota specifications resulting from these new overfishing definitions are the same or lower than in previous years. The economic effects of these overfishing definitions and quota specifications were evaluated at the time Amendment 8 was implemented. The economic analysis presented at the time Amendment 8 implemented was largely qualitative in nature. 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. Due to the lack of an empirical model for these fisheries and knowledge of elasticities of supply and demand, 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" (USDC 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. Since an empirical model describing the elasticities of supply and demand for these species is not available, it was assumed that the price for these species was determined by the market clearance price market or the interaction of the supply and demand curves. These prices were the base prices used to determine potential changes in prices due to changes in landings.

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.

Alternatives for Atlantic mackerel

The three alternatives considered for Atlantic mackerel specifications for 2007 are fully described in section 5.1 of the EA and are summarized in the table below

Table M.1 Proposed specifications for Atlantic mackerel for the 2007 fishing year (mt).

	ABC	IOY	DAH	DAP	JVP	TALFF
Alt. 1	186,000	115,000	115,000	100,000	0	0
Alt. 2	335,000	115,000	115,000	100,000	0	0
Alt. 3	204,000	115,000	115,000	100,000	0	0

Due to a lack of an empirical model for these fisheries and knowledge of elasticities of supply and demand, a qualitative approach to the economic assessment was adopted. Nevertheless, quantitative measures are provided whenever possible.

Landings

The quota proposed (IOY) for 2007 is not expected to be constraining, so no change in the domestic harvest of Atlantic mackerel would be expected as a result of the specifications in 2007 under any of the alternatives for IOY considered for Atlantic mackerel. Both the specification of IOY and ABC far exceed recent landings of Atlantic mackerel. However, US mackerel landings have been increasing in recent years. If landings begin to approach IOY in 2007, the Regional Administrator can increase OY up to ABC. In the case where an in-season adjustment to IOY is necessary, landings would be expected to increase compared to either recent landings or IOY under all three alternatives considered by the Council.

Prices

Given the likelihood that the alternatives for Atlantic mackerel will result in no change in mackerel landings and that mackerel prices are a function of numerous factors including world supply and demand, it is assumed that there will not be a change in the price for this species as a result of the 2007 proposed specifications of IOY. In the case where an in-season adjustment to IOY is necessary, landings would be expected to increase compared to either recent landings or IOY under all three alternatives considered by the Council. If landings increased as a result of an in-season adjustment to IOY, then the price of Atlantic mackerel has the potential to decrease. However, since the majority of US caught Atlantic mackerel are exported to foreign markets, the impact of increased US landings and exports due to an in-season adjustment on the price of US caught mackerel will depend principally on the state of world demand for mackerel and the world supply of mackerel in 2007. Since US supply of mackerel is very small compared to world supply and demand, it appears unlikely that an increase in US production in mackerel will result in a decrease in price on the world market (and hence the amount received by US producers in the world export market). Rather, it would appear more likely that high world demand and prices would stimulate an increase in US production which would trigger the need for an increase in OY up to ABC through an in-season adjustment

Consumer Surplus

Assuming Atlantic mackerel prices will not be affected under the scenario for IOY constructed above, there will be no corresponding change in consumer surplus associated with these fisheries. If Atlantic mackerel prices decrease because of an increase in landings through an in-season adjustment to IOY, then consumer surplus would be expected to increase. However, it more likely than an in-season adjustment would occur under the situation where high world demand causes an increase in price for mackerel. In that case, consumer surplus to US consumers would be expected to decrease.

Harvest Costs

No changes to harvest costs are expected as a result of these measures.

Producer surplus

Assuming Atlantic mackerel prices will not be affected under the scenario constructed above, there will be no corresponding change in producer surplus associated with these fisheries. If Atlantic mackerel prices decrease because of an increase in landings through an in-season adjustment to IOY, then producer surplus would be expected to decrease. However, it is more likely than an in-season adjustment would occur under the situation where high world demand causes an increase in price for mackerel. In that case, producer surplus to US producers would be expected to increase.

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 regulations. None of the measures are expected to change enforcement costs.

Distributive Effects

There are no changes to the quota allocation process for Atlantic mackerel. As such, no distributional effects are identified for this fishery.

Alternatives for *Illex*

The specifications for *Illex* under alternative 1 (status quo and preferred alternative) would be Max OY, ABC, IOY, DAH, and DAP = 24,000 mt and JVP and TALFF = 0 mt. The specifications for *Illex* under this alternative 2 would be Max OY, ABC, IOY, DAH, and DAP = 30,000 mt and JVP and TALFF = 0 mt. The specifications for *Illex* under this alternative 3 would be Max OY, ABC, IOY, DAH, and DAP = 19,000 mt and JVP and TALFF = 0 mt.

Due to a lack of an empirical model for these fisheries and knowledge of elasticities of supply and demand, a qualitative approach to the economic assessment was adopted. Nevertheless,

quantitative measures are provided whenever possible.

Landings

Under the alternatives considered for *Illex*, none are expected to result in a change in landings due to the specifications for the alternative measures in 2007. On average over the past five years, the landings for *lllex* have been below the alternatives considered for this species. Therefore, none of the specifications considered by the Council under the alternatives for 2007 for *Illex* are expected to result in an increase or decrease in landings in 2007.

Prices

Given the likelihood that the alternatives considered for *Illex* would not affect landings in 2007, it is assumed that there will not be a change in the price for this species

Consumer Surplus

Assuming *Illex* prices will not be affected under the scenario constructed above, there will be no corresponding change in consumer surplus associated with these fisheries under the alternative measures considered.

Harvest Costs

No changes to harvest costs are expected as a result of the alternatives considered for *Illex*.

Producer surplus

Assuming *Illex* prices will not be affected under the scenarios constructed above, there will be no corresponding change in producer surplus associated with alternatives considered for Illex.

Enforcement Costs

The alternatives considered for *Illex* are not expected to change enforcement costs.

Distributive Effects

There are no changes to the quota allocation process for *Illex* under the alternatives considered. As such, no distributional effects are expected for these fisheries.

Alternatives for butterfish

The specifications under alternative 1 (status quo and preferred alternative) would be max OY = 12,175 mt, ABC = 4,545 mt, and IOY, DAH, and DAP = 1,681 mt and JVP and TALFF = 0 mt. In addition, this alternative would maintain a 3.0 minimum cod end mesh size requirement for butterfish trips greater than 5,000 pounds implemented in 2005. The specifications under alternative 2 would be Max OY = 16,000 mt, ABC = 7,200 mt, and IOY, DAH, and DAP =

5,900 mt and JVP and TALFF = 0 mt. The specifications under alternative 3 would be Max OY = 12,175 mt and ABC = 12,175 mt, and IOY, DAH, and DAP = 9,131 mt and JVP and TALFF = 0 mt.

Due to a lack of an empirical model for these fisheries and knowledge of elasticities of supply and demand, a qualitative approach to the economic assessment was adopted. Nevertheless, quantitative measures are provided whenever possible.

Landings

No change in the domestic harvest of butterfish would be expected as a result of the specifications proposed for 2007 under any of the alternatives compared to the 2006 status quo.

Prices

Given the likelihood that the alternatives consider will result in no change in butterfish landings and that butterfish prices are a function of numerous factors including supply and demand, it is assumed that there will not be a change in the price for this species under these alternatives.

Consumer Surplus

Assuming butterfish prices will not be affected under the alternatives considered, there will be no corresponding change in consumer surplus associated with these alternatives.

Harvest Costs

No changes to harvest costs are expected as a result of the alternatives considered for butterfish.

Producer surplus

Assuming butterfish prices will not be affected under the alternatives considered, there will be no corresponding change in producer surplus associated with these alternatives.

The law of demand states that price and quantity demanded are inversely related. Given a demand curve for a commodity (good or service), the elasticity of demand is a measure of the responsiveness of the quantity that will be taken by consumers giving changes in the price of that commodity (while holding other variables constant). There are several major factors that influence the elasticity for a specific commodity. These factors largely determine whether demand for a commodity is price elastic or inelastic[1]: 1) the number and closeness of substitutes for the commodity under consideration, 2) the number of uses to which the commodity can be

[1]Price elasticity of demand is elastic when a change in quantity demanded is large relative to the change in price. Price elasticity of demand is inelastic when a change in quantity demanded is small relative to the change in price. Price elasticity of demand is unitary when when a change in quantity demanded and price are the same.

put; and 3) the price of the commodity relative to the consumer's's purchasing power (income). There are other factors that may also determine the elasticity of demand but are not mention here because they are beyond the scope of this discussion. As the number and closeness of substitutes and/or the number of uses for a specific commodity increase, the demand for the specific commodity will tend to be more elastic. Demand for commodities that take a large amount of the consumer's income is likely to be elastic compared to services with low prices relative to the consumer's income. It is argued that the availability of substitutes is the most important of the factors listed in determining the elasticity of demand for a specific commodity (Leftwich 1973; Awk 1988). Seafood demand in general appears to be elastic. In fact, for most species, product groups, and product forms, demand is elastic (Asche and Bjørndal 2003).

For example, an increase in the ex-vessel price of butterfish may increase PS. A decrease in the ex-vessel price of butterfish may also increase PS if we assumed that the demand for butterfish is moderate to highly elastic. However, the magnitude of these changes cannot be entirely assessed without knowing the exact shape of the market demand curve for this species.

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 regulations. None of the alternatives considered are not expected to change enforcement costs.

Distributive Effects

There are no changes to the quota allocation process for butterfish under any of the alternatives considered. As such, no distributional effects are identified for this fishery.

Alternatives for *Loligo*

The alternatives considered for *Loligo* squid are fully described in section 5.4. The specifications under all three alternatives would be Max OY =26,000 mt, ABC, IOY, DAH, and DAP = 17,000 mt and JVP and TALFF = 0 mt with up to 3% of the ABC could be set-aside for scientific research. In terms of the annual quota, these specifications represent the 2006 status quo. Under alternatives 1 and 2, the IOY would be allocated seasonally into three four month periods. Under alternative 3, the status quo quarterly allocation of the quota would be maintained. Alternatives 1 and 2 also would allow *Illex* moratorium vessels to retain up to 10,000 pounds of *Loligo* if the directed fishery is closed in August. In addition, alternatives 1 and 2 would restrict incidental permit holders to one trip per calendar day. Alternatives 1 and 2 differ in that under alternative 1, the second trimester would be sub-divided into separate two month periods with a trigger to close the directed fishery when 45% of the trimester 2 quota is taken.

Due to a lack of an empirical model for these fisheries and knowledge of elasticities of supply and demand, a qualitative approach to the economic assessment was adopted. Nevertheless,

quantitative measures are provided whenever possible.

Landings

Under the alternatives considered for *Loligo,* none are expected to result in a change in landings due to the specifications for the alternative measures in 2007. On average over the past five years, the landings of *Loligo* have been below the alternatives considered for this species. Therefore, none of the specifications considered by the Council under the alternatives for 2007 for *Loligo* are expected to result in an increase or decrease in landings in 2007.

Prices

Given the likelihood that the alternatives considered for *Loligo* would not affect landings in 2007, it is assumed that there will not be a change in the price for this species

Consumer Surplus

Assuming *Loligo* prices will not be affected under the scenario constructed above, there will be no corresponding change in consumer surplus associated with these fisheries under the alternative measures considered.

Harvest Costs

No changes to harvest costs are expected as a result of the alternatives considered for *Loligo*.

Producer surplus

Assuming *Loligo* prices will not be affected under the scenarios constructed above, there will be no corresponding change in producer surplus associated with alternatives considered for *Loligo*.

Enforcement Costs

The alternatives considered for *Illex* are not expected to change enforcement costs.

Distributive Effects

There are several changes to the quota allocation process for *Loligo* under the alternatives considered that could have distributive effects. Under alternatives 1 and 2, the Council proposes to implement a trimester seasonal allocation which could have distributive effect among seasonal participants in the fishery. Alternative 1 attempts to distribute the trimester 2 quota throughout the entire four month period by implementing an intermediate trigger and then reopening the fishery in July. The 10,000 pound trip limit for *Illex* moratorium vessels in August could, under certain conditions, result in a reduction in the amount of *Loligo* quota available for the third trimester. Finally, the proposed landing restriction of one trip per calendar for incidental catch permit holders could reduce the *Loligo* landings for that group of vessels.

Summary of Impacts

The overall impacts of Atlantic mackerel, *Loligo, Illex* and butterfish landings on prices, consumer surplus, and consumer surplus are difficult to determine without detailed knowledge of the relationship between supply and demand factors for these fisheries. In the absence of detailed empirical models for these fisheries and knowledge of elasticities of supply and demand, a qualitative approach was employed to assess potential impacts of the management measures.

The impact of each of the regulatory alternatives relative to the base year (2005) is summarized in Table IRFA-1. When potential outcomes from implementing a specific alternative are equal for all three species in direction, the resulting directional effect is presented as zero. However, when outcomes from implementing a specific alternative differ across species, the directional effects will be presented separately for each species. A “-1" indicates that the level of the given feature would be reduced given the action as compared to the base year. A “+1" indicates that the level of the given feature would increase relative to the base year and a “0" indicates no change. In this analysis, the base line condition was 2005 landings. This comparison will allow for the evaluation of the potential fishing opportunities associated with each alternative in 2007 versus the fishing opportunities that occurred in 2005. Since the preferred alternative for IOY for each species represents the 2006 status quo, each may be expected to have similar overall impacts (i.e., none are expected as a result of the IOY quota specifications under each of these alternatives).

One measure considered for 2007 that could change the competitive nature of these fisheries for Loligo is the proposed landing restriction of one trip per calendar for incidental catch permit holders (alternatives 1 and 2 for *Loligo*) which could reduce the *Loligo* landings for that group of vessels. All of the other the alternatives considered are expected to maintain the competitive structure of these fisheries. No changes in enforcement costs or harvest costs have been identified for any of the alternatives considered for each species.

It is important to mention that although the measures that are evaluated in this specification package are for the 2007 fisheries, the annual specification process for these fisheries could have potential cumulative impacts. The extent of any cumulative impacts from measures established in previous years is largely dependent on how effective those measures were in meeting is intended objectives and the extent to which mitigating measures compensated for any quota overages. Section 6.0 of the EA has a description or historical account of cumulative impacts of the measures established under the FMP since it was implemented.

Table IRFA-1. Qualitative comparative summary of economic effects of regulatory alternatives for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish in 2007 relative to 2005.

Parameter	Alternatives 1-3 for IOY for Mackerel, *Illex* and butterfish; Alternative 3 *Loligo*	Alternatives 1-3 for ABC for Mackerel (in-season adjustment)	Alternatives 1-2 *Loligo*
Landings	0	+	0
Prices	0	-/+	0
Consumer Surplus	0	-/+	0
Harvest Costs	0	0	0
Producer Surplus	0	-/+	0
Enforcement Costs	0	0	0
Distributive Impacts	0	0	+1

"-1" denotes a reduction relative 2005; "0" denotes no change relative 2005; and "+1" denotes an increase relative to 2005.

3.0 INITIAL REGULATORY FLEXIBILITY ANALYSIS

3.1 INTRODUCTION AND METHODS

The Regulatory Flexibility Act (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 or prepare a final regulatory flexibility analysis." 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 million.

The measures regarding the 2007 quotas could affect any vessel holding an active Federal permit for Atlantic mackerel, *Loligo, Illex* or butterfish (see Table IRFA-2 below), as well as vessels that fish for any one of these species in state waters. According to NMFS permit file data, 2,528 commercial vessels were holding Atlantic mackerel permits, 383 vessels were holding *Loligo*/butterfish moratorium permits, 77 vessels possessed *Illex* permits, 2016 vessels held incidental catch permits in 2005. All of these vessels readily fall within the definition of small business. In addition, the 2007 quotas could affect any dealer which holds a federal

Atlantic mackerel, squid and butterfish dealer permit. According to 2005 NMFS permit file data, there were 468 dealers which possessed federal Atlantic mackerel, squid and butterfish dealer permits. The IOY specifications under the preferred alternative for Atlantic mackerel, butterfish and *Loligo* and *lllex* squid represent no constraint on vessels in these fisheries. The level of landings allowed under the preferred alternatives for 2007 have not been achieved by vessels in these fisheries in recent years, with the exception of *Illex* in 2004. Absent such a constraint, no impacts on revenues are expected as a result of the proposed action.

Table IRFA-2. Number of vessels which landed Atlantic mackerel, *Loligo*, *Illex*, and butterfish by permit category in 2004.

Permit Category	(n)	Vessels which landed Mackerel	*Loligo*	*Illex*	Butterfish
Mackerel	(2528)	251	269	48	207
Loligo/Butterfish	(383)	139	220	42	174
Illex	(77)	48	49	30	36
Incidental	(2016)	156	164	24	118

(Source: Unpublished NMFS permit and dealer data).

Since all permit holders may not actually land any of the four species, the more immediate impact of the specifications may be felt by the commercial vessels that are actively participating in these fisheries (see Table RIR-1). 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 2004. 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 IRFA the primary unit of observation for purposes of performing a threshold analysis is vessels that landed any one or more of the four species during calendar year 2005 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 management measures should be evaluated by looking at the impact the 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.

Procedurally, the economic effects of the quota alternatives were estimated as follows. First, the Northeast dealer data were queried to identify all vessels that landed at least one or more pounds of Atlantic mackerel, squid, or butterfish permit in calendar year 2005. The second step was to estimate total revenues from all species landed by each vessel during calendar year 2005. This estimate provides the base from which subsequent quota changes and their associated effects on vessel revenues were compared. Since 2005 is the last full year from which data are available (partial year data could miss seasonal fisheries), it was chosen as the base year for the analysis. That is, partial landings data for 2006 were not used in this analysis because the year is not complete. As such, 2005 data were used as a proxy for 2006.

The third step was to deduct or add, as appropriate, the expected change in vessel revenues depending upon which of the quota alternatives were evaluated. This was accomplished by estimating proportional reductions or increases in the quota alternatives versus the base year 2005 (2006 proxy).

The fourth step was to divide the estimated 2005 revenues from all species by the 2005 base revenues for every vessel in each of the classes. For each quota alternative a summary table was constructed that report the results of the threshold analysis. These results were further summarized by home state as defined by permit application data when appropriate.

The threshold analysis just described is intended to identify impacted vessels and to characterize the potential economic impact on directly affected entities. 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 alternatives were judged to have possible disproportionate effects.

To further characterize the potential impacts on indirectly impacted entities and the larger communities within which owners of impacted vessels reside, selected county profiles are typically constructed. Counties included in the profile typically meet the following criteria: the number vessels with revenue loss exceeding 5 percent per county was either greater than 4, or all impacted vessels in a given state were from the same home county.

3.2 ANALYSIS OF THE IMPACTS OF ALTERNATIVES

For the purpose of ease of comparison, the specifications in previous years compared to actual fishery performance are given by species in the Tables IRFA 3-5 below.
Table IRFA-3. Summary of specifications and landings for Atlantic Mackerel (mt).

	2001	2002	2003	2004	2005	2006
ABC[1]	347,000	347,000	347,000	347,000	335,000	335,000
IOY	88,000	85,000	175,000	170,000	115,000	115,000
DAH[2]	85,000[2]	85,000	175,000	170,000	115,000	115,000
DAP	50,000	50,000	150,000	150,000	100,000	100,000
JVP	20,000	10,000	10,000	5,000	0	0
TALFF	3,000	0	0	0	0	0
US Commercial	12,308	26,192	30,738	53,781	42,206	68,298[3]
US Value (m $)	2.2	6.1	7.2	12.5	11.0	-
US Recreational	1,536	1,293	770	515	1,038	-
Total US	13,844	27,485	31,508	54,296	43,244	-
Canadian	23,868	34,402	44,475	53,565	51,918	-

[1] ABC = F_{target} - estimated Canadian landings.
[2] Includes recreational allocation of 15,000 mt.
[3] Preliminary landings as of May 15, 2006 based on NMFS Dealer Reports.

Table IRFA-4. Summary of specifications and landings for *Illex* (mt).

	2001	2002	2003	2004	2005	2006
Max OY	24,000	24,000	24,000	24,000	24,000	24,000
ABC	24,000	24,000	24,000	24,000	24,000	24,000
IOY	24,000	24,000	24,000	24,000	24,000	24,000
DAH	24,000	24,000	24,000	24,000	24,000	24,000
DAP	24,000	24,000	24,000	24,000	24,000	24,000
JVP	0	0	0	0	0	0
TALFF	0	0	0	0	0	0
Landings (mt)	3,938	2,723	6,389	25,059	11,719	64[1]
Value (millions $)	1.8	1.4	4.0	16.1	8.4	-

[1] Preliminary landings as of May 15, 2006 based on NMFS Dealer Reports.

Table IRFA5. Summary of specifications and landings for butterfish (mt).

	2001	2002	2003	2004	2005	2006
Max OY	16,000	16,000	16,000	16,000	12,175	12,175
ABC	7,200	7,200	7,200	7,200	4,525	4,545
IOY	5,900	5,900	5,900	5,900	1,681	1,681
DAH	5,897	5,900	5,900	5,900	1,681	1,681
DAP	5,897	5,900	5,900	5,900	1,681	1,681
JVP	0	0	0	0	0	0
TALFF[2]	3	0	0	0	0	0
Landings (mt)	4,373	872	473	538	393	102[1]
Value (millions $)	3.2	0.9	0.6	0.7	0.7	-

[1] Preliminary landings as of May 15, 2006 based on NMFS Dealer Reports

Table IRFA-4. Summary of specifications and landings for *Loligo* (mt).

	2001	2002	2003	2004	2005	2006
Max OY	26,000	26,000	26,000	26,000	26,000	26,000
ABC	17,000	17,000	17,000	17,000	17,000	17,000
IOY	17,000	17,000	17,000	17,000	17,000	17,000
DAH	17,000	17,000	17,000	17,000	17,000	17,000
DAP	17,000	17,000	17,000	17,000	17,000	17,000
JVP	0	0	0	0	0	0
TALFF	0	0	0	0	0	0
Landings (mt)	13,983	16,672	11,620	13,322	16,765	7,213[1]
Value (millions $)	20.3	23.5	19.3	21.5	28.6	-

3.2.1 Impacts of Alternatives for Atlantic mackerel

The three alternatives considered for Atlantic mackerel specifications for 2007 are fully described in section 5.1 of the EA and are summarized in the table below

Table 7.1 Proposed specifications for Atlantic mackerel for the 2007 fishing year (mt).

	ABC	IOY	DAH	DAP	JVP	TALFF
Alt. 1	186,000	115,000	115,000	100,000	0	0
Alt. 2	335,000	115,000	115,000	100,000	0	0
Alt. 3	204,000	115,000	115,000	100,000	0	0

In every case, the alternatives considered for Atlantic mackerel for the 2007 specifications of IOY exceed landings of the species for 2005 Therefore, the 2007 quota specifications considered for the Atlantic mackerel fishery represent no constraint on vessels in the fishery in aggregate or individually. Therefore, specification of the 2007 alternatives would represent no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there is no impact on revenues under the Regulatory Flexibility Act. As a result, specifications considered for Atlantic mackerel will have no negative impacts on businesses involved in the commercial harvest of Atlantic mackerel in 2007.

3.2.2 Impacts of Alternatives for *Illex*

The specifications for *Illex* under alternative 1 (status quo and preferred alternative) would be Max OY, ABC, IOY, DAH, and DAP = 24,000 mt and JVP and TALFF = 0 mt. The specifications for *Illex* under this alternative 2 would be Max OY, ABC, IOY, DAH, and DAP = 30,000 mt and JVP and TALFF = 0 mt. The specifications for *Illex* under this alternative 3 would be Max OY, ABC, IOY, DAH, and DAP = 19,000 mt and JVP and TALFF = 0 mt.

In every case, the alternatives considered for *Illex* for the 2007 specifications of IOY exceed landings of the species in 2005 and in most years prior to 2004. Therefore, the 2007 quota specifications considered for the *Illex* fishery represent no constraint on vessels in the fishery in aggregate or individually when compared to average landings over the past five years. Therefore, specification of the 2007 alternatives would represent no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there is no impact on revenues under the Regulatory Flexibility Act. As a result, specifications considered for *Illex* will have no negative impacts on businesses involved in the commercial harvest of *Illex* in 2007.

3.2.3 Impacts of Alternatives for butterfish

The specifications under alternative 1 (2006 status quo and preferred alternative) would be max OY = 12,175 mt, ABC = 4,545 mt, and IOY, DAH, and DAP = 1,681 mt and JVP and TALFF = 0 mt. The specifications under alternative 2 would be Max OY = 16,000 mt, ABC = 7,200 mt, and IOY, DAH, and DAP = 5,900 mt and JVP and TALFF = 0 mt. The specifications under alternative 3 would be Max OY = 12,175 mt and ABC = 12,175 mt, and IOY, DAH, and DAP = 9,131 mt and JVP and TALFF = 0 mt.

The ABC specifications butterfish under alternatives 1-3 far exceed the landings of the species in recent years due to the fact that there is no longer a directed butterfish fishery. Therefore, the 2007 quota specifications under alternatives 1- 3 would represent no constraint on vessels in this fishery in aggregate or individually. In the absence of such constraints, there are no impacts on revenues under the Regulatory Flexibility Act. As a result, the specifications under alternatives 1-3 will have no negative impacts on businesses involved in the commercial harvest of this species.

3.2.4 Impacts of Alternatives for *Loligo*

The alternatives considered for *Loligo* squid are fully described in section 5.4. The specifications under all three alternatives would be Max OY =26,000 mt, ABC, IOY, DAH, and DAP = 17,000 mt and JVP and TALFF = 0 mt with up to 3% of the ABC could be set-aside for scientific research. In terms of the annual quota, these specifications represent the 2006 status quo (no action - status quo).

The ABC specifications *Loligo* under alternatives 1-3 exceed the landings of the species in recent years. Therefore, the 2007 quota specifications under alternatives 1- 3 would represent no constraint on vessels in this fishery in aggregate or individually. In the absence of such constraints, there are no impacts on revenues under the Regulatory Flexibility Act. As a result, the specifications under alternatives 1-3 will have no negative impacts on businesses involved in the commercial harvest of this species.

Appendix 1

Scope of Work for 2007 Mid-Atlantic Research Set-Aside (RSA) Projects

06-RSA-001 - National Fisheries Institute, Inc. (NFI) and Rutgers, The State University of New Jersey (Rutgers), "Development of a Supplemental Finfish Survey Targeting Mid-Atlantic Migratory Species.", Principal Investigator – Eric N. Powell.

Project Abstract: To obtain fifth year support for the development/refinement of a commercial-vessel based survey program in the Mid-Atlantic region that tracks the migratory behavior of selected recreationally and commercially important species. Information gathered from the study would supplement the National Marine Fisheries Service (NMFS) finfish survey databases and will include development of methods to better evaluate how seasonal migration of fish in the Mid-Atlantic influences stock abundance estimates.

> RSA Amount: 223,140 lbs (101,215 kg) Summer Flounder, 221,581 lbs (101,508 kg) Scup, 61,500 lbs (27,896 kg) Black Sea Bass, 281,089 lbs (127,500 kg) *Loligo*, 363,677 lbs (164, 961 kg) Bluefish

Project Description: This project will conduct a trawl survey that involves collaborative efforts from NFI, Rutgers, and the NMFS Northeast Fisheries Science Center (NEFSC). The field work will be carried out by up to two research vessels conducting a trawl survey along up to 8 offshore transects in January, March, May, and November (Figure 1). The transcests will include 6 fixed offshore transects, one each near Alvin, Hudson, Baltimore, Poor Man's, Washington, and Norfolk Canyons, and 2 to 3 adaptive transects positioned within the Mid-Atlantic area based on a pre-cruise meeting with NFI, Rutgers, and the NEFSC. The 2007 field work will primarily focus on sampling fixed transects oriented just north of Baltimore Canyon (38° 20' N) and East of Hudson Canyon (72° W). The Transect sampling may be expanded to include Alvin and poor Man's transects as sea time permits. An additional 2-3 other transects within the range of described transects may be selected for sampling during pre-cruise meetings 2 weeks prior to sampling based on industry input on target species concentrations, and near term information on temperature gradients.

Sampling will be conducted along transects at depths near 40 (73 m), 50 (91m), 60 (110 m), 80 (183 m), 100 (183 m), 125 (229 m), 150 (247 m), 200 (366 m), 225 (411 m), and 250 fm (457 m), with up to five additional trawl sites added along each of the transects based on the catches of the target species. Stations shallower than 150 fm (274 m) will be only sampled during daylight, deeper stations during the night. Primary target species will be summer flounder, scup, black sea bass, monkfish, silver hake, offshore hake, Loligo squid, and spiny dogfish, and secondary target species will be skates, yellowtail flounder, winter flounder, and lobster. One tow will be conducted at each station over a fixed distance of 1 nautical mile (1.8 km), with a tow speed of 3 to 3.2 knots (5.8 to 5.9 km/hr). Careful records will be kept of all gear descriptions so that subsequent surveys can use consistent gear. A 4-seam box net will be used with a 2.4-inch (6- cm) mesh codend. Sampling protocol for handling the catch from the trawl survey will follow standard NOAA Fisheries survey methods. Every effort will be made to weigh the entire catch, or to put in baskets the entire catch and weigh a subsample of the baskets. Lengths will be obtained for target species. If time does not permit sampling between tows, fish sorted for length measurement will be placed in labeled containers and stored until processing can occur. Samples of scup, summer flounder, and black sea bass will be saved for weight and length measurements. Based on request by mackerel and *Illex* assessment groups, Atlantic mackerel will be measured, and *Illex* squid squid will be used in the adaptive station selection process in May. Temperature and depth profiles will be taken for each tow. Pre- and post-cruise meetings will be held to confirm study logistics and conduct retrospective analysis of cruise activities. Scientific research personnel will be on board the vessel at all times when the survey is conducted.

The project will involve one or two vessels in the 75 to 100 ft (23 to 30 m) size range conducting approximately 180, 15 to 30 minute, research bottom tows. The research vessel/vessels will need exemptions from closed areas, seasonal and gear restrictions, and minimum size restrictions.

Additionally, approximately 25 more vessels will be harvesting the RSA amounts allocated to the project. These vessels will need exemptions to closed seasons and trip limits for the RSA species listed under the project. The most likely ports for landings will be in Rhode Island, New York, New Jersey, and Virginia.

EFH Concerns: The area affected by the proposed action has been identified as EFH for species managed by the following FMPs: NE Multispecies; Atlantic Sea Scallop; Monkfish; Atlantic Herring; Summer Flounder, Scup, and Black Sea Bass; Squid, Atlantic Mackerel, and Butterfish; Spiny Dogfish; Atlantic Surfclam and Ocean Quahog; Atlantic Bluefish; Northeast Skates; and Atlantic Tunas, Swordfish, and Sharks Fishery Management Plans. The action in the context of the fishery as a whole should not be substantial.
Endangered species: This action should not adversely affect endangered and threatened species or their critical habitat.
Marine Mammals: Fishing activities conducted under this project should have no adverse impact on marine mammals.

06-RSA-007 – Charles Borden, "2007 Fishery Independent Scup Survey of Hard Bottom Areas in Southern New England Waters" Principal Investigator – Laura Skrobe, University of Rhode Island.

Project Abstract: To conduct a fourth year fishery independent scup survey that utilizes unvented fish traps fished on hard bottom areas in southern New England waters to characterize the size composition of the population. Survey activities will be conducted from May through November at 10 rocky bottom study sites that are located offshore, where there is a minimal scup pot fishery and no active trawl fishery and 2 scup spawning ground sites (Table 1). Study results will expand the current understanding of the scup resource in areas where the resource is otherwise unavailable to existing survey gear.

RSA Amount: 2000 lbs (907 kg) Summer Flounder, 40,000 lbs (18,144 kg) Scup, 30,000 lbs (13,608 kg) Black Sea Bass

Project Description: This project is a fishery independent study to survey scup at 10 rocky bottom areas in southern New England waters that are currently not typically sampled by state or Federal finfish trawl surveys. In addition, 2 sites on the scup spawning grounds in Vineyard Sound, will be sampled for a one month period. The project involves research and compensation fishing in state and Federal waters. Field work will be conducted off the coast of Rhode Island and Massachusetts from June 1 through November 7, 2004. The resultant data will be compared to finfish trawl data collected by NMFS.

This project includes the cooperative efforts of 1 to 2 vessels in the 30 to 60 ft (9.1 to 18.3 m) size range, the University of Rhode Island, and the Rhode Island Department of Environmental Management, Division of Fish and Wildlife. The vessel(s) will conduct the research and some compensation fishing. Research and compensation fishing will take place in state and Federal waters off of Rhode Island and Massachusetts.

The scope of work is separated into a western and eastern sampling design. At the beginning of the project, the research vessel(s) will fish at each collection site in order to focus the sampling activity on areas with a high abundance of scup. The sampling sites will generally correspond to the following:

Western sampling sites:

- 1st site: south of Sakonnet Point, RI (most likely inner Mayo Ledge or Elisha Ledge) – loran numbers 14330/43957;
- 2nd site: will be at the western end of Buzzards Bay (most likely south of Old Cock rock or in the proximity of Buzzards Bay Tower) – loran numbers 14285/43953;
- 3rd site: Browns ledge (approximately ten miles southwest of Westport Harbor, Mass. in federal waters) – loran numbers 14315/43920;
- 4th site: west or south of Nomans Island – loran numbers14250/43850;
- 5th site: south of Newport, RI, Elbow Ledge – loran numbers 14368/43975.

Eastern sampling sites (all east of Oak Bluffs on the Vineyard:

- 1st site: Horse Shoals – loran numbers 14025/34915;
- 2nd site: Cape Pogue – loran numbers 14075/43895;
- 3rd site: Hart Haven/East Chop – loran numbers 14105/43915;
- 4th site: Mink Meadows/West Chop – loran numbers 14115/43930;
- 5th site: Cedar Tree Neck/Norton Rock – loran number 14167/43917.

Spawning sampling sites in the Eastern zone:

- 1st site: Collier's Ledge – loran number 13995/43948;
- 2nd site: Bishops and Clercks – loran number 13970/43935.

Table 1. lists lat. and long. for project sites.

Scup will be collected from each site utilizing standard fish traps (2 x 2 x 2 foot) made with 1½ x 1½ inch coated wire mesh, and identical in all respects to the traps used in the 2006 study. Traps will be un-vented, in order to retain all size classes of scup. The sampling protocol will require that the commercial vessels take 30 traps to each sampling site once during each four-week sampling cycle. Research fishing effort would be (30 traps x 10 sites fished for a total of 24 to 48 hours = 300 to 600 trap/days with a trap day equaling a 24 hour fishing period for 1 trap). This effort for each four week period x 5 four week periods (June through October) = 1,500 to 3,000 trap/days of research effort for the regular sites. Traps will be baited with clams, which fish very quickly, and set on the sampling sites. Traps will then be allowed to fish for one to two days at each site. The 2006 project modified the sampling format to require a minimum of 24 hour set over period. This should substantially increase the number of fish captured as compared to earlier study years.

The 24 hour set over period will also require that each site must be visited twice instead of once. The date, area, depth, set over days, and catch will be recorded and fish measured utilizing the standard NMFS sea sampling protocols. At the conclusion of each sampling cycle, traps will be placed on the vessel for transport back to port. As the gear will be removed from the water at the end of the sampling cycle, there will little possibility of entanglements with other species. This same sampling format will be followed every four weeks from June 15 through October 15 for five complete cycles. In addition, the 2 spawning areas will also be sampled each week from May 15 to June 15 following the identical sampling protocol (30 traps x 2 sites fished for 24 to 48 hours = 60 - 120 trap/days x 7 weeks = 420 - 840. trap/days). Maximum estimated research fishing effort trap/days for the project including both spawning sites and regular sites = 3,840 trap/days (840 for the spawning grounds sampling and 3,000 for the regular site sampling).

Data collected as part of the project will be formatted in a manner consistent with the NMFS and ACCSP formats.

The vessel(s), when conducting research, will need to be exempt form, scup closure restrictions, black sea bass closure restrictions, scup possession limit restrictions, black sea bass possession

limit restrictions, and lobster trap limits and vent regulations. Exemption from the closure restrictions will allow the compensation fishing to proceed during a fishery closure.

Additionally, a second research/RSA harvest vessel in the same size range as the research vessel may conduct research or harvest some of the RSA amounts allocated to the project, if the primary research vessel is unavailable. Therefore, both vessels will need exemptions to closed seasons and trip limits for the RSA listed under the project. The most likely ports for landings will be in Rhode Island and Massachusetts.

EFH Concerns
The area affected by the proposed action has been identified as EFH for species managed by the following FMPs: Northeast Multispecies; Summer Flounder, Scup, and Black Sea Bass; Squid, Atlantic Mackerel, and Butterfish; Atlantic Surf Clam and Ocean Quahog; Atlantic Herring; Atlantic Bluefish; and Atlantic Tunas, Swordfish, and Sharks. The action in the context of the fishery as a whole should not have an adverse effect on EFH.

Endangered species
This action should not adversely affect endangered and threatened species or their critical habitat.

Marine Mammals
Fishing activities conducted under this project should have no adverse impact on marine mammals.

Table 1.

Scup Survey Research Sites - Lat. and Long:

Eastern sampling sites (all east of Oak Bluffs on the Vineyard);

* 1st site: Horse Shoals, loran numbers 14025/34915 (41, 32 north, 70,21 degrees west)
* 2nd site: Cape Pogue, loran numbers 14075/43895 (41,26 north, 70,26 west);
* 3rd site: Hart Haven/East Chop, loran numbers 14105/43915(41,27 north, 70,33 west);
* 4th site: Mink Meadows/West Chop, loran numbers 14115/43930, (41,31 north, 70,36 west)
* 5th site: Cedar Tree Neck/Norton Rock, loran number 14167/43917, (41,25 north, 70,42,45" west)

Spawning sampling sites in the Eastern zone:

* 1st site: Collier's Ledge, loran number 13995/43948,(41,36 north, 70,20 west);
* 2nd site: Bishops and Clercks, loran number 13970/43935 (41, 34 north, 70,15 west)

Western sites:

* 1st site: south of Sakonnet Point, R. I. (most likely inner Mayo Ledge or Elisha Ledge)loran

numbers 14330/43957 (Latitude 41.27, Longitude 71.09);

* 2nd site: will be at the western end of Buzzards Bay (most likely south of Old Cock rock or in the proximity of Buzzards Bay Tower) loran numbers 14285/43953 (Latitude 41.28, Longitude 70.02);

* 3rd site: Browns ledge (approximately ten miles southwest of Westport Harbor, Mass. in federal waters) loran numbers 14315/43920, (Latitude 41.22, Longitude 71.04);

* 4th site: west or south of Nomans Island, 14250/43850, (Latitude 41.16, Longitude 70.51);

* 5th site south of Newport, R.I., Elbow Ledge, 14368/43975, (Latitude 41.27,Longitude 71.09.

<u>06-RSA-005</u> – Cornell Cooperative Ext. of Suffolk County, "Evaluation of Summer Flounder Discard Mortality in the Bottom Trawl Fishery", Principal Investigator – Emerson Hasbrouck

RSA Amount: 178,000 lbs (80,737 kg) Summer Flounder

<u>Project Abstract:</u> The project would implement a program to improve and enhance fishery information relative to discard mortality of summer flounder in the bottom trawl fishery. With the cooperation of commercial bottom trawlers in NY, summer flounder will be collected under various fishing conditions and held live. The summer flounder discard, both legal and sub-legal size will be measured, tagged and kept in a live holding pen (net-pen) for mortality monitoring. Mortality will be monitored on a weekly basis and fish will be released with tags after two weeks. Extended mortality and migration information will be collected upon recapture of tagged fish.

<u>Project Description:</u> The project will improve and enhance fishery information relative to discard issues, especially in the summer flounder commercial bottom trawl fishery. A random sample of summer flounder discards including both legal and sub-legal sized fish will be collected while on board bottom trawling vessels. Fish will be sampled from the summer flounder inshore fishery. Summer flounder mortality will be evaluated relative to tow duration, fish size, and length of time the fish are kept on deck of the vessel for each trip. Approximately 20 fish from each of 6 categories (120 fish) will be measured, tagged, and held in a dockside net pen for mortality monitoring for each trip. The 6 categories are a combination of parameters which include tow durations of 1 hour 2 hour and 3 hour tow times, and 2 different deck times including immediate culling, and a normal fishing practice cull (approximately 30 minutes).

The research trips will be one inshore day trip every 14 to 17 days from May to September for a total of 10 day trips. Overall, with 120 fish taken on each trip, a total of 1,200 fish will be collected from commercial vessels during the project. The trips will be inshore along the coast of southern Long Island from Jones Inlet to Montauk Point reaching depths of 240 ft (73 m). Areas sampled will include NMFS statistical areas 611, 612, 613, and 539. Trips will be made aboard vessels of opprotunity engaged in the mixed trawl fishery. Vessels will be compensated to make 3 specific tows for summer flounder discard mortality. The tow duration will be 30 minutes. Subsampling will be according to NMFS NMFS At-Sea Observer Program Guidelines. Twenty fish will be randomly collected from each cull: 10 legal and 10 sub-legal. Fish condition, and information on tow duration, location, boat and gear specifics, fishing speed, total volume of catch and discard, fish condition, and water and air temperatures will recorded. If there are not 10 sub-legal fish in each catch then additional legal size fish will be kept to maintain a 20 fish sample. The summer flounder will be tagged and transported alive to the dock and kept in a 20 ft (6 m) diameter circular net-pen with 2 3/8 inch (6.67 cm) mesh moored in 10 ft (3 m) of water. The summer flounder will be tagged on the vessels, and will be fed and monitored in the net-pen one to two times per week, over a two week period. A health index will be calculated for each fish that is captured and released. The fish will be released in the area near the holding net-pen which is adjacent to Block Island Sound. Extended mortality and

migration/seasonal movements information will be collected upon future recapture of tagged fish. Collection of tags and payment of rewards for the fish will be over an extended 2 year period. Also, a control group of net-pen held summer flounder will be established for each scientific group through the collection of pond net caught fish, from pond nets in close proximity to the net-pen. Therefore, an additional 1,200 summer flounder will be collected from the pond nets for the control group portion of the project.

Approximately 15 cooperating commercial vessels (research vessels) will need exemptions from minium size restrictions and possession limits to possess a limited number of sublegal summer, flounder and a limited number of legal size summer flounder above the trip limit for scientific purposes only (tagging and transport for net-pen holding).

Additionally, approximately 25 vessels will be harvesting the RSA amounts allocated to the project. These vessels will need exemptions to closed seasons and trip limits for summer flounder. The most likely ports for landings will be in Rhode Island, New York, New Jersey, Virginia, and North Carolina.

Cornell Cooperative Extention will contact New York's DEC, Marine Fisheries Division to obtain New York State permits for possession of undersize fish in state waters, and for landing of the allocated RSA for the project.

06-RSA-002 – National Fisheries Institute "Bycatch Reduction and Gear Development in the Mid-Atlantic: Evaluation of Optimal Codend Mesh Size in the *Loligo* Fishery" Principal Investigator – Eric Powell

RSA Amount: 163,633 lbs (74,223 kg) Summer Flounder, 269,305 lbs (122,155 k) Scup, 40,358 lbs (18.306) Black Sea Bass, 331,000 lbs (150,139 kg) *Loligo*

Project Abstract: The project will address the significant discard issue in the small-mesh *Loligo* squid fishery. The project will evaluate the performance of intermediate codend mesh sizes above the present legal size of 1.875" and below 2.5". Researchers will also attempt to determine the influence of these intermediate mesh sizes on the catch of other species such as butterfish and silver hake and accompanying bycatch species as well as the primary target of the program, submarket size *Loligo* squid.

The project would continue and build upon Mid-Atlantic RSA project 04-RSA-002 which began February 1, 2005 and was designed to address escapement of submarket-size *Loligo* squid in the Loligo squid fishery.

Project Description: The project will use 2 similar vessels to test different mesh sizes in squid nets under commercial use. Exact tow number will depend on the time of each tow, which will be determined by the Captain during fishing. The project will conduct a total of 36 days at sea for up to 2 research vessels in the 75 to 100 ft (23 m to 30 m) range. Assuming a fishing trip of about 4 days dock to dock, this will provide for about 27 fishing days. Commercial vessels fishing for *Loligo* squid normally do not exceed 3- 4 tows per day. Thus, the field work would entail 108 to144 total tows (tows will not exceed 2-3 hours). The vessels conducting the research, preferably will be fishing in parallel, since this permits discriminating the time/location (always confounded) and boat effect statistically. Both vessels will use ABBA protocol, but offset, so all four comparisons can be made over a four tow sequence A1A2, B1B2, A1B2, and B1A2. The joint effort of the two vessels will be 54-72 tows paired tows per vessel, about 18 fishing days, and about 6 fishing trips for each vessel. Each vessel will carry a datalogger that will log vessel position and time in 1 minute intervals using GPS. Water temperature and depth data will be collected for every minute of tow time. Research scientists will be on board each vessel. The research protocol for handling the catch includes the measurement of catch weight for all caught species when possible, and using NMFS approved subsampling protocols when necessary to handle larger catches.

Field work is most likely to take place in February/March near the Hudson Canyon. High butterfish and silver hake discarding events in the *Loligo* fishery are recorded in the observer database in this area during January-March, but are much less common further south. Based on input from NMFS and Industry, field work may encompass a broader area in and/or near the Northern and Southern Gear Restricted Areas (Figure 2).

The legal mesh size for *Loligo* squid is 1.875 inches (4.76 cm). However, a 2.36-inch (6.0-cm)

mesh is also commonly used. For this project mesh sizes of 2.125 (5.4 cm) and 2.25 inch (5.72 cm) will be tested against the legal mesh size.
The research vessel/s will need exemptions from closed areas, seasonal and gear restrictions, and minium size restrictions.

Additionally, approximately 25 more vessels will be harvesting the RSA amounts allocated to the project. These vessels will need exemptions to closed seasons and trip limits for the RSA species listed under the project. The most likely ports for landings will be in Rhode Island, New York, New Jersey, Virginia, and North Carolina.

EFH Concerns
The area affected by the proposed action has been identified as EFH for species managed by the following FMPs: NE Multispecies; Atlantic Sea Scallop; Monkfish; Atlantic Herring; Summer Flounder, Scup, and Black Sea Bass; Squid, Atlantic Mackerel, and Butterfish; Spiny Dogfish; Atlantic Surfclam and Ocean Quahog; Atlantic Bluefish; Northeast Skates; and Atlantic Tunas, Swordfish, and Sharks Fishery Management Plans. The action in the context of the fishery as a whole should not be substantial.

Endangered species
This action should not adversely affect endangered and threatened species or their critical habitat.

Marine Mammals
Fishing activities conducted under this project should have no adverse impact on marine mammals.