2010 Atlantic Mackerel, Squid and Butterfish Specifications
Environmental Assessment
Regulatory Impact Review
Initial Regulatory Flexibility Analysis

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Prepared by the

Mid-Atlantic Fishery Management Council

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National Marine Fisheries Service

1.0 EXECUTIVE SUMMARY

The Mid-Atlantic Fishery Management Council made recommendations for 2010 specifications for the Atlantic mackerel, squid and butterfish (MSB) fisheries at its June 2009 meeting and herein submits them to the Regional Administrator (RA), Northeast Region (NERO), National Marine Fisheries Service (NMFS, also known as NOAA Fisheries). This document examines the expected impacts to the environment from implementation of these recommended specifications. 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 following paragraphs summarize the proposed preferred measures for each of the MSB fisheries, and their expected impacts. The ranges of alternatives considered are described in Table 1 and detailed in later sections of this document.

Alternative Set 1: Atlantic mackerel annual specifications

The preferred alternative proposes: Acceptable Biological Catch (ABC) = 156,000 metric tons (mt), Initial Optimum Yield (IOY)=Domestic Annual Harvest (DAH)= 115,000 mt, Domestic Annual Processing (DAP) = 100,000 mt (the same as in 2009). All other management measures would also remain status quo. The proposed action is consistent with the MSB Fishery Management Plan (FMP) overfishing definition and is based on the most recent (though dated) stock assessment. This action is expected to yield positive social and economic benefits by maintaining the sustainability of the resource and should have no significant impacts on valued ecological components (i.e. biological components including protected resources and physical components including habitat) compared to the fishery as it was prosecuted under the 2009 specifications.

Alternative Set 2: Illex squid (*Illex illecebrosus*) annual specifications

The preferred alternative proposes: Max OY=ABC=IOY=DAH=DAP=24,000 mt (the same as in 2009). The proposed action is consistent with the FMP overfishing definition and is based on the most recent (though dated) stock assessment. All other management measures also would remain status quo. This action is expected to yield positive social and economic benefits by maintaining the sustainability of the resource and should have no significant impacts on valued ecological components (i.e. biological components including protected resources and physical components including habitat) compared to the fishery as it was prosecuted under the 2009 specifications.

Alternative Set 3: Butterfish annual specifications

The preferred alternative proposes: Max OY= 12,175 mt, ABC= 1,500 mt, IOY=DAH=DAP= 500 mt (the same as in 2009). All other management measures also would remain status quo. As such, no significant 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 2009 specifications. The proposed specifications are generally designed to minimize directed fishing while NMFS is in the process of implementing Amendment 10 to the MSB FMP in 2010, which will reduce butterfish discards and thereby rebuild the butterfish stock.

Alternative Set 4: Loligo squid (*Loligo pealeii*) annual specifications

The preferred alternative proposes: Max OY= 32,000 mt, ABC=IOY=DAH=DAP=19,000 mt (the same as in 2009). The proposed action is consistent with the FMP overfishing definition and is based on the most recent (though dated) stock assessment, and is consistent with the FMP overfishing definition and is based on the most recent stock assessment information. The preferred alternative does change how Trimester 1 underages are handled to gain social/economic benefits. The status quo is that Trimester 1 underages roll over into Trimester 3. The preferred alternative proposes that underages from Trimester 1 are applied equally to Trimesters 2 and 3 (50%-50%) if the underage is greater than 25% of the Trimester 1 quota. If the underage is less than 25% of the Trimester 1 quota then underages would roll over into Trimester 3, i.e. retain the status quo situation. All other management measures would remain status quo. This action is expected to yield positive social and economic benefits by maintaining the sustainability of the resource and should have no significant impacts on valued ecological components (i.e. biological components including protected resources and physical components including habitat) compared to the fishery as it was prosecuted under the 2009 specifications.

Alternative Set 5: Loligo squid (*Loligo pealeii*) "net strengthener"/"codend cover" minimum mesh requirement

The preferred alternative proposes to increase the "net strengthener"/"codend cover" minimum mesh requirement from 4.5 inches to 5 inches (inside stretch measurement). This increase may have minor positive benefits for juvenile *Loligo* bycatch and/or finfish bycatch and should have no significant impacts on economic, social, or other valued ecological components (i.e. protected resources and physical components including habitat) compared to the fishery as it was prosecuted under the 2009 specifications.

Table ES1. Summary of 2010 MSB Specifications.

Proposed Specifications in Metric Tons (mt) for Atlantic Mackerel, Squid, and Butterfish for the 2010 Fishing Year.

Specifications	*Loligo*	*Illex*	Atlantic Mackerel	Butterfish
Max OY	32,000	24,000	N/A [1]	12,175
ABC	19,000	24,000	156,000	1,500
IOY	19,000	24,000	115,000 [2]	500
DAH	19,000	24,000	115,000 [3]	500
DAP	19,000	24,000	100,000	500
JVP	0	0	0	0
TALFF	0	0	0	0

1 Not applicable
2 IOY may be increased during the year, but the total ABC will not exceed 156,000 mt
3 Includes a 15,000 mt catch of Atlantic mackerel by the recreational fishery

Table 1. Qualitative summary of expected impacts of specifications considered for 2010 compared to status quo. ("+" signifies a positive impact, "-" a negative impact, and "0" a null impact. "0/" before "+" or "-" indicates a likely small impact; "#a" Alternatives are preferred (unshaded and bolded)

		Valued Ecosystem Components/Environmental Dimensions				
Alternative Set	Alternatives	Managed Resource	Non-target Species	Human Communi-ties	Protected Resources	Essential Fish Habitat
Alternative Set 1 Atlantic Mackerel Annual Specs	**Alternative 1a - Mackerel (intermediately restrictive, status quo, no action, and preferred); ABC=156,000mt, IOY=DAH= 115,000mt, DAP=100,000mt, JVP and TALFF=0mt. REC = 15,000mt**	**0**	**0**	**0**	**0**	**0**
	Alternative 1b - Mackerel (most restrictive, based on long term yield); ABC=56,000mt, IOY=DAH= 56,000mt, DAP=41,000mt, JVP and TALFF=0mt. REC = 15,000mt	0	0/+	0/-	0/+	0/+
	Alternative 1c - Mackerel (least restrictive, 2007 measures); ABC=186,000mt, IOY=DAH= 115,000mt, DAP=100,000mt, JVP and TALFF=0mt. REC = 15,000mt	0	0/-	0/+	0/-	0/-
Alternative Set 2 *Illex* Annual Specs	**Alternative 2a - *Illex* (less restrictive, status quo, no action, and preferred); Max OY= ABC=IOY=DAH=DAP = 24,000mt, JVP and TALFF=0 mt.**	**0**	**0**	**0**	**0**	**0**
	Alternative 2b - *Illex* (more restrictive); Max OY= 24,000, ABC=IOY=DAH= DAP=19,000mt, JVP and TALFF=0 mt.	0	0	0/-	0	0/+
Alternative Set 3 Butterfish Annual Specs	**Alternative 3a - butterfish (most restrictive, status quo, no action, and preferred); Max OY = 12,175, ABC=1,500mt, IOY=DAH=DAP=500mt, JVP and TALFF=0mt.**	**0**	**0**	**0**	**0**	**0**
	Alternative 3b - butterfish (intermediately restrictive); Max OY = 12,175, ABC=4,545mt, IOY=DAH=DAP=1,681mt, JVP and TALFF=0mt.	0/-	0/-	0/+	0/-	0/-
	Alternative 3c - butterfish (least restrictive); Max OY = 12,175, ABC=9,131mt, IOY=DAH=DAP=3,044 mt , JVP and TALFF=0mt.	0/-	0/-	0/+	0/-	0/-
Alternative Set 4 *Loligo* Annual Specs	**Alternative 4a - *Loligo* (preferred); Max OY = 32,000, ABC=IOY=DAH=DAP=19,000mt, JVP and TALFF=0mt. Trimester 1 underages split between Trimester 2 and 3.**	**0**	**0/- to 0/+ by species**	**0/+**	**0**	**0**
	Alternative 4b - *Loligo* (Status quo, and no action); Max OY = 32,000, ABC=IOY=DAH=DAP=19,000mt, JVP and TALFF=0mt. Trimester 1 underages roll to Trimester 3.	0	0	0	0	0
	Alternative 4c - *Loligo* ; Max OY = 32,000, ABC=IOY=DAH=DAP=19,000mt, JVP and TALFF=0mt. Cumulative closures: Trimester 1 closes based on 17% of quota, Trimester 2 closes based on 60% of quota, Trimester 3 closes based on 100% of quota.	0	0/- to 0/+ by species	0/+	0	0
Alternative Set 5 Loligo Minimum Codend Cover Mesh Size (all are inside stretched mesh measurement)	**Alternative 5a (preferred, minorly restrictive); Require minimum codend cover mesh size of 5.0 inches.**	**0/+**	**0/+**	**0**	**0**	**0**
	Alternative 5b (least restrictive, status quo, and no action); Require minimum codend cover mesh size of 4.5 inches (diamond).	0	0	0	0	0
	Alternative 5c (intermediately restrictive); Require minimum codend cover mesh size of 6 inches.	0/+	0/+	0	0	0
	Alternative 5d (intermediately restrictive); Require minimum codend cover mesh size of 6 inches square mesh.	0/+	0/+	0/?	0	0
	Alternative 5e (most restrictive); Require minimum codend cover mesh size of 9.5 inches square mesh.	0/+	0/+	0/?	0	0

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2.0 LIST OF ACRONYMS

AA	Assistant Administrator
ABC	Allowable Biological Catch or Acceptable Biological Catch
ACFCMA	Atlantic Coastal Fisheries Cooperative Management Act
ACL	Annual Catch Limit
ACT	Annual Catch Target
AFS	American Fisheries Society
AM	Accountability Measure
APA	Administrative Procedures Act
AR	auto-regressive
ASMFC	Atlantic States Marine Fisheries Commission or Commission
ATGTRP	Atlantic Trawl Gear Take Reduction Plan
ATGTRT	Atlantic Trawl Gear Take Reduction Team
B	Biomass
BMSY	Biomass Associated with Maximum Sustainable Yield
BRP	Biological reference points
CAFSAC	Canadian Atlantic Fisheries Scientific Advisory Committee
CD	Confidential data
CDP	Census Designated Place
CEA	Cumulative Effects Assessment
CEQ	Council on Environmental Quality
CETAP	Cetacean and Turtle Assessment Program

CFR	Code of Federal Regulations
CI	Confidential Information
CPUE	Catch Per Unit Effort
CV	coefficient of variation
CZMA	Coastal Zone Management Act
DAH	Domestic Annual Harvest
DAP	Domestic Annual Processing
DMF	Department of Maine Fisheries
DOC	Department of Commerce
DOL	Department of Labor
DPS	Distinct Population Segment
DSEIS	Draft Supplementary Environmental Impact Statement
DWF	Department of Wildlife and Fisheries
EA	Environmental Assessment
EAP	Emergency Action Plan
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ELMR	Estuarine Living Marine Resources
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
F	Fishing Mortality Rate
FAO	U.N. Food and Agriculture Organization
FMAT	Fishery Management Action Team
FMAX	Threshold Fishing Mortality Rate
FMP	Fishery Management Plan
FMSY	Fishing Mortality Associated with MSY
FR	Federal Register
FSEIS	Final Supplementary Environmental Impact Statement
FTARGET	Target Fishing Mortality Rate
FWS	U.S. Fish and Wildlife Service
GAMS	general additive models
GB	George's Bank
GC	General Counsel or General Category (Scallop)
GOM	Gulf of Maine
GRA	Gear Restricted Area
HAPC	Habitat Area of Particular Concern
HPTRP	Harbor Porpoise Take Reduction Plan
ICES	International Council for the Exploration of the Sea
ICNAF	International Convention of the Northwest Atlantic Fisheries
IMPLAN	IMpact Analysis for PLANning
IRFA	Initial Regulatory Flexibility Analysis
IOY	Initial Optimum Yield
IQA	Information Quality Act

IRFA	Initial Regulatory Flexibility Analysis
ITQ	Individual Transferrable Quota
IUCN	International Union for Conservation of Nature
JV	Joint Venture
LNG	Liquefied Natural Gas
LOF	List of Fisheries
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
MRIP	Marine Recreational Information Program
MRFSS	Marine Recreational Fisheries Statistical Survey
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSB	Atlantic Mackerel, Squid, Butterfish (Consistent with the relevant plan's name)
MSY	Maximum Sustainable Yield
MT (or mt)	metric tons
NAFO	Northwest Atlantic Fisheries Organization
NAO	National Oceanic and Atmospheric Administration Order
NASUS	National Academy of Sciences of the United States
NE	New England
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fishery Observer Program
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NIOZ	Royal Netherlands Institute for Sea Research
NK	Not classified
NLDC	New London Development Corporation
NMFS	National Marine Fisheries Service (NOAA Fisheries)
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOS	National Ocean Service
NSF	National Science Foundation
OBSCON	Observer Contract
OSP	optimum sustainable population
OTA	Office of Technology Assessment
OY	Optimal Yield
PBR	Potential Biological Removal
PRA	Paperwork Reduction Act
PREE	Preliminary Regulatory Economic Evaluation
PSE	Proportional Standard Error
RFA	Regulatory Flexibility Act
RFF	reasonably foreseeable future
RFFA	Reasonably Foreseeable Future Actions
RIR	Regulatory Impact Review

ROV	Remotely Operated Vehicle
RSA	Research Set-Aside
RV	Research Vessel
SA	South Atlantic
SAFE	Stock Assessment and Fishery Evaluation
SAFIS	Standard Atlantic Fisheries Information System
SAR	Stock Assessment Report
SARC	Stock Assessment Review Committee
SAV	Submerged Aquatic Vegetation
SAW	Stock Assessment Workshop
SBA	Small Business Administration
SBRM	Standardized Bycatch Reporting Methodology
SD	Standard Deviation
SEFSC	Southeast Fisheries Science Center
SEIS	Supplementary Environmental Impact Statement
SF	Sustainable Fisheries
SMB	Squid, Mackerel, and Butterfish (Consistent with the relevant committee's name)
SP	Species
SSB	Spawning Stock Biomass
SSC	Scientific and Statistical Committee
STACRES	Standing Committee on Research and Statistics
STAT	Statistical
TAL	Total Allowable Landings
TALFF	Total allowable level of foreign fishing
TEWG	Turtle Expert Working Group
TL	Total Length
TRP	Take Reduction Plan
TRT	Take Reduction Team
URI	University of Rhode Island
US	United States
USA	United States of America
USCG	United States Coast Guard
USDC	U.S. Department of Commerce
USDI	U.S. Department of the Interior
USGS	Untied Stated Geological Survey
USSR	Union of Soviet Socialist Republics
VEC	Valued Ecosystem Component
VMS	Vessel Monitoring System
VPA	Virtual Population Analysis
VTR	Vessel Trip Report
WNA	Western North Atlantic
WP	Working Paper
ZMRG	Zero Mortality Rate Goal

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4.0 INTRODUCTION AND BACKGROUND

The Mid-Atlantic Fishery Management Council ("the Council") manages the Atlantic mackerel, squid, and butterfish (MSB) fisheries with the MSB Fishery Management Plan (FMP), pursuant to the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSA) as currently amended. The MSB FMP requires the Council to set annual specifications according to national standards specified in the MSA. The MSB fisheries are generally managed through quotas which are based principally on National Standard One, which requires that fishing mortality rates not exceed guidelines established in the MSA. There are new guidelines for National Standard One, which will be implemented in 2011 through an Omnibus Amendment for all the Council's FMPs. Given all MSB species are managed with hard quotas based on ABCs recommended by the Council's Scientific and Statistical Committee (SSC), and given current measures include proactive accountability measures that activate below overfishing levels, the MSB FMP arguably already meets the spirit if not the letter of the new National Standard One guidelines and any deficiencies will be corrected through the Omnibus Amendment, which will be Amendment 13 to the MSB FMP.

The Council's SSC met May 19, 2009 in Baltimore MD and recommended all of the ABCs that are included in the preferred alternatives considered in this document. Per the MSB FMP, the Atlantic Mackerel, Squid and Butterfish Monitoring Committee met in Dover, DE on May 27, 2009 and reviewed the SSC and MAFMC staff recommendations for the 2010 quota and management recommendations. The Monitoring Committee had the same recommendations as the SSC for quotas and added a recommendation for increased *Loligo* codend cover minimum mesh sizes as discussed in this document. The Council considered the SSC's and Monitoring Committee's recommendations for specifications for all four species in the management unit at its June 2009 meeting in New York, NY and all quotas in the preferred alternatives are at the fishing level (i.e. ABC) recommendation of the SSC. This document serves as the submission to NMFS of the Council's recommendations for 2010 MSB specifications, and related analyses supporting the recommendations. The analysis of the proposed measures' environmental impacts, and their significance, 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 Environmental Assessment (EA).

Wording conventions - All acronyms used in this document should be listed in Section 2.0, List of Acronyms. Several critical acronyms and/or abbreviations are noted below. The Magnuson-Stevens Fishery Conservation and Management Act is the primary law governing marine fisheries management in United States federal waters. The Act was first enacted in 1976 and amended in 1996 (via the Sustainable Fisheries Act - "SFA") and in 2007 (via the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 - "MSRA"). In this document, the abbreviation "MSA" refers to the Magnuson-Stevens Fishery Conservation and Management Act as currently amended. Also, hereafter "mackerel" refers to "Atlantic mackerel."

4.1 Purpose of and Need for the Action

The purpose of this action is to establish annual quotas and other measures, where necessary, that will meet the need to prevent overfishing and achieve optimum yield. 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 implement the preferred measures described in this document could result in overfishing and stock depletion. In the case of butterfish, failure to restrict fishing mortality would impede efforts to rebuild this overfished stock.

Regulations at 50 CFR Part 648 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 MSB FMP. The term IOY is used in these fisheries 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.

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 a period of one year only (i.e., 2010) due to the impending implementation of Amendment 10 to the MSB FMP and pending (late 2009) stock assessments for mackerel and butterfish.

4.2 Management Objectives of the MSB 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.

Related to these objectives, the Council has over time instituted a variety of management measures over the years, which are summarized in Table 2.

Table 2. History of the Atlantic Mackerel, Squid and Butterfish FMP

History of the Atlantic Mackerel, Squid and Butterfish FMP		
Year	**Document**	**Management Action**
1978-1980	Original FMPs (3) and individual amendments	Established and continued management of Atlantic mackerel, squid, and butterfish fisheries
1983	Merged FMP	Consolidated management of Atlantic mackerel, squid, and butterfish fisheries under a single FMP
1984	Amendment 1	Implemented squid OY adjustment mechanism
		Revised Atlantic mackerel mortality rate
1986	Amendment 2	Equated fishing year with calendar year
		Revised squid bycatch TALFF allowances
		Implemented framework adjustment process
		Converted expiration of fishing permits from indefinite to annual
1991	Amendment 3	Established overfishing definitions for all four species
1991	Amendment 4	Limited the activity of directed foreign fishing and joint venture transfers to foreign vessels
		Allowed for specification of OY for Atlantic mackerel for up to three years
1996	Amendment 5	Adjusted *Loligo* MSY; established 1 7/8" minimum mesh size
		Eliminated directed foreign fisheries for *Loligo*, *Illex*, and butterfish
		Instituted a dealer and vessel reporting system; Instituted operator permitting
		Implemented a limited access system for *Loligo*, *Illex* and butterfish
		Expanded management unit to include all Atlantic mackerel, *Loligo*, *Illex*, and butterfish under U.S. jurisdiction.
1997	Amendment 6	Established directed fishery closure at 95% of DAH for *Loligo*, *Illex* and butterfish with post-closure trip limits for each species
		Established a mechanism for seasonal management of the *Illex* fishery to improve the yield-per recruit
		Revised the overfishing definitions for Loligo, Illex and butterfish
1997	Amendment 7	Established consistency among FMPs in the NE region of the U.S. relative to vessel permitting, replacement and upgrade criteria
1998	Amendment 8	Brought the FMP into compliance with new and revised National Standards and other required provisions of the Sustainable Fisheries Act.
		Added a framework adjustment procedure.
2001	Framework 1	Established research set-asides (RSAs).

Year	Document	Management Action (Table 2 Continued)
2002	Framework 2	Established that previous year specifications apply when specifications for the management unit are not published prior to the start of the fishing year (excluding TALFF specifications)
		Extended the Illex moratorium for one year; Established Illex seasonal exemption from Loligo minimum mesh;
		Specified the Loligo control rule; Allowed Loligo specs to be set for up to 3 years
2003	Framework 3	Extended the moratorium on entry to the *Illex* fishery for an additional year
2004	Framework 4	Extended the moratorium on entry to the *Illex* fishery for an additional 5 years
2009	Amendment 9	Extended the moratorium on entry into the *Illex* fishery, without a sunset provision
		Adopted biological reference points for *Loligo* recommended by the stock assessment review committee (SARC).
		Designated EFH for *Loligo* eggs based on available information
		Prohibited bottom trawling by MSB-permitted vessels in Lydonia and Oceanographer Canyons
		Authorized specifications to be set for all four MSB species for up to 3 years

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5.0 MANAGEMENT ALTERNATIVES

The alternatives were selected based on an evaluation of a range of specifications that stem from current or historical biologically based reference points and various assumptions about stock status. The specifications recommended by the Council under the preferred alternatives are based on the target control rules specified in the FMP and were reviewed and approved by the SSC and SMB Monitoring Committee. The target control rules are based on the MSA definition of the term "optimum" which, with respect to the yield from a fishery, means the amount of fish which--(A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; (B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and (C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

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 specifications before the start of the new fishing year, then the previous years' specifications shall remain effect.

5.1 Alternative Set 1: Alternatives for Atlantic mackerel

Changes to measures other than ABC, IOY, DAH, and DAP were not considered because no issues with those other measures have been reported. Thus all alternatives maintain that the directed fishery for mackerel closes when 90% of ABC is projected to be taken and incidental trip limits are then implemented for the remainder of the fishing year (20,000 pounds if the fishery closes before June 1 and 50,000 pounds if the fishery closes on/after June 1). Also, up to 3% of the IOY for mackerel may be set aside for scientific research.

The specification of ABC for mackerel accounts for Canadian catch in the following manner: ABC = (Yield at Ftarget) - (expected Canadian catch). The expected Canadian catch is assumed to be the highest of the most recent five years of Canadian landings rounded up to the nearest 1,000, which is 55,000 MT (based on 2005 value - see Table 3).

Table 3. Reported Canadian landings of Atlantic mackerel used in calculation of US ABC.

Year	Canadian landings (mt)
2004	53,365
2005	54,279
2006	53,649
2007	50,578
2008	28,288

5.1.a Alternative 1a for Atlantic mackerel (intermediately restrictive, status quo, no action, and preferred)

The specifications under this alternative would be ABC = 156,000 mt (Yield of 211,000 mt - 55,000 mt for Canada = 156,000 MT) , IOY=115,000 mt, DAH=115,000 mt, DAP=100,000 mt and JVP=0 and TALFF=0 mt (the DAH specification includes a soft allocation of 15,000 mt to the recreational fishery as per the FMP). These specifications are based on projections from SARC 42 (2006), the most recent stock assessment. 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). Other management measures would not change.

SARC 42 (2006) provided deterministic projections for 2008 biomass of 2,043,440 mt (well above Bmsy) and associated catch of 211,000 mt assuming that 2005-2007 landings were more than double what landings actually turned out to be. The projected available landings were the result of applying F=0.12 to a stock that was significantly above Bmsy due to an unusually large year-class (1999) present in 2005, and would be expected to decline to MSY (89,000 mt - 148,000) in the future when more average recruitment conditions exist for the stock. While SARC 42 (2006) projections only went though 2008, the NMFS NEFSC trawl survey indices suggest the stock is likely still at a relatively high stock status so this Alternative uses the SARC projection for 2008 as a best available proxy for 2010.

5.1.b Alternative 1b for Atlantic mackerel (most restrictive)

The specifications under this alternative would be ABC = 56,000 mt, IOY=56,000 mt, DAH=56,000 mt, DAP=41,000 mt and JVP=0 and TALFF=0 mt (the DAH specification includes a soft allocation of 15,000 mt to the recreational fishery as per the FMP). These specifications are based on long term yield calculations from SARC 42 (2006) based on surplus production estimation of 148,000 mt. 75% of 148,000 mt (to account for scientific uncertainty in a way that approximates the procedures listed in the MSB FMP) = 111,000 mt and subtracting 55,000 mt for Canada equals 56,000 mt. Other management measures would not change.

5.1.c Alternative 1c for Atlantic mackerel (least restrictive)

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 a soft allocation of 15,000 mt to the recreational fishery as per the FMP). These specifications were the 2007 measures and were based on projections from SARC 42 (2006) and expected Canadian catch. 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). Since the fishery has not caught as much as assumed in SARC 42's projections, stock size could theoretically be high which could justify a higher ABC than the status quo. Other management measures would not change.

5.2 Alternative Set 2: Alternatives for *Illex*

There is no information to support consideration of Max OY/ABC/IOY/DAH/DAP higher than 24,000, the status quo. Changes to measures other than Max OY/ABC/IOY/DAH/DAP were not considered because no issues with those other measures have been reported. Thus all alternatives maintain that the directed fishery for *Illex* closes when 95% of ABC is projected to be taken (22,800 mt), and a 10,000 pound trip limit implemented for the remainder of the fishing year. Vessels which possess *Illex* incidental catch permits may land up to 10,000 pounds per trip at all times. Also, up to 3% of the IOY for *Illex* may be set aside for scientific research.

5.2.a Alternative 2a for *Illex* (status quo, no action, preferred alternative)

The specifications under this alternative would be Max OY=ABC= IOY=DAH=DAP=24,000 mt and JVP and TALFF = 0 mt. Since data limitations did not allow an update of yield estimates at the threshold and target fishing mortality rates in recent stock assessments, the Council recommended that IOY be specified at the yield associated with Fmsy, which is 24,000. If the fishery closes at 95% of IOY as prescribed, the final amount landed should approximate the yield at 0.75Fmsy.

5.2.b Alternative 2b for *Illex* (more restrictive)

The specifications under this alternative would be Max OY =24,000 mt, ABC=IOY=DAH= DAP=19,000 mt and JVP and TALFF = 0 mt. 19,000 mt was the ABC from 1997-1999 and was associated in an older assessment (SAW 21 in 1996) with a fishing mortality rate that produced 50 percent of the maximum spawning potential of the stock (http://www.epa.gov/fedrgstr/EPA-SPECIES/1998/November/Day-17/e30692.htm).

5.3 Alternative Set 3: Alternatives for Butterfish

Changes to measures other than Max OY/ABC/IOY/DAH/DAP were not considered because no issues with those other measures have been reported. Thus all alternatives maintain the trip limit of 5,000 pounds for moratorium butterfish permits, and maintain the threshold for butterfish minimum mesh requirement (3.0 inches) at 1,000 pounds. Also, the threshold level for directed butterfish fishery closure will still be 80% of DAH. If 80% of DAH is reached prior to Oct 1, a 250 pound daily trip limit results. If 80% of DAH is reached on/after Oct 1, a 600 pound daily trip limit results. Incidental limits are 600 pounds, reduced to 250 pound if the directed fishery closes before Oct 1. Also, Up to 3% of the IOY for butterfish may be set aside for scientific research. Specifications less than the status quo ABC were not considered because the status quo ABC, which is approximately equivalent to an F of 0.1, has been shown to facilitate rebuilding in just one year given average recruitment levels. Also, given most butterfish landed are incidentally caught (there are low trip limits), lowering the DAH below 500 mt is likely to just increase discards rather than significantly reducing fishing mortality.

5.3.a Alternative 3a for butterfish (preferred alternative/status quo/no action/most restrictive)

The specifications under this alternative would be Max OY = 12,175 mt, ABC = 1,500 mt, and IOY=DAH=DAP=500 mt and JVP and TALFF = 0 mt. These specifications, which assume discards are double landings (per the latest stock assessment), are designed to minimize directed fishing while Amendment 10 is implemented (to rebuild butterfish). An ABC of 1,500 mt, which is approximately equivalent to an F of 0.1, has been shown to facilitate rebuilding in just one year given average recruitment levels. These specifications are also generally designed to avoid re-development of a directed fishery while a rebuilding plan is implemented.

5.3.b Alternative 3b for butterfish (less restrictive, equivalent to 2005-2007 measures)

The specifications under this alternative would be Max OY = 12,175 mt, ABC = 4,545 mt, and IOY=DAH=DAP=1,681 mt and JVP and TALFF = 0 mt. The ABC is based on analyses presented in SARC 38 (2004) and an assumption that biomass is the same as it was 2000-2002.

5.3.c Alternative 3c for butterfish (least restrictive)

The specifications under this alternative would be Max OY = 12,175 mt and ABC = 9,131 mt, and IOY=DAH=DAP=3,044 mt and JVP and TALFF = 0 mt. It represents an approximation of application of the F target control rule for a rebuilt stock (12,175*0.75 = 9,131) and takes into account that discards are estimated to equal twice landings. This alternative was under consideration to be eliminated given stock status is thought to be low, but has been included because the butterfish stock has the potential to rebuild quickly, and once rebuilt these are the specifications that would result from the FMP control rule.

5.4 Alternative Set 4: Alternatives for *Loligo* squid - Quotas and associated measures

MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative to biological reference points outlined in the MSA. Amendment 9 to the MSB FMP implemented revised proxies for calculating fishing mortality thresholds and targets as recommended by SARC 34 (2002) to keep current with the best available science. The revised proxies are calculated as follows: FTarget is the 75th percentile of fishing mortality rates during 1987 - 2000 and FThreshold is the average fishing mortality rates during the same period. The revised proxy for FTarget (0.32 for trimesters) will be used as the basis for establishing *Loligo* OY. The revised proxies for FTarget and FThreshold are fixed values based on average fishing mortality rates achieved during a time period when the stock biomass was fairly resilient (1987 - 2000).

Changes to Max OY/ABC/IOY/DAH/DAP were not considered; there is no information supporting an increase or decrease from the status quo at this time. While the recalculated SARC 34 thresholds suggest landings could go as high as 23,000 MT, SARC 34 also recommended keeping landings at or below 19,000 MT (see the 2009 specifications EA for

calculation details). Under all alternatives DAH will be allocated by trimesters into trimester quotas: January-April (43%), May-August (17%) and September-December (40%). When 95% of the annual DAH has been taken (i.e., 18,050 mt), a 2,500 pound trip limit will be implemented. Vessels with *Loligo* incidental permits may land up to 2,500 pounds per trip at all times. Up to 3% of the IOY may be set aside for research. These measures represent the status quo. Other than how Trimester underages are handled, changes to other measures were not considered- no problems with those other measures have been reported. Changes to how Trimester underages are handled are described in the alternatives below. In 2008, the *Loligo* fishery had a significant underage in Trimester 1, which was then transfered to Trimester 3, and a closure in Trimester 2. These circumstances prevented the harvest of the total DAH. The proposed changes are intended to prevent a reoccurance of these circumstances. Alternatives 4a and 4c provide for some (4a) or all (4c) of a Trimester 1 underage to be available in Trimester 2 so as to facilitate overall harvesting of DAH, i.e. optimum yield.

5.4.a Alternative 4a for *Loligo* (preferred)

Under this alternative Max OY =32,000 mt, ABC, IOY, DAH, and DAP = 19,000 mt and JVP and TALFF = 0 mt. This is based on the recommendations of the latest stock assessment, SAW/ SARC 34 (2002). Applying the trimester percentages described above, the trimester allocations would be: Trimester 1: 8,170mt; Trimester 2: 3,230mt; and Trimester 3: 7,600mt. Trimester 1 underages would be split between Trimester 2 and 3 (50%-50%) if the Trimester 1 underage is greater than 25%. If the Trimester 1 underage is less than 25% of the Trimester 1 quota then the underage is applied to Trimester 3 (as is currently done), avoiding potentially small transfers that could lead to unfeasibly short season openings/closures in Trimester 2. Trimester 1 overages, if any, should be small and would still be applied to Trimester 3. Trimester 2 underages or overages would still be applied to Trimester 3. As a result of both the inherent data processing time lag and late dealer reporting in the dealer reporting program, NMFS has indicated that it would not be possible to make the underage calculation and announce a quota adjustment until up to two months after Trimester 1 ends.

5.4.b Alternative 4b for *Loligo* (status quo, no action)

Under this alternative Max OY =32,000 mt, ABC, IOY, DAH, and DAP = 19,000 mt and JVP and TALFF = 0 mt. This is based on the recommendations of the latest stock assessment, SAW/ SARC 34 (2002). Applying the trimester percentages described above, the trimester allocations would be: Trimester 1: 8,170mt; Trimester 2: 3,230mt; and Trimester 3: 7,600mt. Trimester 1 and/or 2 underages and/or overages would be applied to Trimester 3.

5.4.c Alternative 4c for *Loligo*

The specifications under this alternative would be Max OY =32,000 mt, ABC, IOY, DAH, and DAP = 19,000 mt and JVP and TALFF = 0 mt. These specifications are based on the technical and management recommendations of the latest stock assessment, SAW/SARC 34 (2002). Applying the trimester percentages described above, the trimester allocations would be: Trimester 1: 8,170mt; Trimester 2: 3,230mt; and Trimester 3: 7,600mt. Trimester closures would be based on cumulative percentages related to the sum of the Trimester allocations. Thus Trimester 1 would close at 90% of "17% of the annual DAH," Trimester 2 would close at 90% of

"60% (17+43) of the annual DAH," and Trimester 3 would close at 95% of the total annual DAH. The operational difference between 4a and 4c is that with 4c, all of Trimester 1's underages are immediately available to Trimester 2 (with 4a only half would be available and any release would likely be delayed to make sure most late landings had been recorded).

5.5 Alternative Set 5: Alternatives for *Loligo* squid - Codend cover minimum mesh size.

While there are no relevant *Loligo*-specific studies, peer reviewed literature supports a general conclusion that codend covers can reduce the selectivity of trawl gear depending on the mesh of the cover and the mesh of the liner. The current cover requirement is 4.5 inches diamond mesh (inside stretch measurement). Most *Loligo* fishermen are using diamond-mesh covers around 6 inches and some use square-mesh covers up to 9.5 inches. If some of the covers in use in the *Loligo* fishery are reducing selectivity (likely the smaller mesh covers if any), raising the minimum mesh size and/or requiring use of square mesh would likely reduce such effects, reducing bycatch of small squid and/or finfish. All mesh sizes in the alternatives are "inside stretch measurements." See Appendix A, the SMB Monitoring Committee's review of this issue, for additional details.

5.5.a Alternative 5a (preferred, minimally restrictive); Require minimum codend cover mesh size of 5.0 inches.

This is based on increasing to the next highest mesh size currently required in another Mid-Atlantic fishery (Scup).

5.5.b Alternative 5b (least restrictive, status quo, and no action); Require minimum codend cover mesh size of 4.5 inches (diamond).

This was instituted based on what was once the Scup minimum mesh size.

5.5.c Alternative 5c (intermediately restrictive); Require minimum codend cover mesh size of 6 inches.

This is based on the most frequently observed cover mesh size-type observed in use in the *Loligo* fishery by the Northeast Fishery Observer Program (NEFOP).

5.5.d Alternative 5d (intermediately restrictive); Require minimum codend cover mesh size of 6 inches square mesh.

This is based in terms of size on the most frequently observed cover mesh size observed in use in the *Loligo* fishery (NEFOP data). While the fishery predominantly uses diamond-mesh covers, this Alternative would require square meshes, which should cause less mesh obstruction then diamond mesh.

5.5.e Alternative 5e (most restrictive); Require minimum codend cover mesh size of 9.5 inches square mesh.

This is based on the largest and likely least obstructing cover mesh size-type observed in use in the *Loligo* fishery (NEFOP data).

6.0 DESCRIPTION OF AFFECTED ENVIRONMENT AND FISHERIES

This section identifies and describes the *valued ecosystem components* (VECs) (Beanlands and Duinker 1984) likely to be affected by the actions proposed in this document. The VECs comprise the affected environment within which the proposed actions will take place. The VECs are identified and described here as a means of establishing a baseline for the impact analysis that will be presented in section 7 "Analysis of Impacts." The significance of the various impacts of the proposed actions on the VECs will be assessed from a cumulative effects perspective. 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 (CEQ 1997). 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

The physical environment is described next, to establish the context for the VECs, and will be followed by the description of the actual VECs.

6.1 Physical Environment

Climate, physiographic, and hydrographic differences separate the Atlantic ocean from 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 (though the division is probably better thought of as a mixing zone rather than as a definitive boundary). The MSB fisheries are prosecuted in the New England-Middle Atlantic Area. 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 large interconnecting sounds behind the Outer Banks of North Carolina (Freeman and Walford 1974 a-d, 1976 a and b). In the New England-Middle Atlantic area, 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. 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.

Within the New England-Middle Atlantic Area, the principal area within which the MSB 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 the 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.

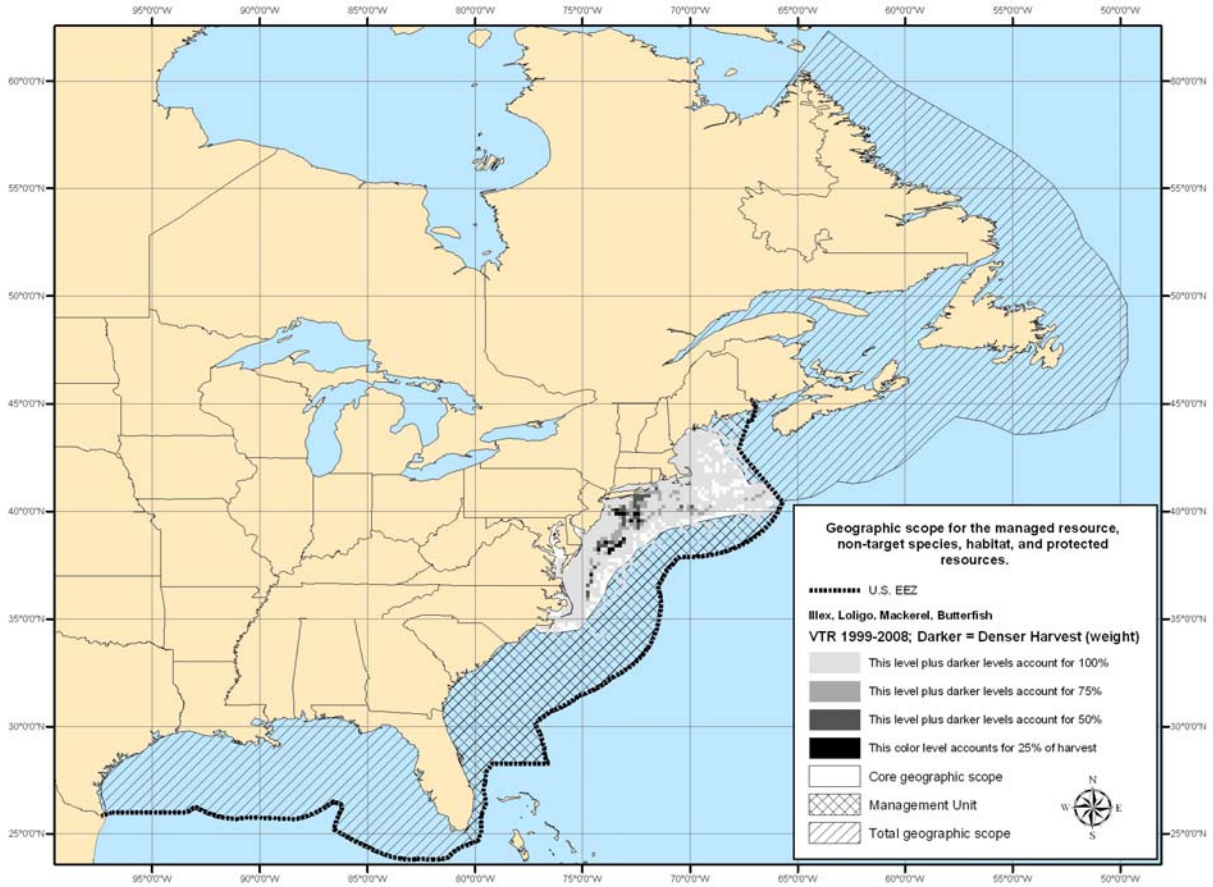

Figure 1. Geographic scope of the Atlantic mackerel, squid and butterfish fisheries.

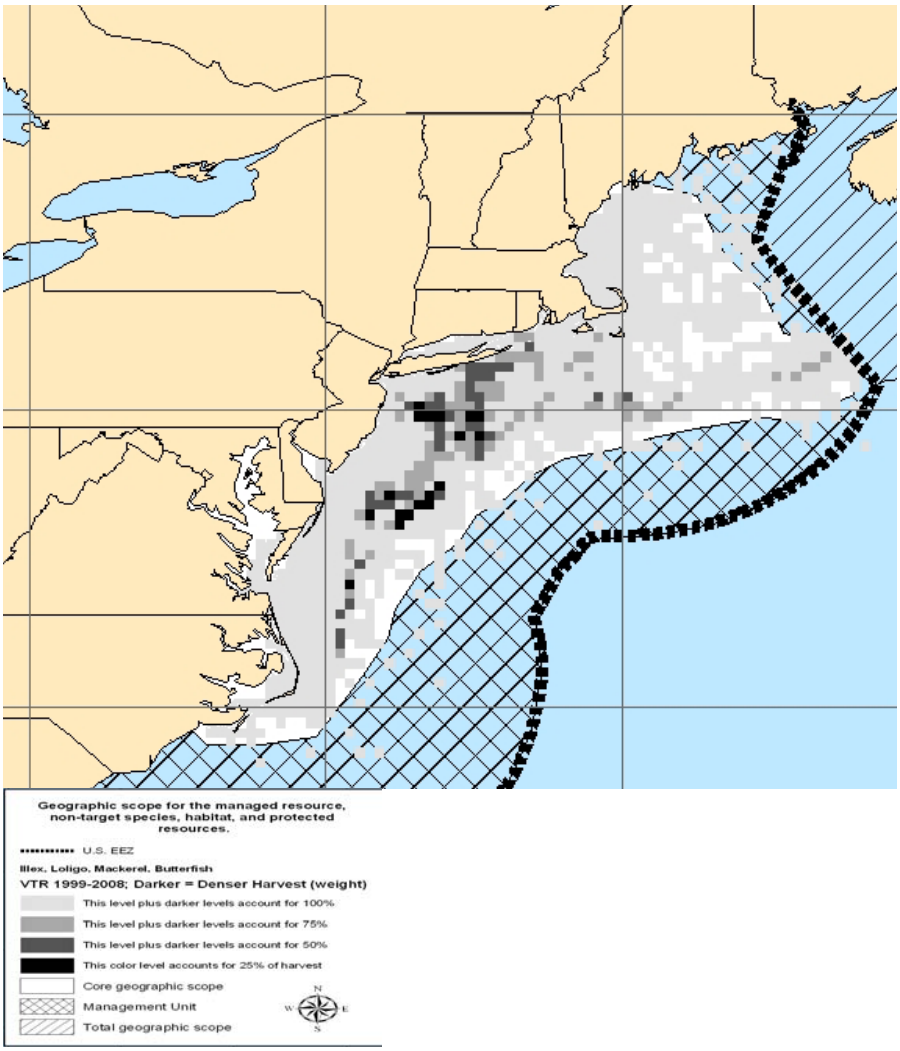

Figure 2. Detail of Core Geographic scope of the MSB fisheries.

Previous public comment has requested that the Council include mention that numerous old dump sites for municipal and industrial waste exist in the management area, specifically the "106-Mile Dump Site " formerly utilized east of Delaware's ocean coastline, beyond the Continental Shelf . Detailed information on the 106-Mile Dump Site can be found in the 1995 EPA report to Congress on the 106-Mile Dump Site available at: http://www.epa.gov/adminweb/history/topics/mprsa/Monitoring,%20Research%20and%20Surveillance%20of%20the%20106%20Mile%20Deepw.pdf. It generally concluded that sewage sludge did not reach important areas for commercial fisheries and that the 106-Mile Dump Site was not the prime source of the generally low chemical contamination in tilefish, the primary commercially important finfish species resident in the shelf/slope areas adjacent to the 106-Mile Dump Site (EPA 1995).

6.2 Basic Biology of the Managed Resources

6.2.1 Atlantic mackerel

Atlantic mackerel is a pelagic, schooling species distributed between Labrador (Parsons 1970) and North Carolina (Anderson 1976a). A southern group begins its spring migration from waters off North Carolina and Virginia in March- April, and moves 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 before moving southward and returning to deep offshore water near Block Island after October (Hoy and Clark 1967). The northern group 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 group begins its southerly autumn migration in November and December and disappears into deep water off Cape Cod. Thus both groups make extensive northerly (spring) and southerly (autumn) migrations to and from spawning and summer feeding grounds. Both groups overwinter between Sable Island (off Nova Scotia) and Cape Hatteras in water generally warmer than 45 F (USDC 1984a).

Biochemical studies (Mackay 1967) have not established that genetic differences exist between the two groups and precise estimates of the relative contributions of the two groups cannot be made (ICNAF 1975). Since 1975 all Atlantic mackerel in the northwest Atlantic have been assessed as a unit stock (Anderson 1982) and are considered one stock for fishery management purposes.

Mackerel spawning occurs during spring and summer and progresses from south to north. The southern group spawns from mid-April to June in the Mid-Atlantic Bight and the Gulf of Maine and the northern group 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).

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°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 (Anderson and Paciorkowski 1978). 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. 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). The maximum age observed is 17 years (Pentilla and Anderson 1976).

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, euphausiid, 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 mortality is probably the largest component of natural mortality on this stock (Overholtz *et al.* 1991b). Atlantic mackerel are an important prey species and are known to be preyed upon by many pelagic and demersal fish species, as well as by marine mammals and seabirds (Smith and Gaskin 1974; Payne and Selzer 1983; Overholtz and Waring 1991; Montevecchi and Myers 1995; Scott and Tibbo 1968; Maurer and Bowman 1975; Stillwell and Kohler 1982, 1985; Bowman and Michaels 1984).

The status of the Atlantic mackerel stock is described in Section **6.6.1.**

6.2.2 *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. 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, Hendrickson and Hart, 2006).

Illex 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 scalping (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 *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 *Illex* consume less crustaceans and more fish as they grow larger.

Illex are an important prey species and are known to be preyed upon by many pelagic and demersal fish species, as well as by marine mammals, seabirds, and *Loligo* squid (Butler 1971, Vinogradov 1972, Maurer 1975, Buckel 1997, Langton and Bowman 1977, Lilly and Osborne 1984, Templeman 1944, Stillwell and Kohler 1985, Scott and Scott 1988, Squires 1957, Wigley 1982, Major 1986, and Brown *et al.*1981).

The status of the *Illex* stock is described in Section **6.6.2.**

6.2.3 Butterfish

Butterfish spawning takes place chiefly during summer (June- August) in inshore waters generally less than 100' deep and over 60 ^{o}F.. The times and duration of spawning are closely associated with changes in surface water temperature. 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 are 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).

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. 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 an important prey species known to be preyed on by a variety of bony fish, sharks, *Loligo* squid, marine mammals, and seabirds (Bigelow and Schroeder 1953, Scott and Tibbo 1968, Horn 1970a, Maurer and Bowman 1975, Tibbets 1977, Stillwell and Kohler 1985, Brodziak 1995a, SAW 38).

The status of the butterfish stock is described in Section **6.6.3.**

6.2.4 *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 usually attaches it to a preexisting cluster of newly spawned eggs (clusters are initiated on rocks, sand, and seaweeds). 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 (Jacobson 2005, 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.

Loligo are an important prey species and are known to be preyed upon by many pelagic and demersal fish species, as well as by marine mammals, seabirds, and *Illex* squid (Lange and Sissenwine 1980, Vovk and Khvichiya 1980, Summers 1983, Waring *et al.* 1990, Overholtz and

Waring 1991, Gannon *et al.* 1997, Maurer 1975, Langton and Bowman 1977, Gosner 1978, Lange 1980, Vinogradov 1984).

The status of the *Loligo* stock is described in Section **6.6.4.**

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 MSB FMP and is being updated via Amendment 11 to the MSB FMP. EFH for the managed resource is described using fundamental information on habitat requirements by life history stage that is summarized in a series of documents produced by NMFS and available at: http://www.nefsc.noaa.gov/nefsc/habitat/efh/. 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. 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. Amendment 8 to the MSB FMP identified and described essential fish habitat for Atlantic mackerel, *Loligo* (except for eggs), *Illex,* and butterfish, summarized below. Amendment 9 to the MSB FMP identified and described essential fish habitat for *Loligo* eggs. There are maps that show areas within which the text descriptions apply, and the maps for all four species are available in Amendment 8, except for Loligo egg EFH, which is in Amendment 9. Amendment 11 (estimated implementation in 2010/2011) will update all of the EFH designations for MSB species.

Current EFH Textual Descriptions

Atlantic mackerel

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

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

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

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

Illex - Pre-recruits and recruits are stock assessment terms which relate to whether or not an individual is selected by the directed bottom trawl fishery and correspond roughly to the life history stages of juveniles and adults, respectively. *Illex* pre-recruits are less than or equal to 10 cm and recruits are greater than 10 cm.

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

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

Loligo

Eggs: EFH for Loligo eggs occurs in coastal and offshore bottom habitats from Georges Bank southward to Cape Hatteras. Loligo egg masses are found attached to rocks and boulders on sand or mud bottom, as well as attached to aquatic vegetation. Generally, the following conditions exist where Loligo egg EFH is found: bottom water temperatures between 10°C and 23°C, salinities of 30 to 32 ppt, and depths less than 50 meters.

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

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

Pre-recruits and recruits are stock assessment terms which relate to whether or not an individual is selected by the directed bottom trawl fishery 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.

Butterfish

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

Larvae: Offshore, EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina areas that comprise the highest 75% of the catch where butterfish larvae were collected in the NEFSC trawl surveys. Inshore, EFH is the "mixing" and/or "seawater" portions of all the estuaries where butterfish larvae are "common," "abundant," or "highly abundant" on the Atlantic coast, from Passamaquoddy Bay, Maine to James River, Virginia. Generally, butterfish larvae are collected in depths between 33 ft and 6000 ft and temperatures between 48° F and 66° F.

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

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

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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 MSB 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:

* = Known to have interacted with MSB 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

Fish

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

Birds

Species	Status
Northern Gannet (*Morus bassanus*)	Protected

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 U.S. 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, NEFOP 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 annual mortality and serious injury of a stock in a given fishery is less than or equal to 10% of the PBR level or, 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 or, in the absence of reliable information it is at the discretion of the Assistant Administrator for Fisheries to determine whether the incidental injury or mortality qualifies (or not) for a specific category.

Marine Mammal Stock Assessment Reports:

As required by the Marine Mammal Protection Act (MMPA), NMFS has incorporated earlier public comments into revisions of marine mammal stock assessment reports. These reports contain information regarding the distribution and abundance of the stock, population growth rates and trends, the stock's Potential Biological Removal level, estimates of annual human-caused mortality and serious injury from all sources, descriptions of the fisheries with which the stock interacts, and the status of the stock. The MMPA requires these assessments to be reviewed at least annually for strategic stocks and stocks for which significant new information is available, and at least once every 3 years for non-strategic stocks.

The 2009 SARs are currently still draft and the final versions are not yet available The final 2008 individual stock assessment reports, as well as regional compilations, are available at http://www.nmfs.noaa.gov/pr/sars/. The "U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2008" report is also available online at: http://www.nefsc.noaa.gov/nefsc/publications/tm/tm201/.

NMFS elevated the (mid-water) MSB fishery to Category I in the 2001 LOF but it was reduced to a Category II fishery in 2007 (see discussion below describing the Atlantic Trawl Gear Take Reduction Plan). 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. The reduction in interactions documented between the MSB fisheries and several species/stocks of marine mammals compared to previous years led to the re-classification. The List of Fisheries for 2009 is available at the following internet website address: http://www.nmfs.noaa.gov/pr/interactions/lof/#lof). The 2009 LOF eliminated *Loligo*, *Illex* and butterfish from the Category II Mid-Atlantic Mid-Water Trawl Fishery since directed fishing these species occurs primarily with bottom otter trawls. No other changes that would affect the classification of the fisheries managed under this FMP occurred in the 2009 LOF.

Based on data presented in the 2008 Stock Assessment Report (SAR), annual serious injury and mortality across *all* fisheries for common dolphin, white sided dolphin, and pilot whale exceeds 10% of each species PBR. PBR is 1,000, 509, and 247 for these "species", respectively, and the average annual mortality from all fisheries is 161, 352 and 167, respectively.

6.4.1 Description of species of concern which are protected under MMPA

The following is a description of species of concern because they are protected under MMPA and, as discussed above, have had documented interactions with fishing gears used to harvest species managed under this FMP. 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 200-2000 m 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).

The following information was taken from the most recent Stock Assessment Report for the species (Waring *et al*. 2009) 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. However, the most recent SAR considers the best abundance estimate for common dolphins to be 120,743 animals (CV=0.23). This is the sum of the

estimates from two 2004 U.S. Atlantic surveys, where the estimate for the northern U.S. Atlantic is 90,547 (CV=0.24) and 30,196 (CV=0.54) for the southern U.S. Atlantic. 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 0.5 because the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic common dolphin is 1000.

Fishery Interactions - The following information was taken from the latest stock assessment for common dolphin contained in Waring *et al.* (2009) which summarizes incidental mortality of this species through 2004.

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 and 49 in 1999 (CV=0.97). After 1999, this fishery is included the North Atlantic bottom trawl fishery.

Atlantic Mackerel

The estimated fishery-related mortality attributed to this fishery was 161 (CV=0.49) animals in 1997 and 0 in 1998 and 1999. After 1999, this fishery included as a component of the mid-Atlantic bottom trawl and mid-water trawl fisheries.

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.

Mid-Atlantic Bottom Trawl

Three common dolphins were observed taken in the mid-Atlantic bottom trawl fishery in 2000, 2 in 2001, 9 in 2004, 15 in 2005 and 1 in 2006.

Atlantic white-sided dolphin (*Lagenorhynchus acutus*)

Atlantic 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 35° N) and perhaps as far east as 43° 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 Jeffrey's 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 for the Gulf of Maine stock is 63,368 (CV=0.27) as estimated from the July to August 1999 line transect survey. This is considered the best estimate of abundance because this survey is recent and provided the most complete coverage of the known habitat. The minimum population size is 50,883. 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 0.5 because the CV of the average annual mortality estimate is less than 0.3. PBR for the western North Atlantic stock of white-sided dolphin is 509.

Fishery Interactions

The following information was taken from the latest stock assessment for white-sided dolphin contained in Waring *et al* (2009) which summarized incidental mortality of this species through 2006.

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

Loligo squid

According to Waring *et al*. (2009), no white-sided dolphin takes have been observed taken incidental to *Loligo* squid fishing operations since 1996.

Atlantic mackerel

NMFS NEFOP 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. 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.

Northeast Mid-water Trawl Fishery (Including Pair Trawl)

The two most commonly targeted fish in this fishery are herring (94% of vessel trip report (VTR) records) and mackerel (0.4%). The observer coverage in this fishery was highest during 2003 and 2004, although a few trips in earlier years were observed. A white-sided dolphin was observed taken in the single trawl fishery on the northern edge of Georges Bank during July 2003 in a haul targeting herring. A bycatch rate model fit to all observed mid-water trawl data (including paired and single, and Northeast and mid-Atlantic mid-water trawls, that targeted either herring or mackerel and were observed between 1999 and 2004 (NMFS unpublished data)) provided the following annual fishery-related mortality (CV in parentheses) estimates: unknown in 2001-2002, 24 (0.24) in 2003, 19 (0.58) in 2004, 15 (0.68) in 2005, and 19 (0.44) in 2005. The average annual estimated fishery-related mortality during 2002-2006 was 19 (0.26).

Mid-Atlantic Mid-water Trawl Fishery (Including Pair Trawl)

The observer coverage in this fishery was highest after 2003, although a few trips in other years were observed. A white-sided dolphin was observed taken in the pair trawl fishery near Hudson Canyon (off New Jersey) during February 2004 in a haul targeting mackerel (but landing nothing). A bycatch rate model provided the following annual fishery-related mortality (CV in parentheses) estimates: unknown in 2001-002, 51 (0.46) in 2003, 105 (0.38) in 2004, 97 (0.76) in 2005, and 54 (0.57) in 2006. The average annual estimated fishery-related mortality during 2002-2006 was 77 (0.21).

Mid-Atlantic Bottom Trawl Fishery

One white-sided dolphin incidental take was observed in 1997 resulting in a mortality estimate of 161 (CV =1.58) animals. No takes were observed in from 1998-2004 or 2006. One take was observed in 2005. The average annual fishery-related mortality during the period 2002-2006 was estimated to be 77 (0.21) animals.

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 U.S. 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 abundance estimate for *Globicephala sp*. is 31,139 (CV=0.27) based on 2004 survey data. 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 0.5 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 249.

Fishery Interactions

The following information was taken from the latest stock assessment for pilot whales contained in Waring *et al.* (2009) which summarizes incidental mortality of these species through 2006. Mortality estimates within the Atlantic mackerel, squid and butterfish complex were made by sub-fishery prior to 2000. After that, each sub-fishery was re-categorized into bottom otter trawl or mid-water fishery categories.

Illex Squid

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), and 0 in 1999. After 1999, this fishery has been included in the Mid-Atlantic bottom trawl fishery.

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 and 49 in 1999 (CV=0.97).

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.

Mid-Atlantic Bottom Trawl

Two pilot whales were taken in the Gulf of Maine in 2004, four in 2005 and one in 2006. The estimated fishery-related mortality to pilot whales (CV in parentheses) in the U.S Atlantic attributable to this fishery was 47 (0.32) in 2000, 39 (0.31) in 2001, 38 (0.36) in 2002, 31(0.31) in 2003, 35 (0.33) in 2004, 31 (0.31) in 2005 and 37 (0.34) in 2006. The average annual estimated fishery-related mortality during 2002-2006 was 34 (0.15).

Mid-Atlantic Mid-Water Trawl – Including Pair Trawl

The observer coverage in this fishery was highest after 2003, though a few trips in earlier years were observed. No pilot whales were observed bycaught in this fishery for the period 2002-2006 though because of data pooling, estimates were still generated. The estimated fishery-related mortality to pilot whales (CV in parentheses) in the U.S Atlantic attributable to this fishery was unknown in 2002, 3.9 (0.46) in 2003, 8.1 (0.38) in 2004, 7.5 (0.76) in 2005, 0 in 2006. The average annual estimated fishery-related mortality during 2002-2006 was 5 (0.34).

6.4.2 Atlantic Trawl Gear Take Reduction Plan

The NMFS convened an Atlantic Trawl Gear Take Reduction Team (ATGTRT) in 2006 as part of a settlement agreement with Center for Biological Diversity. The ATGTRT was convened with the goal of developing consensus recommendations to guide NMFS in creating a Take Reduction Plan (TRP). The TRP focuses on reducing serious injury and mortality (bycatch) of long-finned pilot whales (*Globicephala melas*), short-finned pilot whales (*Globicephala macrorhynchus*), white-sided dolphins (*Lagenorhynchus acutus*), and common dolphins (*Delphinus delphis*) in several trawl gear fisheries in the Atlantic Ocean. These marine mammal species are known to interact with the Mid-Atlantic Mid-water Trawl fishery, which was classified in the MMPA List of Fisheries (LOF) as a Category I fishery (i.e., one that has frequent incidental mortalities or serious injuries of marine mammals) at the time the ATGRT was convened in 2006. These marine mammal species are also known to interact with the Mid-Atlantic Bottom Trawl, Northeast Mid-water Trawl, and the Northeast Bottom Trawl fisheries, which are classified as Category II fisheries (i.e., those that have annual mortality and serious injury greater than 1 percent and less than 50 percent of the PBR level) on the MMPA LOF.

Under the framework of section 118 of the Marine Mammal Protection Act (MMPA), the ATGTRT will aim to draft a TRP that reduces bycatch of these stocks to insignificant levels approaching a zero mortality and serious injury rate (known as the Zero Mortality Rate Goal, or ZMRG), taking into account the economics of the fishery, the availability of existing technology, and existing state or regional fishery management plans, within five years of implementation. NMFS has identified ZMRG as ten percent of the Potential Biological Removal (PBR) rate, which is defined as the maximum level of mortality (excluding natural deaths) that will not harm a particular stock. The ATGTRT is in the unique situation of designing a take reduction plan for cetacean populations that are currently below their respective PBR levels; thus, rather than working to achieve PBR within six months of implementing the TRP, the Team can focus on the five-year goal of reaching ZMRG. Another unique characteristic of the Team is that it is gear-based rather than species-based. Although white-sided dolphins were not originally included in the settlement agreement, when looking at the data, NMFS found that the bycatch rate of this species was below PBR, but above the insignificant threshold, similar to the other species addressed in the settlement agreement. NMFS decided to include white-sided dolphins in the list of stocks under the ATGTRT's purview to proactively address bycatch of this stock before it potentially exceeds PBR.

The first meeting of the ATGTRT was held on September 19-22, 2006 in Providence, RI. The team received summary information on available data relating to abundance and mortality of the four species included in the TRP. ATGTRT members asked NMFS to reevaluate the classification of the mid-water trawl fishery as a Category I fishery based on the most recent estimates of bycatch. At that meeting, NMFS noted that the tier analysis that supported the mid-water trawl fishery's elevation to Category I was based on the average takes over the most recent five year period. During this period one of the years utilized for the mid-water trawl fishery elevation included an increase in marine mammal bycatch that appeared to drive the fisheries Category I classification. Because the increase in marine mammal takes that resulted in the elevation of the mid-Atlantic mid-water trawl fishery to Category I is no longer part of the 5-year average considered in the tier-analysis, the TRT requested that NMFS re-evaluate the classification of the mid-Atlantic mid-water trawl fishery as a Category I fishery. The tier analysis requested by the ATGTRT resulted in a reclassification of the mid-water trawl fishery to Category II in the MMPA List of Fisheries (LOF) for 2007.

A second meeting of the ATGTRT was convened in Baltimore, MD on April 25-26, 2007. NMFS scientists presented new PBR data for white-sided dolphin and explained how updated abundance estimates for those species were used to determine the new PBR. Abundance estimates, and therefore also PBR, were not updated for common dolphin, and pilot whales because the data for those species was collected in 2004 and were still considered current. Updated results on bycatch estimates by species were also presented.

In addition to presenting biological and economic information updates, NMFS briefed the ATGTRT on the timeline and requirements for developing a TRP for non-strategic stocks in Category II fisheries. A NOAA General Counsel (GC) guidance memo indicated that there is no timeline within the MMPA requiring the ATGTRT to submit a draft TRP because all the fisheries affected by the ATGTRT are Category II fisheries and none of the stocks under the ATGTRP are strategic at this time. While the GC guidance memo indicated that there is no timeline contained within the MMPA requiring the TRT to submit a draft TRP, NMFS requested that the TRT move forward and make the best effort possible to meet the 11 month obligation to develop a TRP. While unable to agree on whether to develop a TRP within the 11 month timeframe, TRT members did agree that developing a research plan would maintain progress towards obtaining the ultimate goal of reducing the serious injury and mortality of marine mammals in Atlantic trawl fisheries. By the conclusion of the meeting the ATGTRT finalized a consensus research strategy to present to NMFS. The strategy stated the following:

The Atlantic Trawl Take Reduction Team (ATGTRT) recommends, by consensus, the following strategies for Atlantic Trawl Fisheries. The ATGTRT does not intend for these recommendations to be considered as a TRP for the purposes of the MMPA at this time.

Education & Outreach:

- *Operate this as an Education & Outreach Subgroup so we can include all stakeholders to inform captains/crewmen/company owners on this process.*
- *2-sided laminated placard for captains and crews to reference while at sea, that provides the following information:*

- *Make fishermen aware of hotspots (statistical area, time, etc. . .) where observers have seen elevated interaction with marine mammals – so they can be informed of voluntary measures (i.e. reduce the number of turns and tow times while fishing at night). The Subgroup should determine whether this is applicable for bottom trawl operations.*
- *Encourage recording and reporting of sighting of marine mammals and behavior in and around fishing operations. Hopefully these data can eventually move beyond the level of anecdotal information to become part of assessment processes.*

NMFS Assistance:

- *Develop species identification placard.*
- *Clarify takes between pair- and single- mid-water trawls and various bottom trawl fisheries.*
- *Resolve white-sided dolphin assessment uncertainty – why is there so much variation in the white-sided dolphin abundance estimates and determine stock structure?*
- *Elucidate fishery characteristics (i.e. revenue valuation, trawl and trip volumes, etc. . .) of trawl fisheries. Document the social and economic value of the trawl fisheries before mitigation.*
- *Observer program to clarify kite v. transducer panel in the pair-trawl fishery. Additional investigation is needed on whether there are kites in the pair trawl fishery (observer confusion? Given different names by captains?). Why do the pair trawls labeled this way have higher bycatch rates?*
- *Update Pilot Whale abundance estimates with 2006 survey data. Determine if this is applicable to other stocks.*
- *Generate maps from Maine to the North Carolina/South Carolina border that encompass all of the closures and gear modification areas affecting these trawl fisheries (MMPA, National Marine & Horseshoe Crab Sanctuaries, MSA, etc).*
- *Convene Industry/NMFS workshop to help differentiate the various bottom trawl fisheries in New England and the Mid-Atlantic, based on fishing practices.*
- *Add info on kites to bottom trawl observer logs.*
- *Provide more observer coverage in the Mid-Atlantic.*
- *For mid-water trawl, between 38 – 39 lat, more observer coverage is needed to see if the elevated bycatch rate there really exists or is just due to very low coverage.*
- *More observer coverage is needed in 622 and 627 for bottom trawls, to see what is going on there.*

Research & Gear Mitigation

- *Operate this as a Research & Gear Mitigation Subgroup so we can include all stakeholders.*
- *Convene Industry Workshop to build on the 2006 workshop in Atlantic City, NJ which reviewed the characteristics of trawl fisheries with takes, and early field research.*
- *Phased Research Plan:*
    - *Step 1*
        - *Industry video of normal trawl operations.*
        - *Industry video and sonar of mammals interacting with gear (in consultation with NEFSC, SEFSC – Pascagoula Lab, industry consultants, etc).*
    - *Step 2*

- *Field experimentation with various excluder devices and other gear modifications (w/ NEFSC, SEFSC – Pascagoula Lab, industry consultants, etc. . .).*
- *Observations of fishing practice modifications.*

- *Step 3*
  - *Industry and partners bring results of research to Research & Gear Mitigation Subgroup to discuss the information and how to move forward.*

Caveats and needs that apply to the Research & Gear Mitigation component of the Strategy:

- *Funding for video equipment, vessel use, lost revenues*
- *Marine mammal takes occurring in NMFS-sanctioned experiments not be extrapolated into the fishery. [NMFS will investigate various options against takes counting for PBR.]*
- *NMFS reviews videos and provides confidentiality protection for video materials.*
- *Expeditiously process necessary permits.*
- *No loss of days at sea for vessel participation.*

Other Research Recommendations

- *Additional information is needed on the annual distribution of these marine mammals. General research on seasonal overlap of the mammals and the fisheries will be helpful.*
- *NMFS work expeditiously to differentiate pilot whales and takes by species.*
- *Why is there a correlation between vessel horsepower and vessel bycatch? NMFS can analyze the data they have to see why vessel horsepower is important (size of boat, speed, size of net, noise, etc). It would also be good to brainstorm with industry to get their thoughts on this.*

Review observer data to look for correlations in regards to marine mammal takes, diet and discards.

Additional background information on the ATGTRP, including complete meeting summaries, is available at the following website: http://www.nero.noaa.gov/prot_res/atgtrp/index.html.

6.4.3 Description of Turtle Species with Documented Interactions with the MSB Fisheries

Leatherback sea turtles (*Dermochelys coriacea*)

Leatherback turtles (*Dermochelys coriacea*) were listed as endangered under the ESA on June 2, 1970. 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). 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).

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

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

Poaching is not known to be a problem for U.S. nesting populations. However, numerous fisheries that occur in both U.S. state and Federal waters are known to negatively impact juvenile and adult leatherback sea turtles. These include incidental take in several commercial and recreational fisheries. Fisheries known or suspected to incidentally capture leatherbacks include those deploying bottom trawls, off-bottom trawls, purse seines, bottom longlines, hook and line, gill nets, drift nets, traps, haul seines, pound nets, beach seines, and surface longlines (NMFS and USFWS 1992). Leatherback interactions with the southeast shrimp fishery are also common. Turtle Excluder Devices (TEDs), typically used in the southeast shrimp fishery to minimize sea turtle/fishery interactions, are less effective for the large-sized leatherbacks. Therefore, the NMFS has used several alternative measures to protect leatherback sea turtles from lethal interactions with the shrimp fishery. These include establishment of a Leatherback Conservation Zone (60 FR 25260). NMFS established the zone to restrict, when necessary, shrimp trawl activities from off the coast of Cape Canaveral, Florida to the Virginia/North Carolina Border. It allows the NMFS to quickly close the area or portions of the area to the shrimp fleet on a short-term basis when high concentrations of normally pelagic leatherbacks are recorded in more coastal waters where the shrimp fleet operates. Other emergency measures may also be used to minimize the interactions between leatherbacks and the shrimp fishery. For example, in November 1999 parts of Florida experienced an unusually high

number of leatherback strandings. In response, the NMFS required shrimp vessels operating in a specified area to use TEDs with a larger opening for a 30-day period beginning December 8, 1999 (64 FR 69416) so that leatherback sea turtles could escape if caught in the gear.

Leatherbacks are also susceptible to entanglement in lobster and crab 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.

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. The most recent 5-year ESA leatherback turtle status review was completed in 2007 (NMFS & USFWS 2007c) which included an analysis of the most recent population and demographic data available for the species. The most recent population size estimate for the North Atlantic Ocean is a range of 34,000- 94,000 adult leatherbacks where the species appears to be stable or increasing (NMFS & USFWS 2007c). However, the East Pacific and Malaysian leatherback populations appear to have collapsed. Given the best available information, NMFS & USFWS (2007) concluded that the leatherback turtle should not be reclassified under the ESA and should remain listed as endangered. In addition, the review also concluded that available information indicates that an analysis and review of the species should be conducted in the future to determine if application of the Distinct Population Segment policy under the ESA to the endangered leatherback turtle is warranted.

Fishery Interactions

A single leatherback sea turtle capture has been documented on observed MSB fishing trips according to the NEFOP Database. The animal was caught in a bottom otter trawl net in October 2001 on a trip off the coast of New Jersey 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. No leatherback turtles have been observed in the MSB fisheries since the 2001 observation described above ((based on unpublished NEFOP data through February 2007). An estimate of total bycatch of this species is not available as the rate of interaction is low.

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 habitats include the open ocean, continental shelves, bays, lagoons, and estuaries (NMFS& FWS 2007b).

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).

The most recent 5-year ESA loggerhead sea turtle status review was completed in 2007 (NMFS & USFWS 2007b) which included a review of the most recent research results for loggerhead sea turtles. Genetic analyses conducted since the last five-year review indicate there are five demographically independent groups in the Western North Atlantic, corresponding to nesting beaches found in Florida and Mexico. The primary metric used to evaluate trends in global loggerhead populations are counts of beach nests, many of which occur in areas outside U.S. waters. Given that loggerhead nest counts have generally declined during the period 1989-2005, NMFS & USFWS (2007b) concluded that loggerhead turtles should not be delisted or reclassified and should remain designated as threatened under the ESA. However, the review also concluded that available information indicates that an analysis and review of the species should be conducted in the future to determine if application of the Distinct Population Segment policy under the ESA is warranted for the species. Additionally, the Center for Biological Diversity and the Turtle Island Restoration Network filed a petition to reclassify loggerhead turtles in the North Pacific Ocean as a distinct population segment (DPS) with endangered status and designate critical habitat under the ESA (72 *Federal Register* 64585; November 16, 2007). While this petition is geared toward the North Pacific, the possibility exists that it could affect status in other areas. NMFS concluded that the petition presented substantial scientific information such that the petition action may be warranted, and published a notice and request for comments, available at: http://www.nmfs.noaa.gov/pr/pdfs/fr/fr72-64585.pdf. At this time, the Northwest Atlantic loggerhead population is only a "potential" distinct population segment and cannot be considered for delisting separately from the listed entity (i.e., the entire species) until it meets both the recovery criteria for each recovery unit and has completed a formal DPS evaluation and designation, which would involve proposed rulemaking, public review and comment and a final rulemaking (NMFS and USFWS 2008).

The Second Revision of the Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea turtle (*Caretta caretta*) was published in December 2008 (NMFS and USFWS 2008). The Loggerhead Recovery Team conducted a detailed analysis of threats to assist in prioritizing recovery actions. The highest priority threats, adjusted for relative reproductive values for each life stage/ecosystem, include bottom trawl, pelagic longline, demersal longline, and demersal large mesh gillnet fisheries; legal and illegal harvest; vessel strikes; beach armoring; beach erosion; marine debris ingestion; oil pollution; light pollution; and predation by native and exotic species.

Fishery Interactions

Illex Fishery

A single capture of a loggerhead turtle on an *Illex* trip was documented in 1995 according to the NEFOP 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. In addition, there have been no loggerhead turtles observed to be captured in the *Illex* fishery since the 1995 observation (based on unpublished NEFOP data through February 2007).

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. Five turtles (one loggerhead and four unknown) were taken by the *Loligo* fishery off New Jersey and Rhode Island during September and October 2002. In 2004, a loggerhead was resuscitated after capture on an observed *Loligo* haul, and was tagged and released alive. In addition, only one loggerhead turtle was observed to be captured in the *Loligo* fishery (taken in July 2008) since the 2004 observation based on unpublished NEFOP data through July 2009. An estimate of total bycatch of this species in the *Loligo* fishery is not currently available. Based on 1996-2004 observer data, Murray 2006 estimated that 616 loggerhead turtles per year are caught in Mid-Atlantic bottom trawl gear, but did not break down bycatch rates by fishery (though of the 66 interactions used by Murray's model, 5, or 8%, came from trips targeting *Loligo*).

NMFS Sea Turtle Conservation Strategy

NMFS announced in May 2009 (Federal Register / Vol. 74, No. 88 / Friday, May 8, 2009) its intention to prepare an Environmental Impact Statement (EIS) and to conduct public scoping meetings to comply with the National Environmental Policy Act (NEPA) by assessing potential impacts resulting from the proposed implementation of new sea turtle regulations in the Atlantic and Gulf of Mexico trawl fisheries. These requirements are proposed to protect threatened and endangered sea turtles in the western Atlantic Ocean and Gulf of Mexico from incidental capture, and would be implemented under the Endangered Species Act (ESA). NMFS announced consideration of rulemaking for these new sea turtle regulations February 15, 2007 in an Advance Notice of Public Rulemaking.

All sea turtles that occur in U.S. waters are listed as either endangered or threatened under the Endangered Species Act of 1973 (ESA). The Kemp's ridley (Lepidochelys kempii), leatherback (Dermochelys coriacea), and hawksbill (Eretmochelys imbricata) are listed as endangered. Loggerhead (Caretta caretta) and green (Chelonia mydas) turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific coast of Mexico, which are listed as endangered. Due to the inability to distinguish these green turtle populations away from the nesting beach, green turtles are considered endangered wherever they occur in United States waters. Incidental capture (bycatch) of sea turtles in fisheries is a primary factor hampering the recovery of sea turtles in the Atlantic Ocean and the Gulf of Mexico.

To address this factor comprehensively, NMFS initiated a Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic Ocean and Gulf of Mexico Fisheries (Strategy). The Strategy is a gear-based approach to addressing sea turtle bycatch. Certain types of fishing gear are more prone to incidentally capture sea turtles than others, depending on the design of the gear, the way the gear is fished, and/or the time and area within which it is fished. The Strategy provides a framework to evaluate sea turtle interactions by gear type in order to have a more comprehensive assessment of fishery impacts across fishing sectors as well as across state, federal, and regional boundaries. Through this Strategy, NMFS seeks to address sea turtle bycatch across jurisdictional boundaries and fisheries for gear types that have the greatest impact on sea turtle populations.

Based on documented sea turtle-fishery interactions, NMFS has identified several gear types that need to be addressed to reduce incidental capture of sea turtles. These gear types include, but are not limited to: gillnets, longlines, trap/pot and trawl gear. Trawl gear has been identified as a priority for addressing sea turtle bycatch, given our knowledge of the level of bycatch in this gear and the availability of technology that is effective at excluding sea turtles from capture in trawl gear.

NMFS is now working to develop and implement bycatch reduction regulations for trawl fisheries in the Atlantic and Gulf of Mexico when and where sea turtle bycatch has occurred or where gear, time, location, fishing method, and other similarities exist between a particular trawl fishery and a trawl fishery where sea turtle bycatch has occurred. Turtle Excluder Devices (TEDs) have been proven to be an effective method to minimize adverse effects related to sea turtle bycatch in the shrimp trawl fishery, summer flounder trawl fishery, several state trawl fisheries, and certain other trawl fisheries around the world. TEDs have an escape opening, usually covered by a webbing flap that allows sea turtles to escape from trawl nets. While TEDs have potential as a bycatch reduction device for all trawl fisheries, differences in trawl designs and fishing methods may necessitate modifications or adjustments to the design of existing TEDs before they can be applied in other trawl fisheries. Testing is necessary to ensure that feasible TED designs for specific fisheries still accomplish the desired sea turtle bycatch reduction goals and to determine the TEDs' impact on target catch retention. It is possible that TEDs may not be feasible for some trawl fisheries. In the event that TEDs are not a viable option, other regulations, e.g., tow time restrictions and time/area closures, may need to be considered. NMFS anticipates a phased approach to the implementation of regulations to reduce sea turtle bycatch in trawl fisheries as the information needed to support and properly analyze regulations in various trawl type becomes available. The ANPR specified those trawl fisheries for which the first phase of establishment of conservation measures via regulation are being considered.

Under the Strategy, there is a proposed three-phase approach to regulating trawl fisheries. The first phase, ''Trawl Phase I,'' will include the following fisheries summer flounder, Atlantic sea scallop, whelk, calico scallop and the flynet fisheries for croaker and weakfish. The second phase, ''Trawl Phase II,'' will likely include sheepshead/black drum/king whiting, porgy, skimmer, Spanish sardine/scad/ladyfish/ butterfish, trynet, squid/mackerel/butterfish, and multispecies (large and small mesh) trawl fisheries. Phase three, ''Trawl Phase III,'' will likely

include the skate, horseshoe crab, monkfish, bluefish, spiny dogfish, and the herring trawl fisheries. Given that NMFS is still in the process of developing and testing the appropriate TED technology for phases two and three fisheries, it is possible that some fisheries in Phase II may move to Phase III or vice versa. Additional trawl fisheries that may exist or develop but have not been identified above would also be considered in Phase II and/or Phase III as information becomes available on those fisheries. For some of these fisheries, TEDs may not be effective given the configuration of the gear or the size of the target species. For those fisheries in which TEDs are not effective, other mitigation measures, such as time and area closures or tow time restrictions, may be considered. The EIS will provide background on the overall Strategy but, due to the state of the current knowledge on Phase II and Phase III, the EIS analyses will focus on fisheries that were identified for Trawl – Phase I.

NMFS will evaluate a range of alternatives in the Draft EIS for implementing phase one of the Strategy to reduce sea turtle bycatch and mortality in trawl fisheries along the Atlantic Coast. In addition to evaluating the status quo, NMFS will evaluate several alternatives. These alternatives include time and area closures, requiring the use of TEDs in the summer flounder, whelk, croaker and weakfish flynet and calico scallop trawls for the entire Atlantic Coast, as well as combination of spatial and temporal options. In terms of spatial options, sea turtles in U.S. waters range as far North as Georges Bank and the Gulf of Maine, but may be less likely to interact with a fishery towards the northern extent of this range. We will likely evaluate several alternatives related to the northern/northeastern extent of any required gear modification or other regulation. In general, NMFS is considering applying any gear modification or other regulation shoreward to the mean high water line. Similarly, several alternatives will likely be evaluated for the temporal extent of when a regulation would be in effect, as sea turtles migrate north along the Atlantic coast as waters warm each year, and are only present in more northern areas during the warmer months. Several datasets are available to help select and analyze the various spatial and temporal alternatives; these include fisheries landings and catch reports, observer data, sea surface temperature data, sea turtle strandings data, and sea turtle sighting and survey data.

6.4.4 Birds

Northern Gannet (*Morus bassanus*)

The Northern gannet is a migratory seabird federally protected in the U.S. and Canada. Gannets spend the boreal summer along coastal Canada and the winter along the U.S. East Coast continental shelf waters. North American breeding colonies exist at 6 main sites in the Gulf of St. Lawrence and along the Atlantic coast of Newfoundland. During the nesting season, March – November, birds forage throughout the North Atlantic from the Bay of Fundy, off the coasts of Newfoundland, Labrador and Greenland and throughout the Gulf of St. Lawrence. Dispersal from breeding sites begins in September, where gannets migrate south along the Northeast Atlantic coast and are considered common winter residents off most Northeast coastal states. Primary prey of the Northern gannet include herring, mackerel and squids. North American breeding population has been increasing since the early 1970's and in 2000 the population was estimated at 144,596 individuals. Northern gannets were not listed as a species of conservation concern by the USFWS in 2008.

Northern gannet Fishery Interactions:

Illex squid: No interactions observed for 2004 – 2008.

Loligo squid: For 2004 to 2008, one Northern Gannet take was observed in March of 2004.

Atlantic mackerel: For 2004 to 2008 a total of 62 Northern Gannets have been observed (2004, n = 17; 2005, n = 1; 2006, n = 2; 2007, n = 30; 2008, n = 12).

Butterfish: No interactions observed for 2004 – 2008.

6.5 Fishery, 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 10's FSEIS, available at http://www.nero.noaa.gov/nero/regs/com.html (data through 2006). An update for 2008 of the importance of the Atlantic mackerel, squid and butterfish to the ports and communities along the Atlantic Coast of the United States is provided immediately below, in section 6.6 of this EA. For each species, Section 6.6 describes the following: stock status; history of landings, quota performance (since mandatory reporting in 1997); 2008 data for: total landings, revenues, vessels, trips, landings by state, landings by month, landings by gear, landings by port, ports most dependent on each species, numbers of permitted vessels by state, numbers of permitted dealers by state, and landings by NMFS federal permit category; areas fished; market overview if applicable; and recreational landings if applicable.

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6.6 Fishery, and Socioeconomic Description (Human Communities)

6.6.1 Atlantic mackerel

6.6.1.1 Status of the Stock

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 (2006) to be F_{msy} = 0.16 and SSB_{msy} = 644,000 mt.

The Atlantic mackerel stock was most recently assessed at SARC 42 (2006). SARC 42 was publically available in 2006 and included data through 2004. Fishing mortality on Atlantic mackerel in 2004 was estimated to be F = 0.05 and spawning stock biomass was 2.3 million mt, leading, SARC 42 to conclude that the northwest Atlantic mackerel stock is not overfished and overfishing is not occurring. 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. 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. Available trends in biomass and recruitment are shown below in Figure 3.

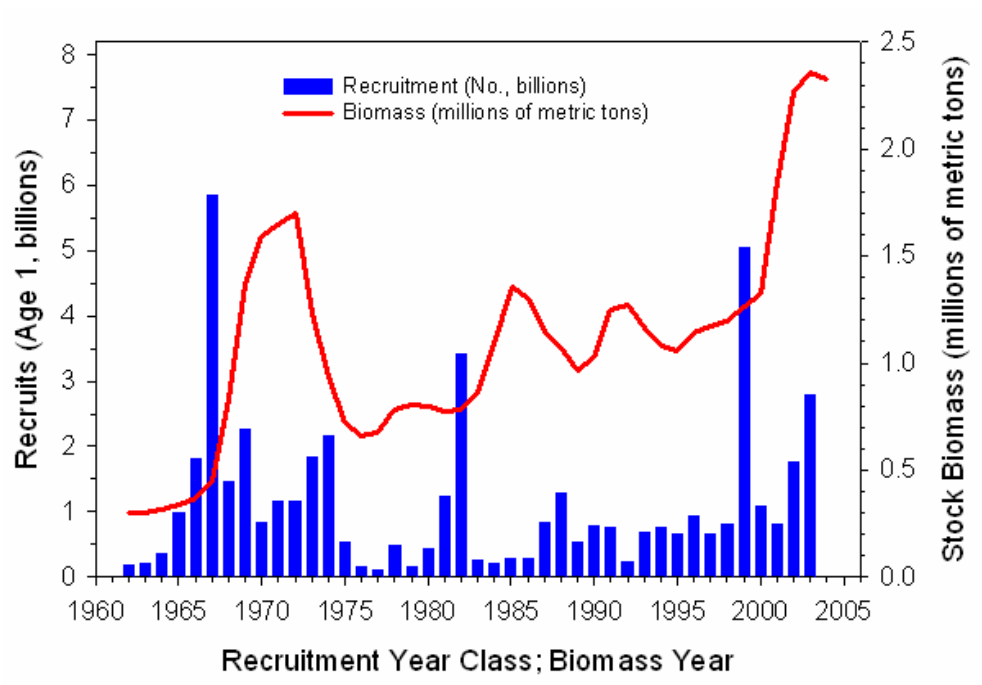

Figure 3. Mackerel biomass and recruitment.

In SARC 42 (2006), deterministic projections for 2006-2008 were conducted by assuming fishing mortality was maintained at F_{target} and assuming annual recruitment values based on the fitted S/R curve. If the F_{target} F=0.12 had been attained in 2006-2008, SSB was projected to

decline to 2,043,440 mt by 2008 with associated landings of 211,990 mt. While actual landings were well below assumed landings, no updated projections are available. Since no projections were made for 2010, the Monitoring Committee used the 2008 projection as the best available proxy for 2010. These short-term projections are relatively high due to an unusually large year-class (1999) present in 2005, and it is expected that these projected landings will decline to MSY (89,000-148,000 mt) in the future when more average recruitment conditions exist in the stock. Amounts available for U.S. harvest would be even less since Ftarget=0.75 x Fmsy and since the Canadian expected catch has to be deducted. NEFSC Spring Survey indices for Atlantic Mackerel are included below in Figure 4.

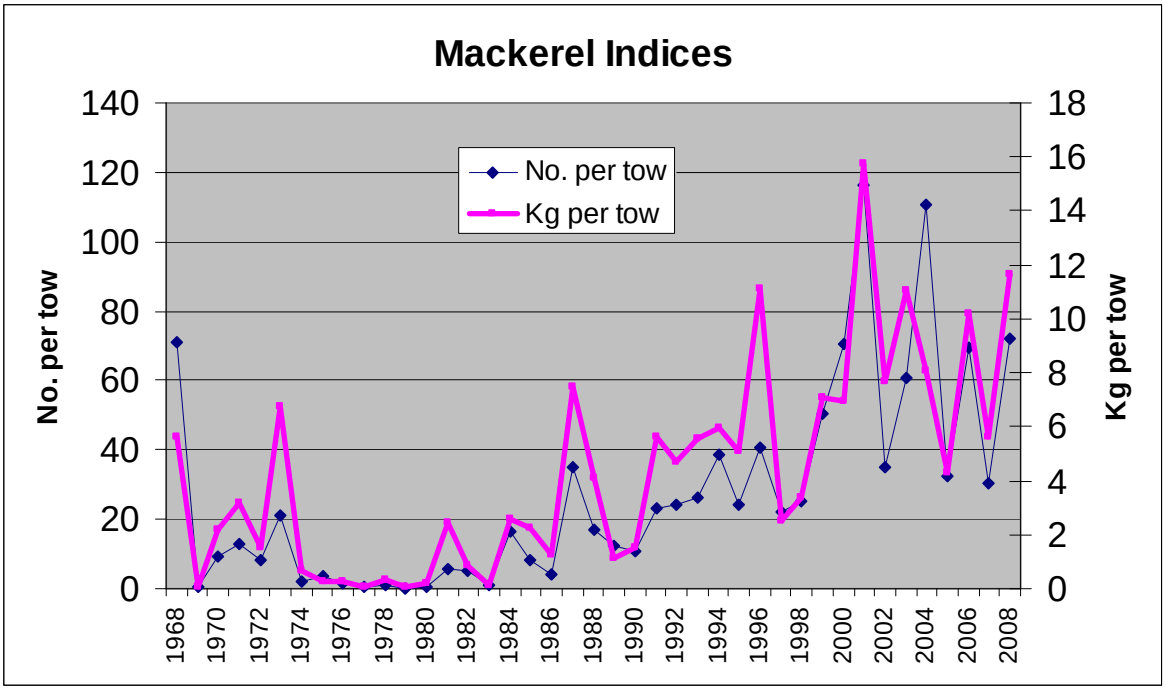

Figure 4. Spring Survey Atlantic Mackerel Indices.

6.6.1.2 Historical Commercial Fishery

The modern northwest Atlantic mackerel fishery began with the arrival of the European distant-water fleets (DWF) in the early 1960's. 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 MSB FMP 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 before being phased out again (Figure 5).

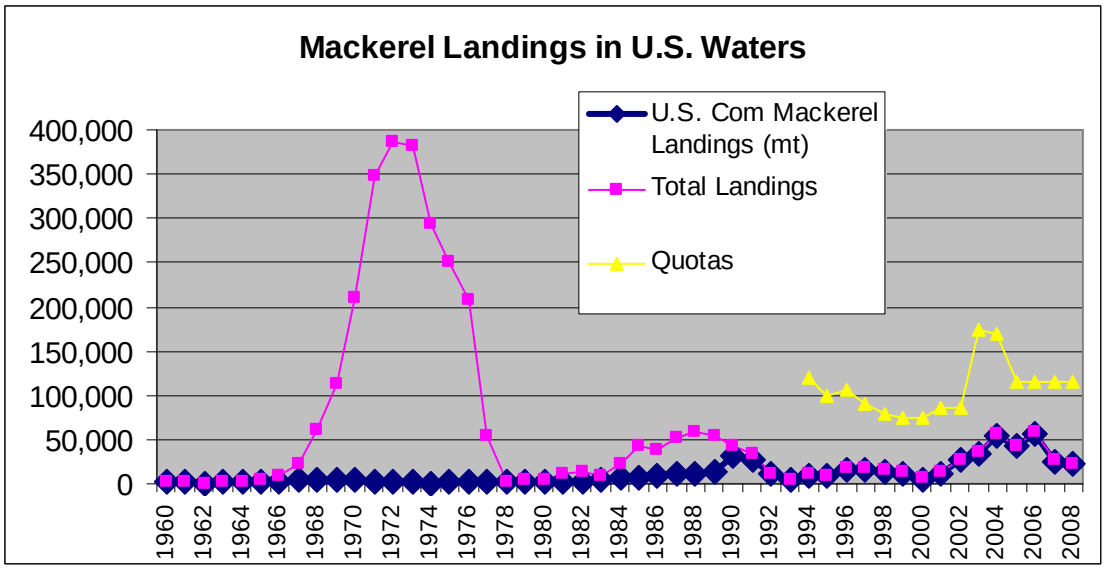

Figure 5. Atlantic mackerel landings within 200 miles of U.S. Coast, 1960-2008.

US commercial landings of mackerel increased steadily from roughly 3000 mt in the early 1980s to greater than 31,000 mt by 1990. US mackerel landings declined to relatively low levels 1992-2000 before increasing in the early 2000's. The most recent years have seen a significant drop-off in harvest. Price (nominal) has fluctuated without trend since 1982 and averaged $285/mt in 2008.

Analysis of NMFS weighout data is used to chart annual estimates for U.S. Atlantic mackerel landings (mt), ex-vessel value ($), and prices 1982-2008 ($/mt) in the figures below.

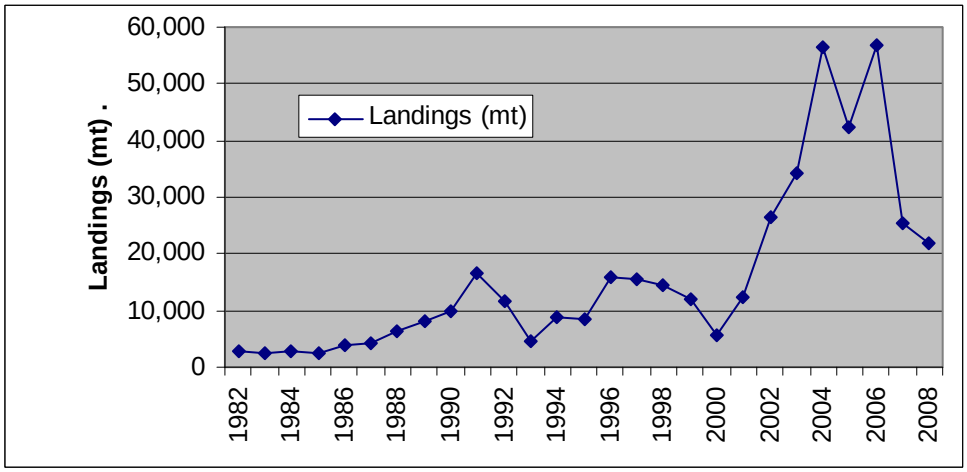

Figure 6. U.S. Atlantic mackerel landings.
Source: Unpublished NMFS dealer reports

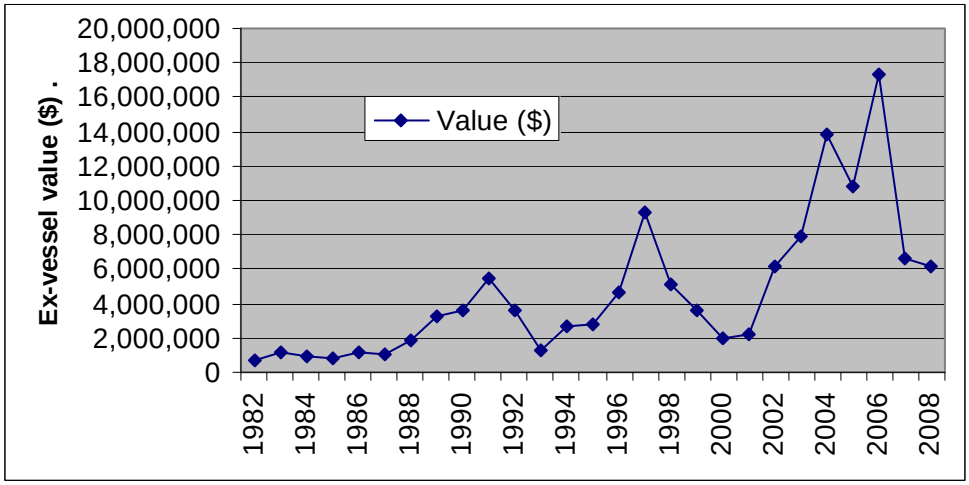

Figure 7. U.S. Atlantic mackerel ex-vessel revenues.
Source: Unpublished NMFS dealer reports

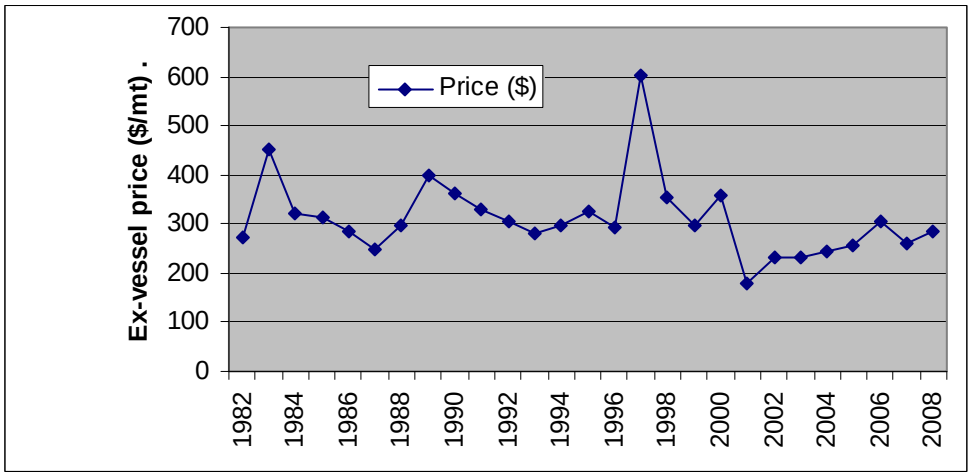

Figure 8. U.S. Atlantic mackerel ex-vessel prices.
Source: Unpublished NMFS dealer reports

Quota Performance

The principle measure used to manage mackerel is quota monitoring via dealer weighout data that is submitted weekly. The dealer data triggers in-season management actions that institute relatively low trip limits when 90% of the quota is landed. Mandatory reporting for mackerel was fully instituted in 1997 so quota performance since 1997 is most relevant in terms of quota performance going forward. Table 4 lists the performance of the mackerel fishery (commercial and recreational together) compared to its quota. There have been no quota overages.

Table 4. Mackerel Quota Performance 1997-2008. (mt)

Year	Harvest (Commercial and Recreational)	Quota	Percent of Quota Landed
1997	17,138	90,000	19%
1998	15,195	80,000	19%
1999	13,366	75,000	18%
2000	7,046	75,000	9%
2001	13,440	85,000	16%
2002	27,815	85,000	33%
2003	35,068	175,000	20%
2004	56,968	170,000	34%
2005	43,242	115,000	38%
2006	58,493	115,000	51%
2007	26,429	115,000	23%
2008	22,440	115,000	20%

6.6.1.3 2008 Commercial Fishery and Community Analysis

The following tables describe, for Atlantic mackerel in 2008, the total landings, value, numbers of vessels making landings, numbers of trips landing mackerel, price per metric ton (Table 5), landings by state (Table 6), landings by month (Table 7), landings by gear (Table 8), landings by port (Table 9), ports most dependent on mackerel (Table 10), numbers of permitted and active vessels by state (Table 11), numbers of Uncanceled permits over time (Figure 9), numbers of permitted and active dealers by state (Table 12), and landings by NMFS federal permit category (Table 13).

Table 5. Total landings and value of Atlantic mackerel during 2008.

(Based on unpublished NMFS dealer reports. For Vessels and Trips, only landing records with recorded NE Permits or Hull Numbers are considered. As such, these numbers are somewhat underestimated.)

	Landings (mt)	Value ($)	Vessels	Trips	$/mt
Atlantic mackerel	21,749	6,190,726	281	1,561	$285

Source: Unpublished NMFS dealer reports

Table 6. Atlantic mackerel landings (mt) by state in 2008.

State	Landings (mt)	Pct_of_Total
Massachusetts	16074.28	74%
New Jersey	4275.72	20%
Rhode Island	1081.89	5%
Maine	218.32	1%
New York	58.59	0%
Connecticut	39.18	0%
North Carolina	0.35	0%
Virginia	0.3	0%
New Hampshire	0.21	0%
Maryland	0	0%
Total	21,749	100%

Source: Unpublished NMFS dealer reports

Table 7. Atlantic mackerel landings (mt) by month in 2008.

MONTH	Landings (mt)	Pct of Total
January	10,738	49%
February	2,281	10%
March	2,551	12%
April	5,305	24%
May	55	0%
June	7	0%
July	6	0%
August	0	0%
September	16	0%
October	11	0%
November	9	0%
December	770	4%
Total	21,749	100%

Source: Unpublished NMFS dealer reports

Table 8. Atlantic mackerel landings (mt) by gear category in 2008.

GEAR_NAME	Landings_mt	Pct_of_Total
TRAWL,OTTER,MIDWATER	9472	44%
TRAWL,OTTER,MIDWATER PAIRED	9137	42%
TRAWL,OTTER,BOTTOM,FISH	2727	13%
Other	413	2%
Total	21749	100%

Source: Unpublished NMFS dealer reports

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Table 9. Atlantic mackerel landings by port in 2008.

name	ST_Name	Landings_mt	Pct_of_Total
GLOUCESTER	MASSACHUSETTS	8196.54	38%
NEW BEDFORD	MASSACHUSETTS	6763.19	31%
CAPE MAY	NEW JERSEY	CI	CI
FALL RIVER	MASSACHUSETTS	CI	CI
NORTH KINGSTOWN	RHODE ISLAND	CI	CI
PORTLAND	MAINE	218.28	1%
Others	NA	247	1%
Total	NA	21,749	100%

Source: unpublished NMFS dealer reports.

Table 10. Value of Atlantic mackerel landings by port compared to total value of all species landed by port in 2008 where mackerel comprised >= 1% of total value.

Port Name	State	Federally Permitted Vessels	Value of All Species	Value of Mackerel	Pct of Port's Revenue from Mackerel
NORTH KINGSTOWN	RI	5	CI	CI	>1%
FALL RIVER	MA	≤3	CI	CI	>1%
GLOUCESTER	MA	46	$54,164,321	$1,855,704	3%
NEW YORK CITY	NY	≤3	CI	CI	>1%
CAPE MAY	NJ	11	CI	CI	>1%

Note: CI = Confidential Information or potentially Confidential Information
Source: unpublished NMFS dealer reports.

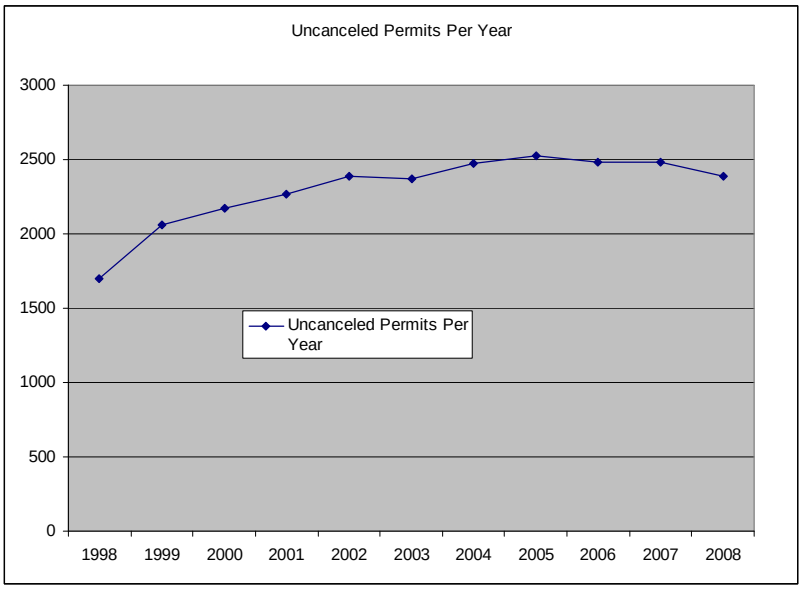
Table 11. Atlantic mackerel vessel permit holders and active permit holders in 2008 by homeport state (HPST).

HPST	Permitted Vessels	Active Vessels
MA	935	78
NJ	304	37
ME	287	5
NY	230	24
RI	155	47
NC	110	2
NH	108	12
VA	93	.
CT	44	6
MD	29	1
FL	15	.
DE	14	1
PA	9	.
GA	3	.
SC	2	.
AL	1	.
NE	1	1
TX	1	.
WV	1	1
Total	2342	215

Source: unpublished NMFS permit and dealer data.

(Note: Table 11 active vessel numbers are less than Table 5 numbers because Table 11 only includes vessels w/ federal permits)

Figure 9. Uncanceled Mackerel Permits Per Year



Source: Unpublished NMFS Permit Data

Table 12. Atlantic mackerel, squid, and butterfish dealer permit holders and those that made Atlantic mackerel purchases in 2008 by state.

State	Permitted Dealers	Active Dealers
MA	167	28
NY	117	16
RI	47	13
ME	38	5
NJ	75	5
NC	35	4
VA	33	4
NH/CT/MD	43	4
AL	1	.
CA	1	.
DE	6	.
FL	8	.
GA	1	.
HI	1	.
LA	3	.
NS	1	.
PA	4	.
SC	2	.
VI	1	.

Source: unpublished NMFS permit and dealer reports.

Table 13. Atlantic mackerel landings by permit category for the period 1999-2008.

Year	Atlantic Mackerel Permit		Party/Charter		No Permit/ Unknown		Total	
	mt	%	mt	%	mt	%	mt	Quota
1999	11,378	95%	4	0%	649	5%	12,031	75,000
2000	5,333	94%	10	0%	306	5%	5,649	75,000
2001	12,063	98%	0	0%	277	2%	12,340	85,000
2002	25,887	98%	0	0%	643	2%	26,530	85,000
2003	33,969	99%	0	0%	329	1%	34,298	175,000
2004	56,097	99%	0	0%	342	1%	56,439	170,000
2005	41,603	99%	0	0%	606	1%	42,209	115,000
2006	56,703	100%	0	0%	157	0%	56,860	115,000
2007	24,446	96%	0	0%	1,101	4%	25,547	115,000
2008	21,305	98%	0	0%	444	2%	21,749	115,000

6.6.1.4 Description of areas fished in VTR Reports

Vessel Trip Reports (VTRs) represent captains' estimates of kept weight of fish/squid. VTR reports, which are a subset of the landings data, provide the approximate location of kept fish/squid. VTR reports for mackerel in 2008 by NMFS three digit statistical area (see Figure 10) are given in Table 14.

Table 14. Statistical areas from which 1% or more of Atlantic mackerel were kept in 2008 according to VTR Reports.

Stat Area	Landings (mt)	Percentage from Area
615	6,344	29%
612	5,425	24%
526	4,374	20%
616	1,930	9%
613	1,564	7%
525	864	4%
539	398	2%
521	273	1%
617	251	1%
527	249	1%

Source: Unpublished NMFS VTR reports.

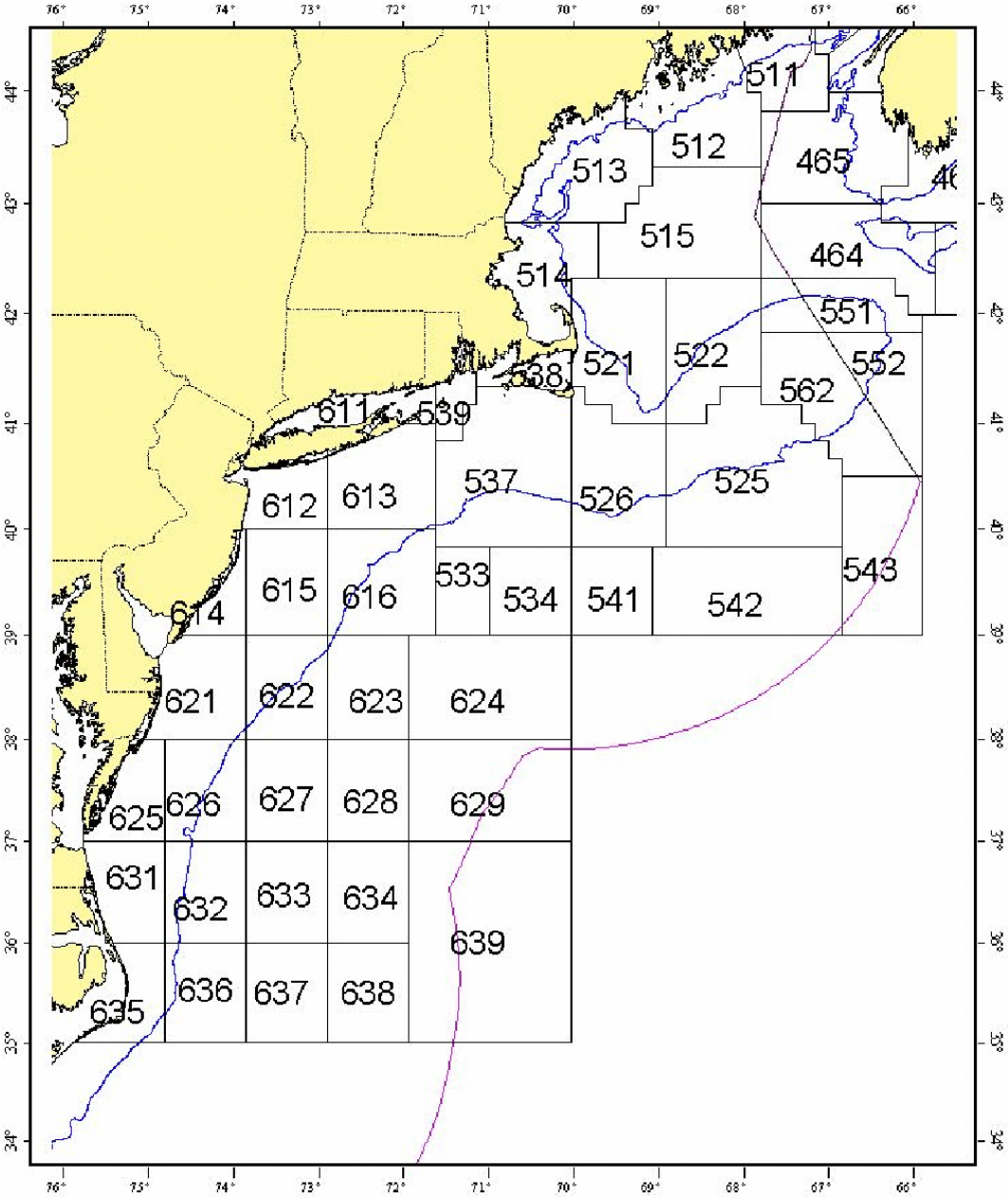


Figure 10. NMFS Statistical Areas

6.6.1.5 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.

6.6.1.5.1 World Production and Prices

According to the FAO, world landings of Atlantic mackerel dramatically increased in the 1960s, peaked at 1,092,759 mt in 1975, and have been between 550,000 mt and 850,000 mt since 1977. 2005 and 2006 landings, the most recent available, were about 560,000 mt, which since 1966 would be considered low but not unprecedented (Figure 11) (http://www.fao.org/fishery/statistics/programme/3,1,1). Prices for exported U.S. mackerel, likely a good indication of prices on the world market, averaged $1,222 per mt in 2008 (*Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division*).

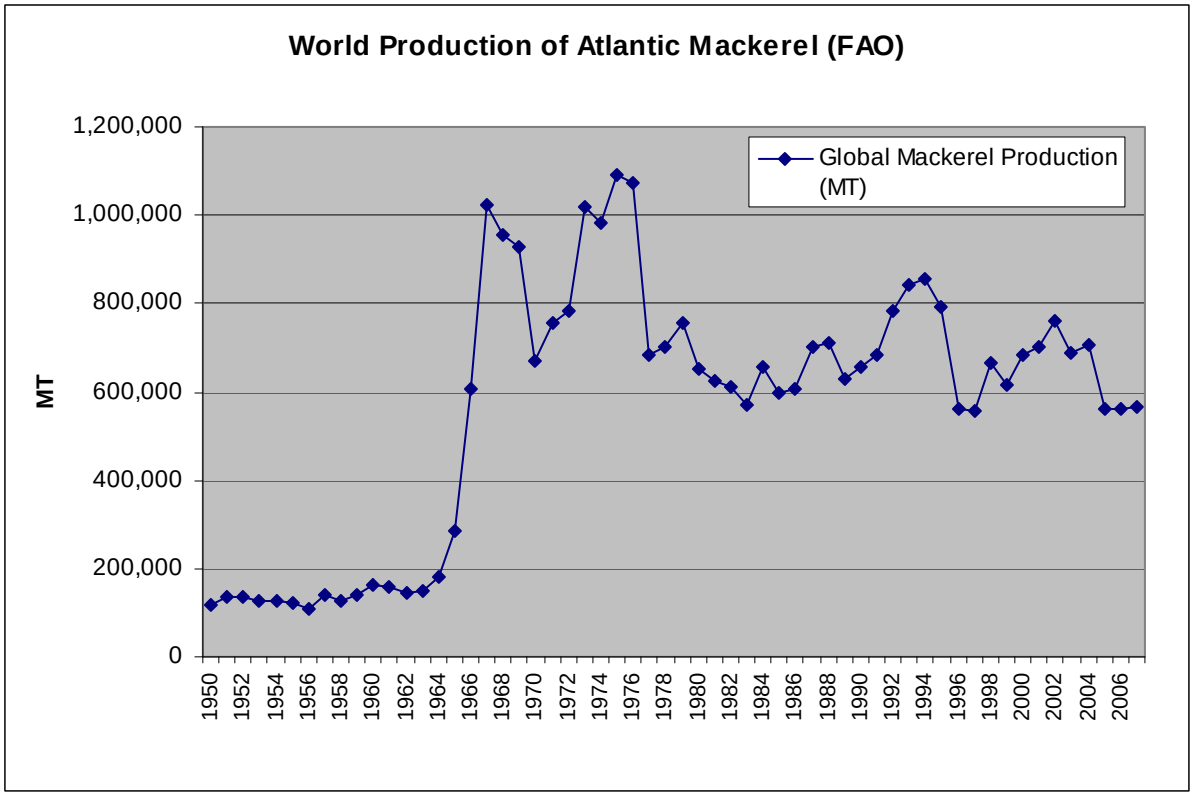


Figure 11. World production of Atlantic mackerel, 1950-2007 based on FAO (2008).

6.6.1.5.2 Future Supplies of and Demand for Mackerel

The nature of future mackerel supply depends largely on the future production of the European mackerel stock, which is much greater than the U.S./Canadian stock. European mackerel stock production fell off in 2006 and 2007, resulting in increased demand for mackerel imports (Chetrick 2006: http://www.fas.usda.gov/info/fasworldwide/2006/10-2006/EUMackerel.pdf). It appears that demand for US mackerel will probably 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. Other influences on demand (income, tastes, competitor products) are difficult to predict.

6.6.1.5.3 US Exports of Mackerel

In 2008, US exports of all mackerel products (fresh, frozen, and prepared/preserved) totaled 27,034 mt, valued at $33 million. The leading markets for US exports of mackerel in 2008 were Egypt (4,881 mt), Japan (4,290), Turkey (3,813), Georgia (1,702), and Bulgaria (1,674) (*Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division.*).

6.6.1.6 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 1999, as estimated from the NMFS Marine Recreational Fishery Statistics Survey (MRFSS), are given in Table 15 and Table 16. In recent years, recreational mackerel harvest has varied from roughly 1,633 mt in 1997 to 530 in 2004. The highest landings occur from New Jersey to Massachusetts. Most Atlantic mackerel are taken from boats. Also, over the same time period approximately 10% of all mackerel caught (by number) were released.

Estimates for Atlantic mackerel recreational harvest are relatively uncertain due to low encounter rates. From 1999-2008 annual estimates had an average Proportional Standard Error (PSE) of 16%. Based on how PSEs are calculated, this means that on average we were approximately 95% sure that the real number for weight of mackerel harvest was within 32% (+ or -) of our estimate (best was ± 23%, worst was ± 46%). This also means there is a 5% chance that the real number is even further away. In addition, the uncertainty is even higher in reality because of sampling problems with MRFSS (MRIP is trying to figure out by just how much - see countmyfish.noaa.gov). Breakouts by state or mode would have greater uncertainty.

Table 15. Recreational harvest (rounded to nearest metric ton) of Atlantic mackerel by state, 1999-2008.

Year	ME	MD	MA	NH	NJ	NY	NC	RI	VA	DE	CT
1999	258	17	624	156	214	15	0	45	5	0	0
2000	364	1	857	166	31	10	0	2	15	0	0
2001	287	22	885	224	78	18	0	7	2	13	0
2002	387	2	728	65	60	0	0	47	0	3	1
2003	123	0	510	79	29	19	0	8	1	0	0
2004	207	0	291	27	2	0	0	0	0	3	0
2005	181	0	768	74	10	0	0	0	0	0	0
2006	109	0	1,488	31	0	0	0	1	0	0	3
2007	280	0	561	43	0	0	0	0	0	0	0
2008	148	0	413	129	0	0	0	0	0	0	0

Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division.

Table 16. Recreational landings (rounded to nearest metric ton) of Atlantic mackerel by mode and total, 1999-2008.

Year	PARTY-CHARTER Boats	PRIVATE or RENTAL Boats	SHORE	Annual Total
1999	293	955	87	1,335
2000	81	1,239	127	1,448
2001	164	1,290	82	1,536
2002	23	1,172	98	1,294
2003	53	594	123	770
2004	21	395	115	530
2005	25	994	14	1,033
2006	11	1,560	62	1,633
2007	20	801	63	884
2008	9	646	35	691

Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division.

6.6.2 *Illex illecebrosus*

6.6.2.1 Status of the Stock

The overfishing definition for *Illex* was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Illex* will be defined to occur when the catch associated with a threshold fishing mortality rate of FMSY is exceeded. Annual quotas will be specified which correspond to a target fishing mortality rate of 75% of FMSY. Maximum OY will be specified as the catch associated with a fishing mortality rate of FMSY. In addition, the biomass target is specified to equal BMSY. The minimum biomass threshold is specified as ½ BMSY.

The *Illex* stock was most recently assessed at SARC 42 (2006). SARC 42 was publically available in 2006 and included data through 2004. 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. SAW 37 (the previous assessment) also could not 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, it was determined that overfishing was not likely to have occurred during 1999-2002. NEFSC indices for fall surveys (when *Illex* are available) are included below in Figure 12.

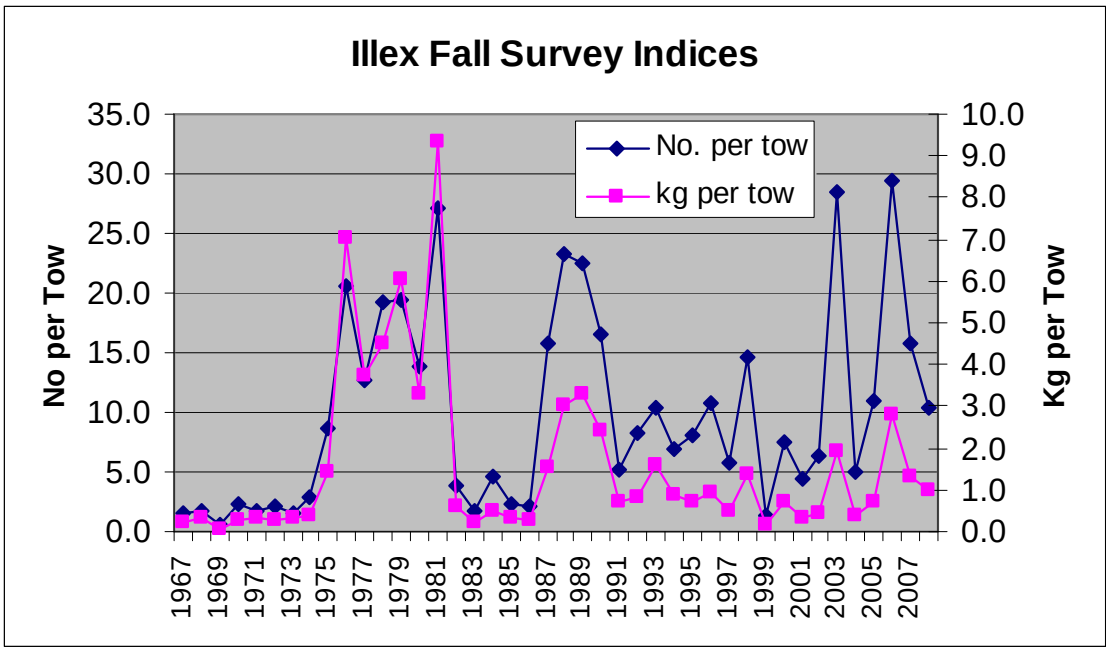


Figure 12. *Illex* Indices from NEFSC Fall survey.

6.6.2.2 Historical Commercial Fishery

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 (Figure 13). 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 fitfully during the 1980's as foreign fishing was eliminated in the US EEZ. *Illex* landings are heavily influenced by year-to-year availability and world-market activity. Price (nominal) has increased fitfully since 1982 and averaged $525/mt in 2008.

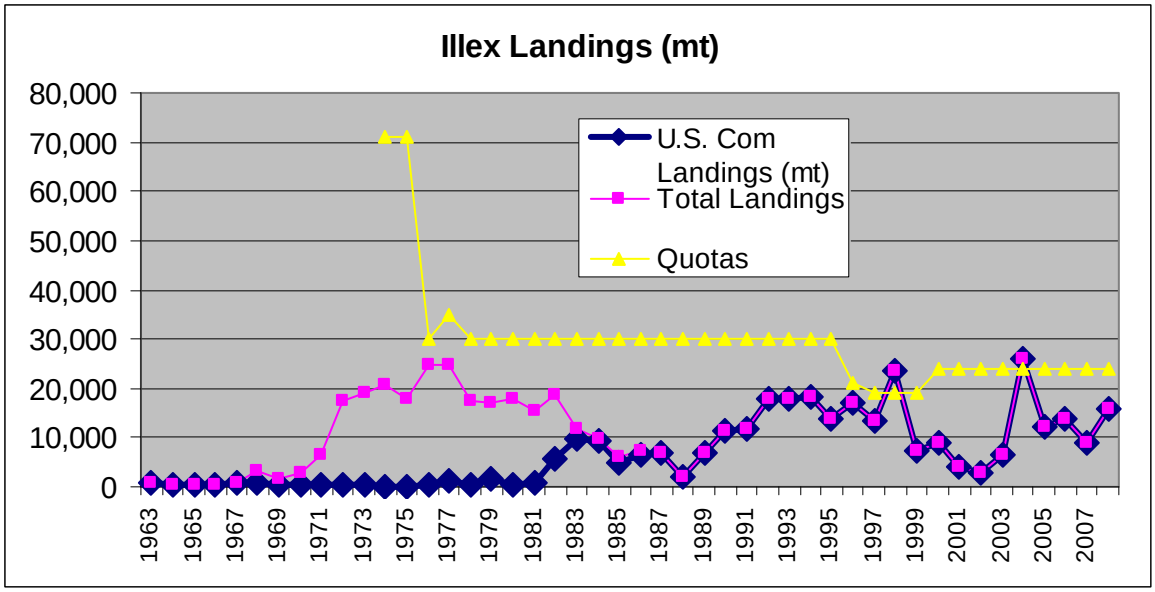


Figure 13. Landings of *Illex* in the U.S. EEZ, 1963-2008.

Analysis of NMFS dealer weighout data 1982-2008 is used to chart annual averages for U.S. landings (mt), ex-vessel value ($), and prices ($/mt) in the figures below.

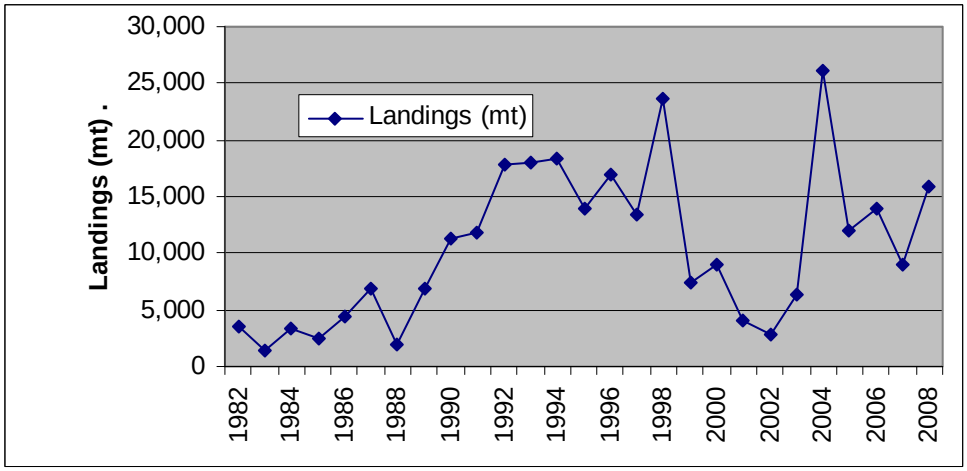


Figure 14. U.S. *Illex* landings.

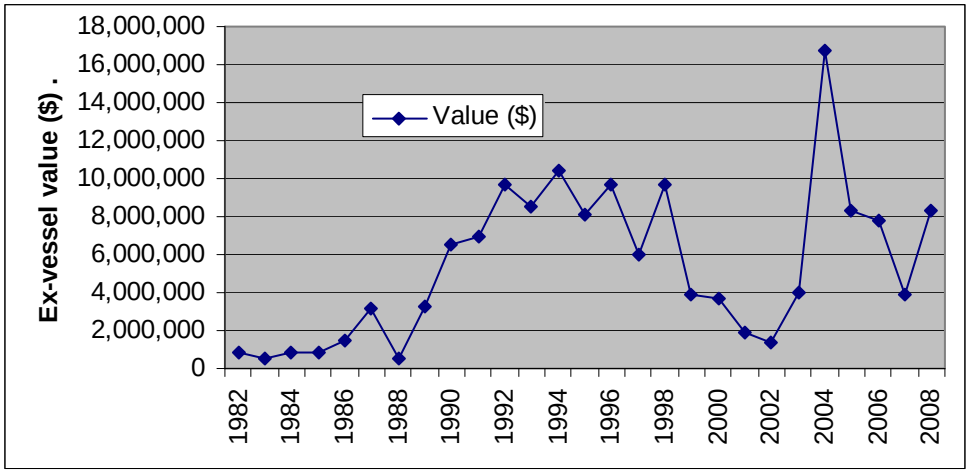


Figure 15. U.S. *Illex* ex-vessel revenues.
Source: Unpublished NMFS dealer reports

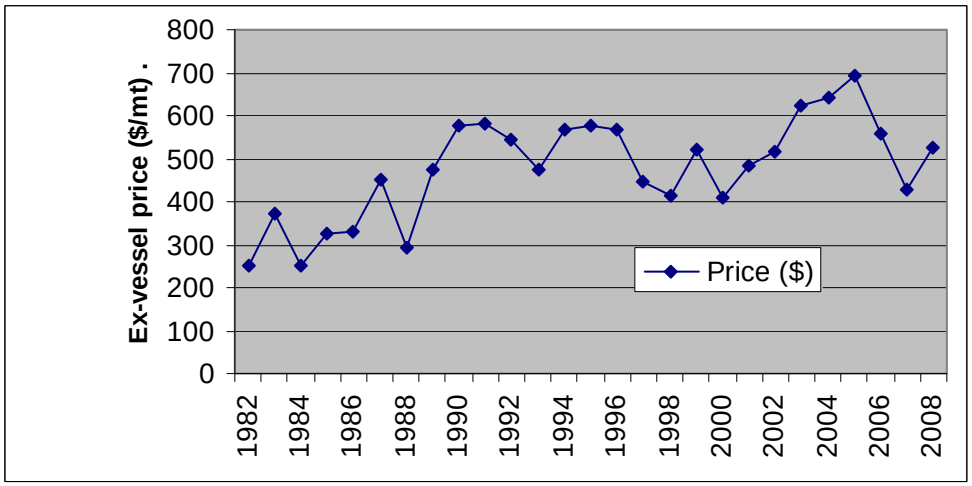


Figure 16. U.S. *Illex* ex-vessel prices.
Source: Unpublished NMFS dealer reports

Quota Performance

The principle measure used to manage *Illex* is quota monitoring via dealer weighout data that is submitted weekly. The dealer data triggers in-season management actions that institute relatively low trip limits when 95% of the quota is landed. Mandatory reporting for *Illex* was fully instituted in 1997 so quota performance since 1997 is most relevant in terms of quota performance going forward. Table 17 lists the performance of the *Illex* fishery compared to its quota. There was a quota overage in 1 of the last 10 years (a 9% overage in 2004) and 2 of the last 12 years (the 9% overage and a 24% overage in 1998). NMFS is continually augmenting its quota projecting procedures so presumably future overages would be even less likely.

Table 17. *Illex* Quota Performance 1997-2008. (mt)

Year	Landings	Quota	Percent of Quota Landed
1997	13,356	19,000	70%
1998	23,568	19,000	124%
1999	7,389	19,000	39%
2000	9,011	24,000	38%
2001	4,009	24,000	17%
2002	2,750	24,000	11%
2003	6,391	24,000	27%
2004	26,097	24,000	109%
2005	12,011	24,000	50%
2006	13,944	24,000	58%
2007	9,022	24,000	38%
2008	15,900	24,000	66%

6.6.2.3 2008 Commercial Fishery and Community Analysis

The following tables describe, for *Illex* in 2008, the total landings, value, numbers of vessels making landings, numbers of trips landing *Illex* (Table 18), landings by state (Table 19), landings by month (Table 20), landings by gear (Table 21), landings by port (Table 22), ports most dependent on *Illex* (Table 23), numbers of permitted and active vessels by state (Table 24), numbers of permitted and active dealers by state (Table 25), and landings by NMFS federal permit category (Table 26).

Table 18. Total landings and value of *Illex* during 2008.
(based on unpublished NMFS dealer reports. For Vessels and Trips, only landing records with recorded NE Permits or Hull Numbers are considered. As such, these numbers are somewhat underestimated.)

	Landings (mt)	Value ($)	Vessels	Trips	$/mt
Illex	15,900	8,345,521	37	230	$525

Source: Unpublished NMFS dealer reports

Table 19. *Illex* landings (mt) by state in 2008.

State	Landings_ mt	Pct_of_Total
New Jersey	10,454	66%
Rhode Island	5,333	34%
Virginia	77	0%
North Carolina	35	0%
Other	2	0%
Total	15,900	100%

Source: Unpublished NMFS dealer reports

Table 20. *Illex* squid landings (mt) by month in 2008.

MONTH	Landings_mt	Pct_of_Total
January	0	0%
February	0	0%
March	0	0%
April	2	0%
May	33	0%
June	881	6%
July	2,485	16%
August	6,129	39%
September	4,123	26%
October	2,032	13%
November	157	1%
December	57	0%
Total	15,900	100%

Source: Unpublished NMFS dealer reports

Table 21. *Illex* landings (mt) by gear category in 2008.

GEAR_NAME	Landings_mt	Pct_of_Total
TRAWL,OTTER,BOTTOM,FISH	12,710	80%
HAND LINE, OTHER	2,054	13%
TRAWL,OTTER,MIDWATER	939	6%
DREDGE, OTHER	161	1%
Other	36	0%
Total	15,900	100%

Source: Unpublished NMFS vessel trip reports

Table 22. *Illex* landings by port in 2008.

name	ST_Name	Landings_mt	Pct_of_Total
CAPE MAY	NEW JERSEY	CI	CI
NORTH KINGSTOWN	RHODE ISLAND	CI	CI
All others		115	1%
Total	NA	15,900	100%

Source: Unpublished NMFS dealer reports.

Table 23. Value of *Illex* landings by port compared to total value of all species landed by port in 2008 where *Illex* comprised >= 1% of total value

Port Name	State	Federally Permitted Vessels	Value of All Species	Value of *Illex*	Pct of Port's Revenue from *Illex*
NORTH KINGSTOWN	RI	5	CI	CI	>1%
CAPE MAY	NJ	13	CI	CI	>1%

Source: Unpublished NMFS dealer reports.

Table 24. *Illex* moratorium vessel permit holders and active vessels in 2008 by homeport state (HPST).

HPST	Permitted Vessels	Active Vessels
NJ	26	7
MA	14	2
RI	12	4
NC	7	1
NY	7	1
VA	5	.
PA	3	1
CT	2	1
NH	1	.
Total	77	17

Source: Unpublished NMFS dealer reports. (Note: Table 24 active vessel numbers are less than Table 18 numbers because Table 24 only includes vessels with federal moratorium permits).

Table 25. Atlantic mackerel, squid, butterfish dealer permit holders and permitted dealers who bought *Illex* in 2008 by state. Source: Unpublished NMFS dealer reports.

State	Permitted Dealers	Active Dealers
MA	167	7
ME, RI, CT	96	5
NJ, NY, VA, NC	260	7
AL	1	.
CA	1	.
DE	6	.
FL	8	.
GA	1	.
HI	1	.
LA	3	.
MD	16	.
NH	16	.
NS	1	.
PA	4	.
SC	2	.
VI	1	.

Table 26. *Illex* landings by permit category for the period 1999-2008.

Year	Illex Moratorium Permit		Party/ Charter		Incidental		No Permit/ Unknown		Total	
	mt	%	mt	%	mt	%	mt	%	mt	Quota
1999	7,367	100%	0	0%	13	0%	8	0%	7,389	19,000
2000	8,234	99%	0	0%	1	0%	77	1%	8,312	24,000
2001	3,922	98%	0	0%	0	0%	86	2%	4,009	24,000
2002	2,743	100%	0	0%	2	0%	5	0%	2,750	24,000
2003	6,389	100%	0	0%	0	0%	2	0%	6,391	24,000
2004	25,008	98%	0	0%	139	1%	274	1%	25,422	24,000
2005	11,279	96%	0	0%	23	0%	415	4%	11,717	24,000
2006	13,377	97%	0	0%	52	0%	408	3%	13,837	24,000
2007	8,907	99%	0	0%	1	0%	114	1%	9,022	24,000
2008	15,585	98%	0	0%	0	0%	315	2%	15,900	24,000

6.6.2.4 Description of the areas fished in VTR Reports

Vessel Trip Reports (VTRs) represent captains' estimates of kept weight of fish/squid. VTR reports, which are a subset of the landings data, provide the approximate location of kept fish/squid. VTR reports for *Illex* in 2008 by NMFS three digit statistical area (see Figure 10) are given in Table 27.

Table 27. Statistical areas from which 1% or more of *Illex* were kept in 2008 according to VTR Reports.

Stat Area	Landings (mt)	Percentage from Area
622	10,639	73%
616	1,110	8%
621	697	5%
632	680	5%
526	564	4%
626	399	3%
623	305	2%

Source: Unpublished NMFS VTR reports.

6.6.3 Atlantic butterfish

6.6.3.1 Status of the stock

The overfishing definition for Butterfish was revised in Amendment 8 to comply with the SFA as follows: overfishing for butterfish will be defined to occur when the catch associated with a threshold fishing mortality rate of FMSY is exceeded. Annual quotas will be specified which correspond to a target fishing mortality rate of 75% of FMSY. Maximum OY will be specified as the catch associated with a fishing mortality rate of FMSY. In addition, the biomass target is specified to equal BMSY. The minimum biomass threshold is specified as ½ BMSY.

The butterfish stock was most recently assessed at SARC 38 (2004). SARC 38 (2004) was publically available in 2004 and included data through 2002. SARC 38 (2004) determined that butterfish was overfished in 2002 (NEFSC 2004). Although the assessment stock size estimates are highly imprecise (80% confidence interval ranged from 2,600 mt to 10,900 mt), the overfished determination was based on the fact that the 2002 biomass estimate for butterfish of 7,800 mt fell below the threshold level defining the stock as overfished (1/2 Bmsy=11,400 mt). Based on the current overfishing definition, overfishing was not occurring (NMFS 2004). Trends in recruitment and biomass are shown below in Figure 17 while trawl survey indices are provided in figures 18 and 19.

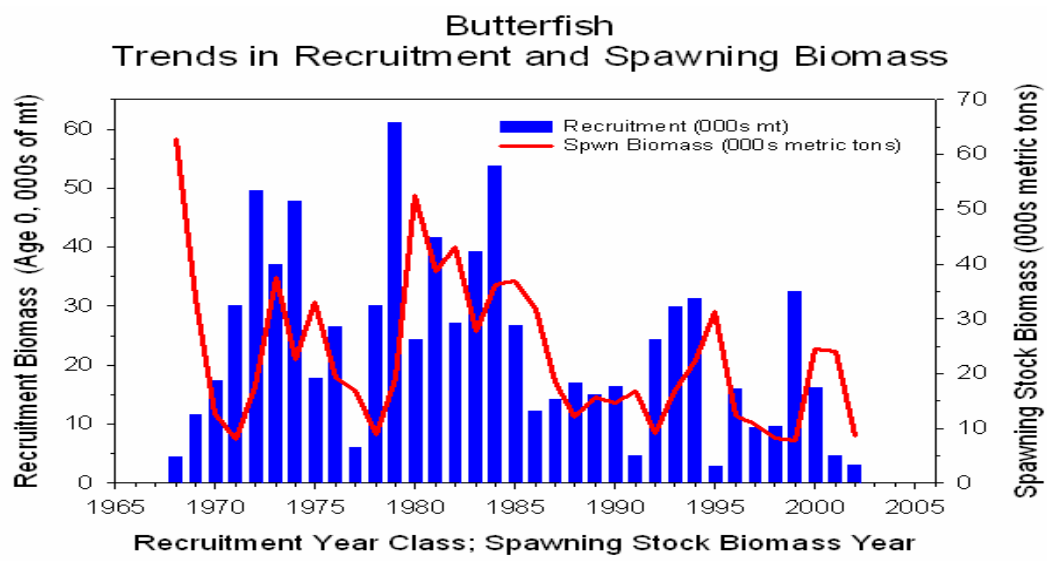


Figure 17. Butterfish recruitment and biomass.

Butterfish discards are estimated to equal twice the annual landings (NEFSC 2004). Analyses have shown that the primary source of butterfish discards is the *Loligo* fishery because it uses small-mesh, diamond-mesh codends (as small as 1 $^{7/8}$ inches minimum mesh size) and because butterfish and *Loligo* co-occur year round. The truncated age distribution of the butterfish stock is also problematic. Historically, the stock was characterized by a broader age distribution and the maximum age was six years. The lifespan is now three years (NEFSC 2004). The truncated age structure results in reduced egg production and the reduced lifespan artificially reduces the mean generation time required to rebuild the stock. Because of the overfished determination,

current federal law obligates the Council to develop and implement a stock rebuilding plan, and Amendment 10, now in rulemaking, will implement a butterfish rebuilding plan.

There is no peer reviewed information available on butterfish abundance in 2008. Recent, unpublished NEFSC survey indices suggest that butterfish relative abundance may have increased only somewhat since 2002. It should also be noted that, historically, the spring and fall survey indices have not tracked each other. Regardless, the 2004 SAW/SARC report is the authoritative reference for stock status and current federal law obligates the Council to develop and implement a stock rebuilding plan until a peer reviewed butterfish stock assessment determines the stock is rebuilt to the B_{msy} level (the next butterfish assessment is scheduled for fall 2009).

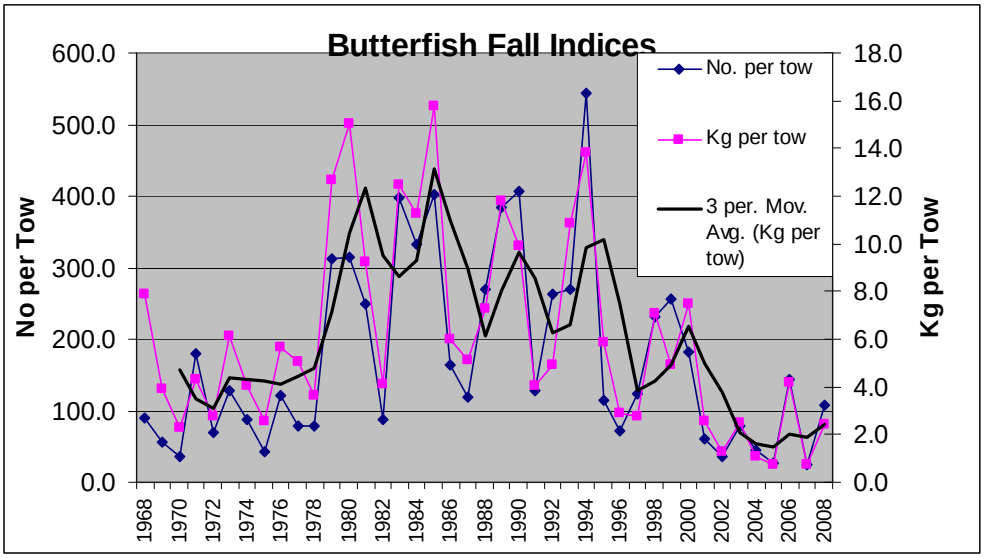


Figure 18. NEFSC fall trawl survey indices for butterfish, 1968-2008

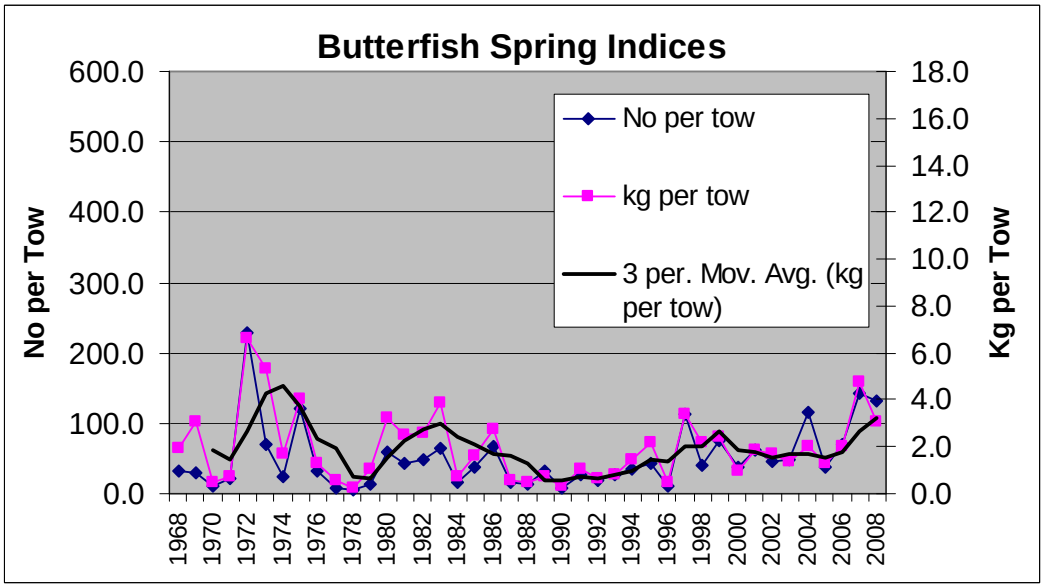


Figure 19. NEFSC spring trawl survey indices for butterfish, 1968-2008

6.6.3.2 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 32,000 mt in 1973. With the advent of extended jurisdiction in US waters, reported foreign catches declined sharply from 14,000 mt in 1976 to 2,000 mt in 1978 (Figure 20). Foreign landings were completely phased out by 1987.

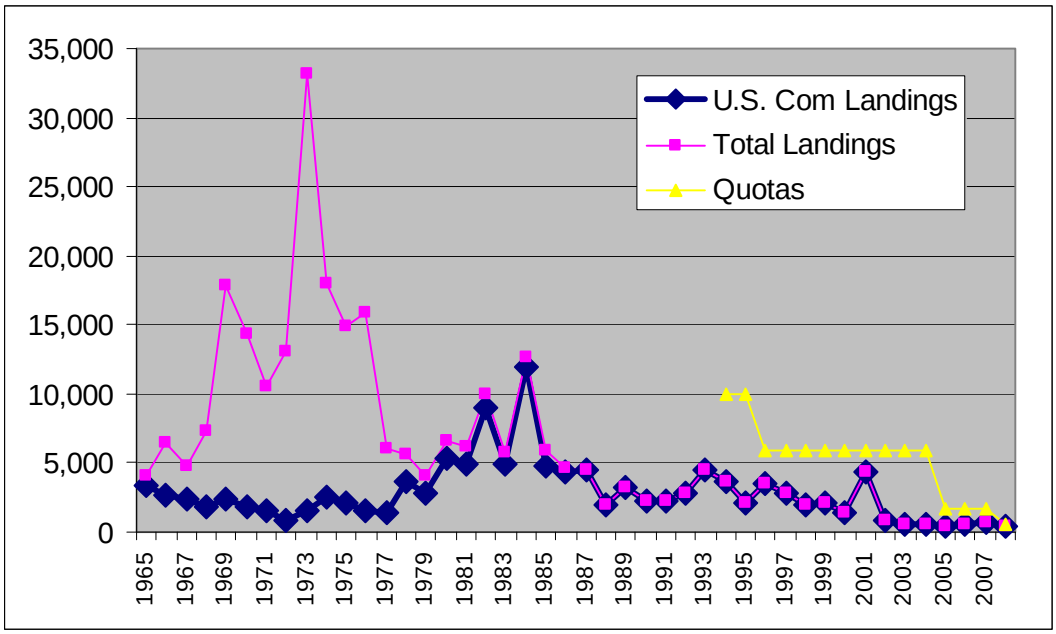


Figure 20. Landings of butterfish in the United States exclusive economic zone (mt).

During the period 1965-1976, US Atlantic butterfish landings averaged 2,051 mt. From 1977-1987, average US landings doubled to 5,252 mt, with a historical peak of slightly less than 12,000 mt landed in 1984. Since then US landings have declined sharply. Low abundance and reductions in Japanese demand for butterfish has probably had a negative effect on butterfish landings. Price (nominal) has increased fitfully since 1982 and averaged $1,677/mt in 2008. Analysis of NMFS weighout data 1982-2008 is used to chart annual averages for U.S. landings (mt), ex-vessel value ($), and prices ($/mt) in the figures below.

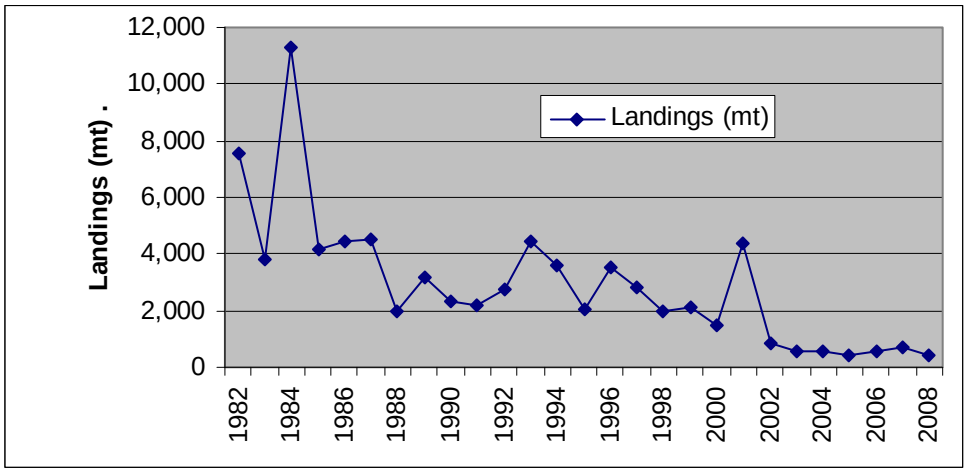


Figure 21. U.S. butterfish landings.
Source: Unpublished NMFS dealer reports

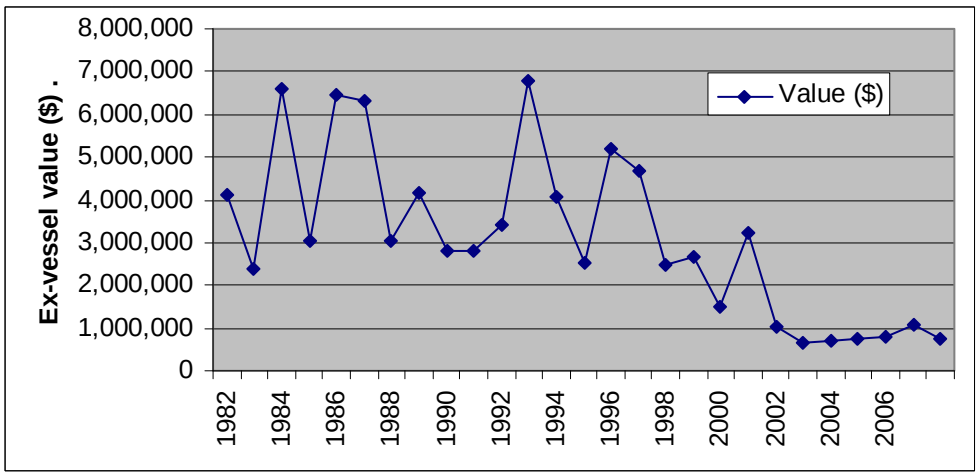


Figure 22. U.S. butterfish ex-vessel revenues.
Source: Unpublished NMFS dealer reports

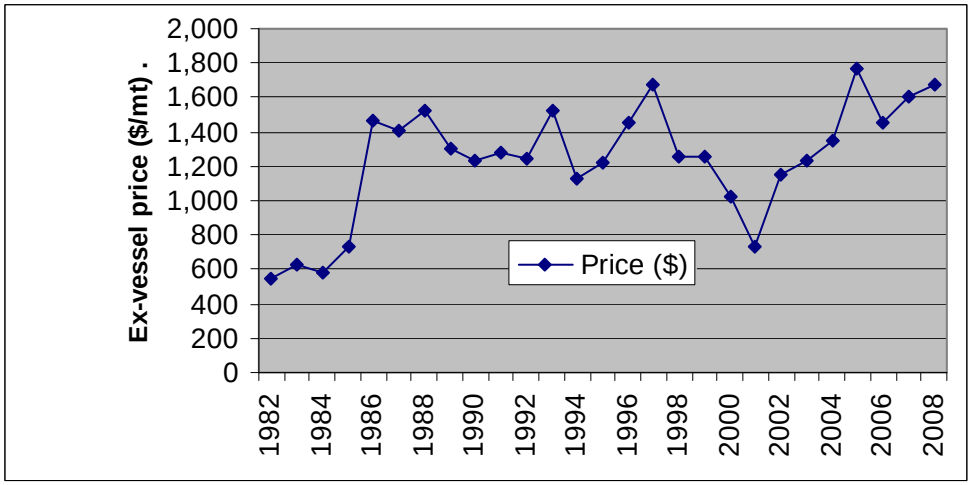


Figure 23. U.S. butterfish ex-vessel prices.
Source: Unpublished NMFS dealer reports

Quota Performance

The principle measure used to manage butterfish landings is quota monitoring via dealer weighout data that is submitted weekly. The dealer data triggers in-season management actions that institute relatively low trip limits when 80% of the quota is landed. Mandatory reporting for butterfish was fully instituted in 1997 so quota performance since 1997 is most relevant in terms of quota performance going forward. Table 28 lists the performance of the butterfish fishery compared to its quota. There have been no quota overages. There was a closure in 2008 after the quota was reduced by 70%, but the closure threshold and the trip limits performed as designed and prevented a quota overage.

Table 28. Butterfish Quota Performance 1997-2008 (mt)

Year	Landings	Quota	Percent of Quota Landed
1997	2,795	5,900	47%
1998	1,966	5,900	33%
1999	2,110	5,900	36%
2000	1,449	5,900	25%
2001	4,404	5,897	75%
2002	872	5,900	15%
2003	536	5,900	9%
2004	534	5,900	9%
2005	437	1,681	26%
2006	554	1,681	33%
2007	674	1,681	40%
2008	451	500	90%

6.6.3.3 2008 Commercial Fishery and Community Analysis

The following tables describe, for butterfish in 2008, the total landings, value, numbers of vessels making landings, numbers of trips landing butterfish (Table 29), landings by state (Table 30), landings by month (Table 31), landings by gear (Table 32), landings by port (Table 33), ports most dependent on butterfish (Table 34), numbers of permitted vessels by state (Table 35), numbers of permitted dealers by state (Table 36), and landings by NMFS federal permit category (Table 37).

Table 29. Total landings and value of butterfish during 2008.
(Based on unpublished NMFS dealer reports. For Vessels and Trips, only landing records with recorded NE Permits or Hull Numbers are considered. As such, these numbers are somewhat underestimated.)

	Landings (mt)	Value ($)	Vessels	Trips	$/mt
Butterfish	451	756,353	307	5,034	$1,677

Source: Unpublished NMFS dealer reports

Table 30. Butterfish landings (mt) by state in 2008.

State	Landings_mt	Pct_of_Total
Rhode Island	191	42%
New York	188	42%
Connecticut	22	5%
New Jersey	20	4%
Massachusetts	15	3%
Virginia	12	3%
Maryland	2	0%
Maine	1	0%
New Hampshire	0	0%
Delaware	0	0%
Total	451	100%

Source: Unpublished NMFS dealer reports.

Table 31. Butterfish landings (mt) by month in 2008.

MONTH	Landings_mt	Pct_of_Total
January	51	11%
February	97	21%
March	44	10%
April	42	9%
May	47	11%
June	50	11%
July	38	8%
August	27	6%
September	16	3%
October	15	3%
November	10	2%
December	13	3%
Total	451	100%

Source: Unpublished NMFS dealer reports.

Table 32. Butterfish landings (mt) by gear category in 2008.

GEAR_NAME	Landings_mt	Pct_of_Total
TRAWL,OTTER,BOTTOM,FISH	296	66%
UNKNOWN (mix of state reports and dealer reports without gear record)	108	24%
DREDGE, OTHER	15	3%
POUND NET, OTHER	7	2%
TROLL LINE, OTHER	4	1%
GILL NET,SINK, OTHER	4	1%
TRAWL,OTTER,BOTTOM,OTHER	4	1%
HAND LINE, OTHER	3	1%
DIP NET, COMMON	2	1%
LONGLINE, BOTTOM	2	0%
POUND NET, FISH	2	0%
TRAWL,OTTER,MIDWATER	1	0%
FLOATING TRAP	1	0%
POTS + TRAPS,OTHER	1	0%
OTHER	1	0%
Totals	451	100%

Source: Unpublished NMFS dealer data.

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Table 33. Butterfish landings by port in 2008.

name	ST_Name	Landings_mt	Pct_of_Total
POINT JUDITH & NORTH KINGSTOWN	RHODE ISLAND	175	39%
MONTAUK	NEW YORK	136	30%
HAMPTON BAYS & AMAGANSETT	NEW YORK	30	6%
NEW BEDFORD	MASSACHUSETTS	11	2%
NEWPORT & LITTLE COMPTON	RHODE ISLAND	16	4%
NEW LONDON	CONNECTICUT	9	2%
OTHER NEW YORK	NEW YORK	19	4%
CAPE MAY	NEW JERSEY	7	2%
BELFORD	NEW JERSEY	7	2%
OTHER CONNECTICUT	CONNECTICUT	7	1%
HAMPTON & CHINCOTEAGUE	VIRGINIA	8	1%
POINT PLEASANT	NEW JERSEY	5	1%
STONINGTON	CONNECTICUT	5	1%
All others	NA	16	3%
	Total	451	100%

Source: Unpublished NMFS dealer reports

Table 34. Ports that had 1% or greater of ex-vessel value from butterfish. The additional data provided in a similar table for other species can not be provided due to data confidentiality.

Port Name	State
OTHER NEW LONDON	CONNECTICUT
AMAGANSETT	NEW YORK
WAINSCOTT	NEW YORK
MATTITUCK	NEW YORK
MONTAUK	NEW YORK
GREENPORT	NEW YORK
ISLAND PARK	NEW YORK
MORICHES	NEW YORK
LITTLE WICOMICO RIVER	VIRGINIA

Source: Unpublished NMFS dealer reports and NMFS permit database data

Table 35. *Loligo*/Butterfish moratorium vessel permit holders in 2008 by homeport state (HPST) and how many of those vessels were active.

HPST	Permitted Vessels	Active Vessels
MA	104	18
NJ	84	41
NY	59	41
RI	57	47
NC	22	6
ME	17	1
VA	12	1
CT	8	6
PA	4	1
MD	2	1
NH	1	.
WV	1	1
Total	371	164

Source: Unpublished NMFS dealer reports and NMFS permit database data

(Note: Table 35 active vessel numbers are less than Table 29 numbers because Table 35 only includes vessels with federal moratorium permits).

Table 36. Atlantic mackerel, squid, butterfish dealer permit holders and how many were active (bought butterfish) in 2008 by state.

State	Permitted Dealers	Active Dealers
NY	117	31
RI	47	16
MA, ME, NH	221	13
NJ	75	7
VA	33	6
CT, MD	27	4
AL	1	.
CA	1	.
DE	6	.
FL	8	.
GA	1	.
HI	1	.
LA	3	.
NC	35	.
NS	1	.
PA	4	.
SC	2	.
VI	1	.

Source: Unpublished NMFS dealer reports and NMFS permit database data

Table 37. Butterfish landings by permit category for the period 1999-2008.

Year	Loligo/Butterfish Moratorium Permit		Party/Charter		Incidental		No Permit/ Unknown		Total	
	mt	%	mt	%	mt	%	mt	%	mt	Quota
1999	1,868	89%	0	0%	33	2%	209	10%	2,110	5,900
2000	1,175	81%	0	0%	60	4%	214	15%	1,449	5,900
2001	3,991	91%	1	0%	52	1%	360	8%	4,404	5,897
2002	653	75%	0	0%	39	4%	180	21%	872	5,900
2003	367	69%	0	0%	17	3%	151	28%	536	5,900
2004	323	61%	0	0%	21	4%	190	36%	534	5,900
2005	271	62%	0	0%	13	3%	154	35%	437	1,681
2006	377	68%	0	0%	36	7%	141	25%	554	1,681
2007	524	78%	0	0%	42	6%	108	16%	674	1,681
2008	320	71%	0	0%	29	6%	102	23%	451	500

6.6.3.5 Description of the areas fished in VTR Reports

Vessel Trip Reports (VTRs) represent captains' estimates of kept weight of fish/squid. VTR reports, which are a subset of the landings data, provide the approximate location of kept fish/squid. VTR reports for butterfish in 2008 by NMFS three digit statistical area (see Figure 10 except as noted in table below) are given in Table 38.

Table 38. Statistical areas from which 1% or more of butterfish were kept in 2008 according to VTR Reports.

Stat Area	Landings (mt)	Percentage from Area
537	154	28%
700 (off NC - Gulf Butterfish	147	27%
616	87	16%
611	43	8%
539	24	4%
613	21	4%
525	13	2%
148 (Inshore Long Island)	9	2%
612	7	1%
635	7	1%

Source: Unpublished NMFS VTR reports

6.6.4 *Loligo pealei*

6.6.4.1 Status of the stock

The *Loligo* stock was most recently assessed at SARC 34 (2002). SARC 34 was publically available in 2002 and included data through 2000. 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. 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.

Amendment 9 implemented revised proxies for calculating fishing mortality thresholds and targets as recommended by SARC 34 (2002). The revised proxies are calculated as follows: FTarget is the 75th percentile of fishing mortality rates during 1987 - 2000 and FThreshold is the average fishing mortality rates during the same period. The revised proxy for FTarget (0.32 or 0.24 for trimesters and quarters, respectively) will be used as the basis for establishing *Loligo* OY. These revised proxies for FTarget and FThreshold are fixed values based on average fishing mortality rates achieved during a time period when the stock biomass was fairly resilient (1987 - 2000). In addition, the biomass target is specified to equal B_{MSY}.

SARC 34 (2002) 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 (2002) recommended that the Council maintain a catch not to exceed about 20,000 mt (to include both landings and discards). 2008 indices were somewhat below the long term average for kg/tow (Figure 24).

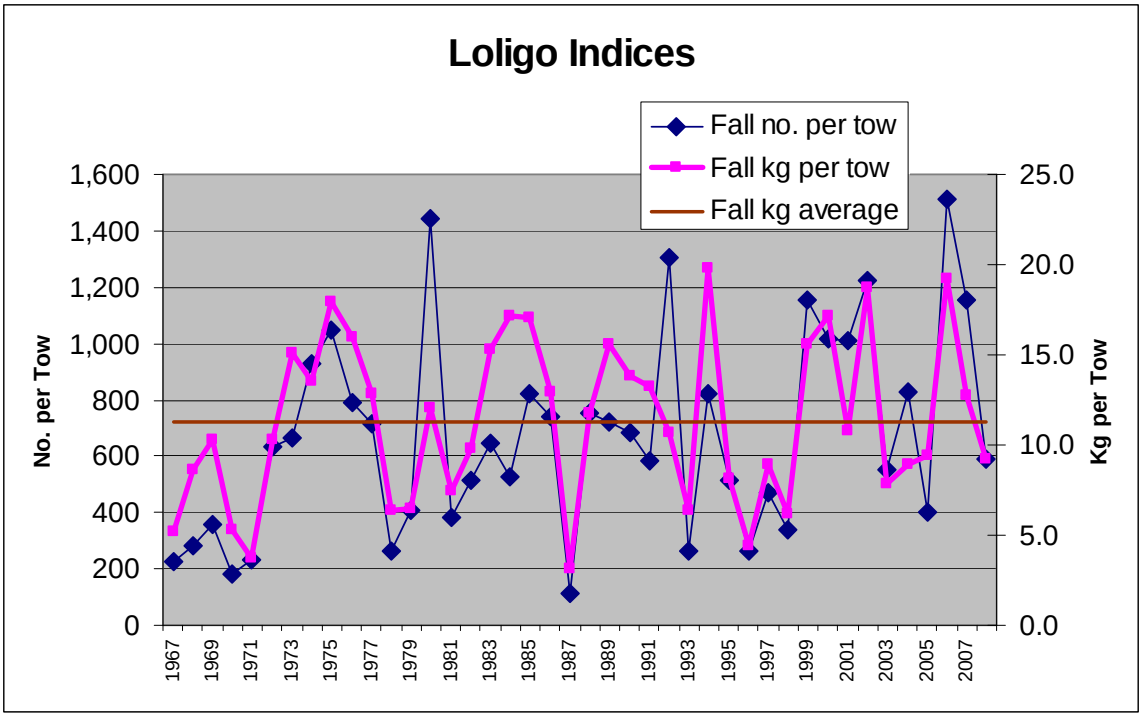

Figure 24. ***Loligo*** **Indices from NEFSC Fall survey.**

6.6.4.2 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 food fish 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 (Figure 25).

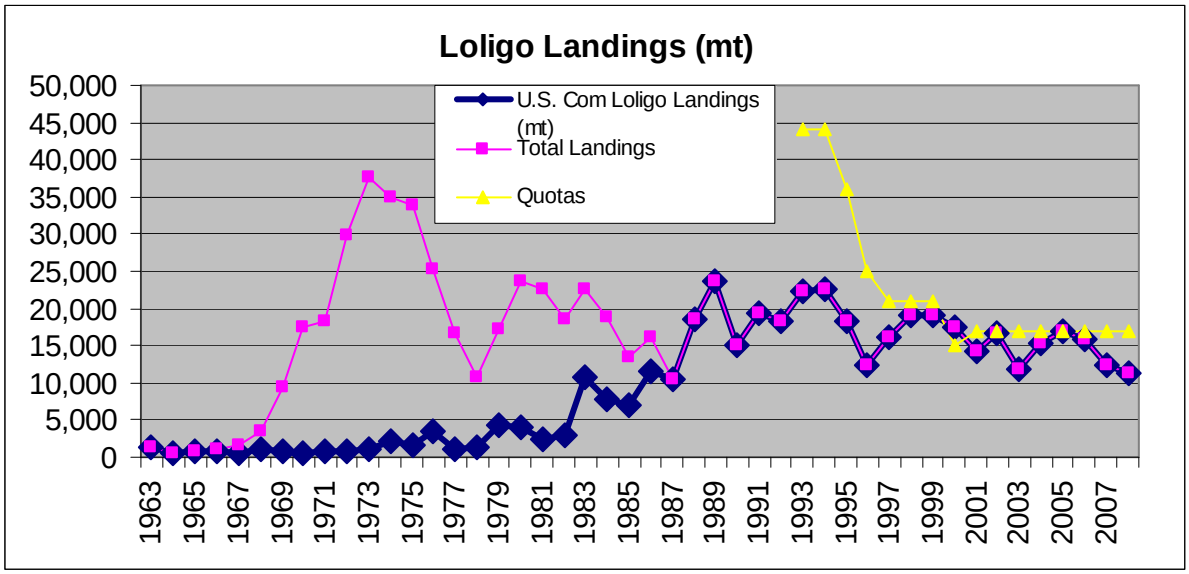

Figure 25. Landings of *Loligo* in the U.S. EEZ, 1963-2008.

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* landings 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. Price (nominal) has increased fitfully since 1982 and averaged $2,046/mt in 2008.

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 centuries, 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 offshore waters until the 1980's. Analysis of NMFS weighout data 1982-2008 is used to chart annual averages for U.S. landings (mt), ex-vessel value ($), and prices ($/mt) in the figures below.

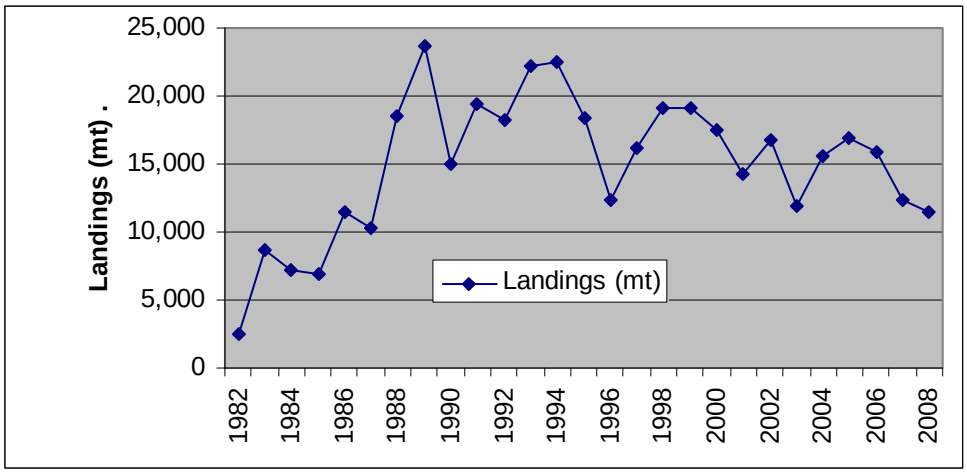

Figure 26. U.S. *Loligo* landings.
Source: Unpublished NMFS dealer reports

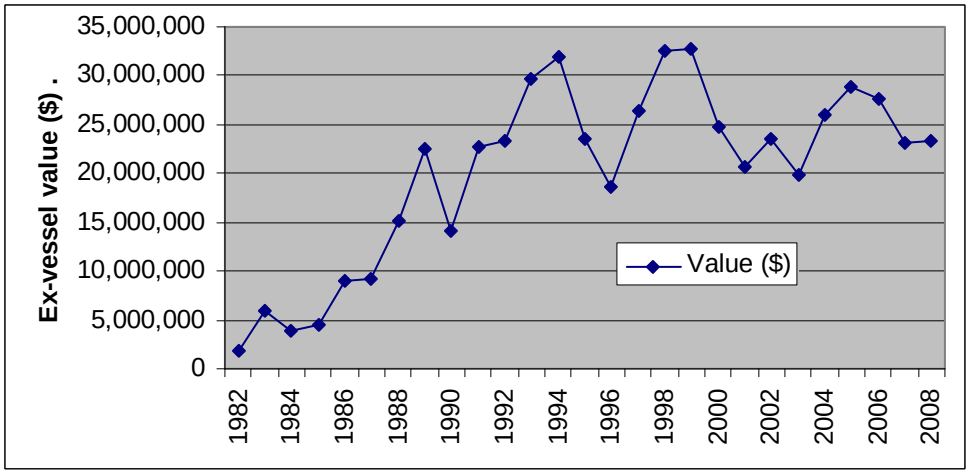

Figure 27. U.S. *Loligo* ex-vessel revenues.

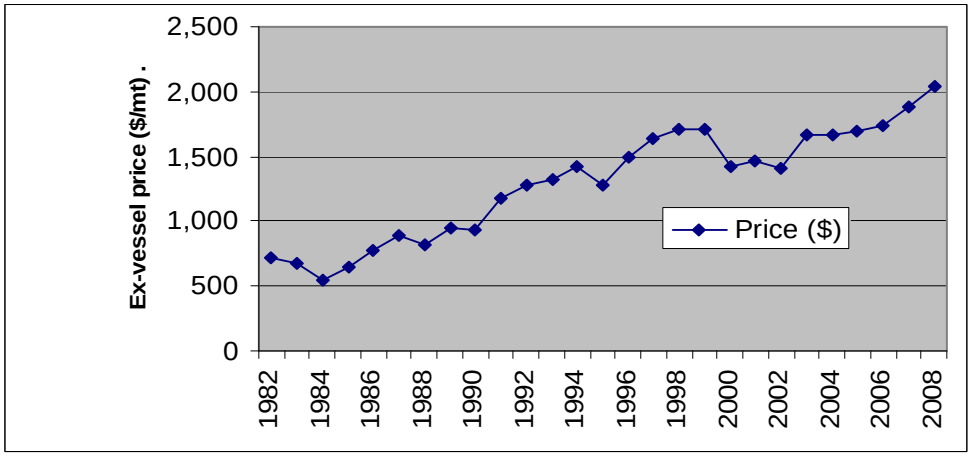

Figure 28. U.S. *Loligo* ex-vessel prices.
Source: Unpublished NMFS dealer reports

Quota Performance

The principle measure used to manage *Loligo* is Trimester quota monitoring via dealer weighout data that is submitted weekly. The dealer data triggers in-season management actions that institute relatively low trip limits when 90% of the Trimester quotas are reached in Trimesters 1 and 2 and when 95% of the annual quota is reached in Trimester 3. Mandatory reporting for *Loligo* was fully instituted in 1997 so quota performance since 1997 is most relevant in terms of quota performance going forward. Table 39 lists the performance of the *Loligo* fishery compared to its quota. There has been one quota overage in the last 12 years, a 17% overage in 2000. NMFS is continually augmenting its quota projecting procedures so presumably future overages would be even less likely. There are occasional overages of the sub-annual quota, but these should have more allocative rather than biological effects since Trimester 1 and 2 overages are applied to Trimester 3.

Table 39. *Loligo* Quota Performance 1997-2008 (mt)

Year	Landings	Quota	Percent of Quota Landed
1997	16,113	21,000	77%
1998	19,123	21,000	91%
1999	19,109	21,000	91%
2000	17,480	15,000	117%
2001	14,238	17,000	84%
2002	16,707	17,000	98%
2003	11,935	17,000	70%
2004	15,566	17,000	92%
2005	16,983	17,000	100%
2006	15,907	17,000	94%
2007	12,342	17,000	73%
2008	11,400	17,000	67%

As described in the alternatives, the *Loligo* quota is currently divided up into trimesters and has been since 2007. 2000 also had Trimester management while 2001-2006 had quarterly management. Each seasonal time period closes at a threshold of the seasonal allocation, which results in seasonal closures. The seasonal closures that have occurred are:

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;
2006	Feb 13-Mar 31; April 21-April 26; May 23-June 30; Sept 2-Sept 30;
2007	April 13-April 30;
2008	July 17 - Aug 31.

6.6.4.3 2008 Commercial Fishery

The following tables describe, for *Loligo* in 2008, the total landings, value, numbers of vessels making landings, numbers of trips landing *Loligo* (Table 40), landings by state (Table 41), landings by month (Table 42), landings by gear (Table 43), landings by port (Table 44), ports most dependent on *Loligo* (Table 45), numbers of permitted and active vessels by state (Table 46), numbers of permitted and active dealers by state (Table 47), and landings by NMFS federal permit category (Table 48).

Table 40. Total landings and value *Loligo* during 2008.
(Based on unpublished NMFS dealer reports. For Vessels and Trips, only landing records with recorded NE Permits or Hull Numbers are considered. As such, these numbers are somewhat underestimated.)

	Landings (mt)	Value ($)	Vessels	Trips	$/mt
Loligo	11,400	23,321,888	335	8,175	$2,046

Source: Unpublished NMFS dealer reports

Table 41. *Loligo* landings (mt) by state in 2008.

State	Landings_mt	Pct_of_Total
Rhode Island	6,639	58%
New York	2,480	22%
New Jersey	1,248	11%
Massachusetts	754	7%
Connecticut	262	2%
Other	17	0%
Total	11,400	100%

Source: Unpublished NMFS dealer reports

Table 42. *Loligo* squid landings (mt) by month in 2008.

MONTH	Landings_mt	Pct_of_Total
January	1,697	15%
February	1,584	14%
March	292	3%
April	239	2%
May	530	5%
June	1,424	12%
July	1,213	11%
August	497	4%
September	777	7%
October	1,624	14%
November	783	7%
December	742	7%
Totals	11400	100%

Source: Unpublished NMFS dealer reports

Table 43. *Loligo* landings (mt) by gear category in 2008.

GEAR_NAME	Landings_mt	Pct_of_Total
TRAWL,OTTER,BOTTOM,FISH	9,503	83%
UNKNOWN	1,240	11%
DREDGE, OTHER	368	3%
TRAWL,OTTER,BOTTOM,OTHER	65	1%
Other	225	2%
Totals	11,400	100%

Source: Unpublished NMFS dealer reports

Table 44. *Loligo* landings by port in 2008.

name	ST_Name	Landings_mt	Pct_of_Total
POINT JUDITH, NORTH KINGSTOWN	RHODE ISLAND	6,321	42%
MONTAUK	NEW YORK	1,445	13%
CAPE MAY	NEW JERSEY	1,083	9%
HAMPTON BAYS & SHINNECOCK	NEW YORK	858	8%
NEW BEDFORD	MASSACHUSETTS	356	3%
NEWPORT	RHODE ISLAND	299	3%
NEW LONDON	CONNECTICUT	158	1%
BARNSTABLE & HYANNISPORT	MASSACHUSETTS	244	2%
POINT PLEASANT	NEW JERSEY	117	1%
Others	NA	519	5%
Total	NA	11,400	100%

Source: Unpublished NMFS dealer reports

Table 45. Value of *Loligo* landings by port compared to total value of all species landed by port in 2008 where *Loligo* comprised >= 1% of total value.

Port Name	State	Federally Permitted Vessels	Value of All Species	Value of *Loligo*	Pct of Port's Revenue from *Loligo*
NORTH KINGSTOWN	RHODE ISLAND	CI	CI	CI	>1%
HAMPTON BAYS	NEW YORK	CI	CI	CI	>1%
POINT JUDITH	RHODE ISLAND	77	$36,501,261	$9,367,809	26%
SHINNECOCK	NEW YORK	CI	CI	CI	>1%
OTHER BARNSTABLE	MASSACHUSETTS	CI	CI	CI	>1%
MONTAUK	NEW YORK	30	$16,383,706	$3,266,441	20%
WOODS HOLE	MASSACHUSETTS	CI	CI	CI	>1%
NEW LONDON	CONNECTICUT	CI	CI	CI	>1%
GREENPORT	NEW YORK	CI	CI	CI	>1%
OTHER SUFFOLK	NEW YORK	CI	CI	CI	>1%
NEW YORK CITY	NEW YORK	3	$108,080	$9,536	9%
NEWPORT	RHODE ISLAND	11	$6,738,328	$575,075	9%
HYANNISPORT	MASSACHUSETTS	CI	CI	CI	>1%
KINGSTON	MASSACHUSETTS	CI	CI	CI	>1%
POINT LOOKOUT	NEW YORK	4	$3,739,259	$234,006	6%
FALMOUTH	MASSACHUSETTS	7	$1,713,366	$82,699	5%
MORICHES	NEW YORK	CI	CI	CI	>1%
CAPE MAY	NEW JERSEY	45	$68,956,604	$2,130,060	3%
BELFORD	NEW JERSEY	CI	CI	CI	>1%
OTHER CONNECTICUT	CONNECTICUT	CI	CI	CI	>1%
LITTLE COMPTON	RHODE ISLAND	CI	CI	CI	>1%
OTHER NEW LONDON	CONNECTICUT	CI	CI	CI	>1%
STONINGTON	CONNECTICUT	19	$8,090,969	$126,254	2%
FREEPORT	NEW YORK	4	$416,318	$5,266	1%
PROVIDENCE	RHODE ISLAND	CI	CI	CI	>1%
AMAGANSETT	NEW YORK	CI	CI	CI	>1%

Source: Unpublished NMFS dealer reports

Table 46. *Loligo*-butterfish moratorium vessel permit holders in 2008 by homeport state (HPST) and how many of those vessels were active (landed *Loligo*)

HPST	Permitted Vessels	Active Vessels
MA	104	27
NJ	84	50
NY	59	45
RI	57	49
NC	22	6
ME	17	1
VA	12	1
CT	8	8
PA	4	1
MD	2	1
NH	1	.
WV	1	1
Total	371	190

Source: Unpublished NMFS dealer reports

(Note: Table 40 numbers are less than Table 34 numbers because Table 40 only includes vessels with federal moratorium permits)

Table 47. Atlantic mackerel, squid, butterfish dealer permit holders by state and how many were active (bought *Loligo)* in 2008 by state.

State	Permitted Dealers	Active Dealers
NY	117	38
MA	167	18
RI, CT	58	20
NJ	75	9
VA, MD	49	6
ME, NH	54	3
AL	1	.
CA	1	.
DE	6	.
FL	8	.
GA	1	.
HI	1	.
LA	3	.
NC	35	.
NS	1	.
PA	4	.
SC	2	.
VI	1	.

Source: Unpublished NMFS dealer reports

Table 48. *Loligo* landings by permit category for the period 1999-2008.

Year	Loligo/Butterfish		Party/Charter		Incidental		No Permit/		Total	
	mt	%	mt	%	mt	%	mt	%	mt	Quota
1999	18,214	95%	0	0%	215	1%	680	4%	19,109	21,000
2000	16,280	93%	0	0%	393	2%	802	5%	17,475	15,000
2001	13,423	94%	6	0%	170	1%	640	4%	14,238	17,000
2002	15,279	91%	4	0%	408	2%	1,016	6%	16,707	17,000
2003	10,988	92%	0	0%	98	1%	850	7%	11,935	17,000
2004	14,052	90%	1	0%	158	1%	1,355	9%	15,566	17,000
2005	15,274	90%	11	0%	75	0%	1,621	10%	16,981	17,000
2006	14,179	89%	0	0%	272	2%	1,455	9%	15,907	17,000
2007	11,219	91%	0	0%	194	2%	929	8%	12,343	17,000
2008	10,616	93%	0	0%	133	1%	652	6%	11,400	19,000

6.6.4.5 Description of areas fished in VTR Reports

Vessel Trip Reports (VTRs) represent captains' estimates of kept weight of fish/squid. VTR reports, which are a subset of the landings data, provide the approximate location of kept fish/squid. VTR reports for *Loligo* in 2008 by NMFS three digit statistical area (see Figure 10 except as noted in table below) are given in Table 49.

Table 49. Statistical areas from which 1% or more of *Loligo* were kept in 2008 according to VTR Reports.

Stat Area	Landings (mt)	Percentage from Area
537	2,819	23%
616	2,524	20%
622	1,858	15%
613	761	6%
562	610	5%
623	551	4%
525	431	3%
632	356	3%
539	307	2%
611	285	2%
526	269	2%
626	209	2%
166 (Inshore Long Island)	186	2%
538	185	1%
75 (Nantucket Sound)	169	1%
621	142	1%

Source: Unpublished NMFS VTR reports

7.0 ENVIRONMENTAL CONSEQUENCES AND 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

Table 50. Atlantic mackerel specifications considered for 2010. All numbers are metric tons except for the trip limits, which are in pounds.

	ABC	IOY	DAH	DAP	JVP	TALFF	Inc. Trip Limits
Alt. 1a	156,000	115,000	115,000	100,000	0	0	20,000/50,000
Alt. 1b	56,000	56,000	56,000	100,000	0	0	20,000/50,000
Alt. 1c	186,000	115,000	115,000	100,000	0	0	20,000/50,000

The three alternatives considered for Atlantic mackerel specifications for 2010 are fully described in section 5.1 and are summarized in Table 50 above (alternative 1a is the preferred alternative). Changes to measures other than ABCs were not considered. For all measures the Regional Administrator can increase the IOY up to, but not to exceed, the ABC specification if applicable through an in-season adjustment (see section 648.21 of the Federal Code of Regulations). Also, up to 3% of the IOY may be set aside for scientific research.

Managed Resource

Given the available information, MAFMC staff, the SSC, and the Monitoring Committee recommended using the SARC 42 (2006) 2008 projection for 2010 (see Section 5.1.a for details). Given the relatively low landings 2005-2008, all else being equal, stock size should have been even higher than predicted for 2008, and NEFSC trawl survey indices do not supply contradictory evidence so maintaining the 2008 levels in 2010 should result in a relatively conservatively low ABC. The Atlantic Mackerel, Squid and Butterfish Committee and Council subsequently adopted this ABC specification at their June 2009 meeting. Since the preferred alternative, 1a, is the status quo, impacts on managed species related to the specification of ABC, IOY, DAH, DAP, JVP, of TALFF are expected to be similar to the prior fishing year. Since the preferred alternative, 1a, is based on the MSB FMP's control rule and the most recent stock information, it should maintain the health of the mackerel stock, including a scenario where the in-season adjustment of IOY (115,000 mt) is made up to ABC (156,000 mt).

The specification of a 56,000 mt ABC under Alternative 1b, since it is less than 1a, should also maintain the health of the mackerel stock. The specification of an 186,000 mt ABC under Alternative 1c for a single year would probably not be significantly detrimental to the mackerel stock but there would be higher risk than under 1a or 1b, including a scenario where the in-season adjustment of IOY (115,000 mt) is made up to ABC (186,000 mt).

Non-Target Species

The primary species taken incidentally and discarded in the directed mackerel fishery over the most recent five years of data (2004-2008) are listed in Table 51. The primary database used to assess discarding is the NMFS Observer Program database, which includes data from trips that had trained observers onboard to document discards. One critical aspect of using this database to describe discards is to correctly define the trips that constitute a given directed fishery. Presumably some criteria of what captains initially intend to target, how they may adjust targeting over the course of a trip, and what they actually catch would be ideal. Thus to begin this process, staff first reviewed 2004-2008 trips in the dealer weighout database to see if a certain trip definition could account for most mackerel landed. The result of this review resulted in the following definition for mackerel trips using landings: All trips that had at least 50% mackerel by weight and 45,000 pounds mackerel AND those trips 33%-50% mackerel by weight but over 100,000 pounds mackerel. The general idea is to include significant landings that are over 50% mackerel and also those larger landings that might not have been quite 50% mackerel. This definition results in capturing almost 97% of all mackerel landings in the dealer weighout database 2004-2008 and was applied to the observer database to examine discards in the mackerel fishery. The resulting set of trips in the observer database included ten on average for each year 2004-2008. Information for the 10 species (99.9% of all discards) that make up most discards on these trips is presented in Table 51. Some co-directing occurs with mackerel and Atlantic herring, so the high Atlantic herring numbers to some extent are not the result of bycatch so much as directed fishing for both on the same trip. This also means that some of the discards described below may be related to directed herring fishing rather than directed mackerel fishing, but given the co-directing that occurs it is very difficult to fully disentangle the two. Regarding the 3% of mackerel landings that are not captured in the trip definition, on the relevant identifiable trips 2004-2008 (some of the 3% are not identifiable because they are "lumped" state reports), a wide variety of species were landed (dealer weighout database) with Atlantic herring, *Loligo*, and silver hake making up the majority of landings on these trips (and each were individually larger than the mackerel landings), further suggesting that the chosen definition of a "mackerel trip" is appropriate for the purpose of bycatch/discard descriptions.

While a very rough estimate, especially given the low observer coverage in small mesh fisheries and non-accounting for spatial and temporal trends, one can use the information in Table 51 and the fact that about 40,949 MT of mackerel were caught annually 2004-2008 to generally and very roughly estimate annual incidental catch for the ten species in the table. For example in Table 51, since there were about 40,949 MT of mackerel caught annually (landings scaled up by 1% to account for mackerel discarding), and for every MT of mackerel caught there are 4.2 pounds of scup caught (4th Column from left in Table 51), the mackerel fishery may have caught about 170,000 pounds (170,961 in Table 51) of scup per year. This is the last column in Table 51 and while the information is provided, readers are strongly cautioned that while this is a reasonable approach for a general, rough, and relative estimate given the available data, it is highly imprecise. Note also that even the estimates that can be calculated would only really be valid for the 97% of landings captured by the chosen directed mackerel trip definition. It is even more difficult to assess the other 3% because to some degree the mackerel itself is being caught incidental to other fisheries. The mackerel-to-other-species ratios were scaled up to the 100% of

mackerel caught to keep things relatively simple.

The discards of large pelagics in the Atlantic mackerel fishery are generally unknown due to the inability of the observers to view these discards because of the pumping of fish that occurs from codend to hold; large-bodied species are prevented from entering the pump (the pump sends the catch directly from the codend into the hold) and are discarded while the codend is submerged.

Table 51. Key species taken and discarded in directed trips for Atlantic mackerel, based on unpublished NMFS Northeast Fisheries Observer Program data and unpublished dealer weighout data from 2004-2008. (see text for criteria). There are 2204.6 pounds in one metric ton.

NE Fisheries Science Center Common Name	Pounds Observed Caught	Pounds Observed Discarded	For every metric ton of mackerel caught, pounds of given species caught.	For every metric ton of mackerel caught, pounds of given species discarded.	D:K Ratio (Ratio of species discarded to Mackerel Kept)	Of all discards observed, percent that comes from given species	Percent of given species that was discarded	Rough Annual Catch (pounds) based on 5-year average of mackerel catch (40949 mt)
Directed Mackerel Trip Bycatch and Discards								
MACKEREL, ATLANTIC	22,284,817	211,172	2,204.6	20.9	0.96%	48%	1%	NA
DOGFISH, SPINY	119,649	114,649	11.8	11.3	0.52%	26%	96%	484,693
HERRING, ATLANTIC	1,249,195	57,269	123.6	5.7	0.26%	13%	5%	5,060,457
SCUP	42,203	42,203	4.2	4.2	0.19%	10%	100%	170,961
HERRING, BLUEBACK	41,498	8,465	4.1	0.8	0.04%	2%	20%	168,107
BASS, STRIPED	2,442	2,442	0.2	0.2	0.01%	1%	100%	9,892
SHAD, HICKORY	1,745	1,730	0.2	0.2	0.01%	0%	99%	7,069
SHAD, AMERICAN	3,193	650	0.3	0.1	0.00%	0%	20%	12,935
ALEWIFE	23,345	506	2.3	0.1	0.00%	0%	2%	94,570
BUTTERFISH	7,389	387	0.7	0.0	0.00%	0%	5%	29,932

For non-target species that are managed under a fishery management plan, incidental catch/discards are considered as part of the management of the fishery. 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 2010 since this level of IOY represents the 2009 status quo. An in season adjustment up to ABC under all three alternatives could result in an increase in fishing effort relative to the IOY specification of 115,000 mt. The biological significance of increased bycatch associated with these alternatives is difficult to quantify given current information, but it is anticipated that the increase would be not be significant to the relevant species stock status.

Thus under 1a, the status quo, impacts are expected to be similar to the prior fishing year. 1b, with its smaller 56,000 ABC could benefit non-target species if it constrained effort, and 1c, with its larger 186,000 ABC could result in an increase in fishing effort relative to the current specifications and thus an increased negative impact on non-target species.

An in-season increase from IOY (115,000 mt) up to ABC (156,000 mt for 1a and 186,000 mt for 1c) would likely increase impacts (more effort). While the degree can not be quantified, it would likely be in proportion to the amount of the increase relative to the original quota.

7.1.2 Habitat Impacts

This fishery is prosecuted primarily with mid-water trawls, which do not contact the seabed. About 10% of the mackerel harvested are caught with bottom trawl gear. The status quo alternative, 1a, which is the preferred alternative, would not be expected to change habitat impacts compared to how the fishery was prosecuted in 2009. 1b, with its smaller 56,000 ABC could benefit habitat if it constrained effort, and 1c, with its larger 186,000 ABC could result in an increase in fishing effort relative to the current specifications and thus an increased negative impact on habitat. However mackerel landings have not yet been limited by the quota, so it is difficult to predict what effect a change in the quota might have on actual (vs. potential) fishing effort – in the case of habitat impacts, bottom trawling. Since catch is limited by the availability of the resource, it is difficult to predict how changes in the quota would affect effort and therefore habitat. If the total catch did increase under alternative 1c over what it would be under the status quo, it would likely be taken primarily in mid-water trawls, so the habitat impacts would likely be minimal.

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 (if applicable) to a level not to exceed ABC through an in season adjustment to IOY. An in-season adjustment up to ABC could potentially result in an increase in fishing effort 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. If an in-season adjustment is necessary and includes an expanded use of bottom trawls as well as mid-water trawls, then some increased but unquantifiable level of impact on habitat could occur.

7.1.3 Impacts on Endangered and Other Protected Species

Section 6.4 describes the available information on interactions between the mackerel fishery and endangered and other protected species. Since the mackerel fishery overlaps with some marine mammal distributions, some marine mammal interactions are possible with the species highlighted in Section 6.4. The distribution of sea turtles also overlaps with the operation of the Atlantic mackerel fishery. 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. Loggerheads are also unlikely to catch or target fast moving fish such as mackerel. Thus, interactions between sea turtles and the Atlantic mackerel fishery are not anticipated.

Given the preferred alternative is the status quo (1a), the preferred alternative is not expected to have any significant impacts on endangered and other protected species compared to how the fishery operated under the 2009 specifications. 1b could theoretically lead to reduced effort and 1c could theoretically lead to increased effort, and as effort is reduced or increased, theoretically interactions could follow suit.

In-season adjustment to OY

An in-season adjustment up to ABC could potentially result in an increase in fishing effort. 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 an in season adjustment 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 (see 6.4.2). 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 a number of 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. As noted above, the species of principal concern in the directed mackerel fishery are common dolphins. The western North Atlantic stocks of pilot whales, common dolphins, and white-sided dolphins were designated as non-strategic in the 2007 Marine Mammal Stock Assessment Report.

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 relatively high world demand has created conditions which are favorable for continued growth of the US mackerel fishery. 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 2010. To reach this level, the Atlantic mackerel stock will need to be sufficiently abundant and available in the right sizes to the harvest sector (unlike the situations in 2007-2009). Industry members have testified that if stock conditions are similar to those prior to 2005, then they fully intend and expect to land the entire IOY.

The MSA 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 (2006) 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 2010. 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, recreation, and 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 resulting in zero TALFF will yield positive social and economic benefits to the mackerel fishery and to the Nation.

All three alternatives include 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. In addition to the recent increases in domestic processing capacity, the Council noted that there was no or minimal JVP activity during last few years that JVP was specified above zero. 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 2010 was based, in part, on the fact no JVP activity has occurred for Atlantic mackerel since 2002.

Since the specification of IOY/ABC under the preferred alternative (1a) is the same as the 2009 specification of IOY, social or economic impacts are expected to be similar to the prior fishing year. The IOY is unlikely to be constraining but should availability be sufficient the IOY will constrain mortality so as to preserve the socio-economic benefits associated with a healthy mackerel stock. 1b, with its smaller 56,000 ABC could result in forgone revenue should mackerel be sufficiently available, and 1c, with its larger 186,000 ABC could result in additional opportunities should mackerel be sufficiently available.

In-season adjustment up to ABC

The IOY for mackerel could be increased during the fishing season up to a level not to exceed ABC through an in-season adjustment.

Under alternatives 1a, an in-season adjustment of IOY (115,000 mt) up to ABC (156,000 mt) would represent an increase of about 36% in landings and revenue. Assuming a constant 2008 average ex-vessel price of $285/mt (see Figure 8), this would amount to an increase of about $11.7 million in total revenue or $41,584 per vessel (based on the total of 281 vessels which landed mackerel in 2008). 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 a much greater extent than the average vessel in the fishery with an in-season adjustment up to ABC. There could be no adjustment with alternative 1b due to the low ABC. Under alternatives 1c, an in-season adjustment of IOY (115,000 mt) up to ABC (186,000 mt) would represent an increase of about 62% in landings and revenue. Assuming a constant 2008 average ex-vessel price of $285/mt (see Figure 8), this would amount to an increase of about $20.2 million in total revenue or $72,011 per vessel (based on the total of 281 vessels which landed mackerel in 2008).

7.2 Impacts of Alternatives for *Illex*

7.2.1 Biological Impacts on Managed Resource and Non-Target Species

Managed Resource

The Council considered two quota options for *Illex* in 2010. Alternative 2a, the preferred alternative, would maintain the 2009 specifications in 2010 (status quo) and was also the preferred alternative. Being the status quo, impacts are expected to be similar to the prior fishing year. 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 2010 (same as in 2008). Other management actions remain status quo. Thus 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 approximately 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 per pound 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. Also the same as last year, vessels which possess *Illex* incidental catch permits may land up to 10,000 pounds per trip at all times and up to 3% of the IOY for *Illex* may be set aside for scientific research. In summary, 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 compared to the 2008 fishing year.

In setting the quota for 2010, 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 2010 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 landings 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 2010, 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 the majority of 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 2010, the current FMP does allow for in-season adjustments to the IOY (i.e., either upward or downward).

Alternative 2b would be more restrictive than 2a and set the *Illex* quota at a precautionary 19,000 mt. 19,000 mt was the quota from 1997-1999 and was associated in an older assessment (SAW 21 in 1996) with a fishing mortality rate that produced 50 percent of the maximum spawning potential of the stock (http://www.epa.gov/fedrgstr/EPA-SPECIES/1998/November/Day-17/e30692.htm). No significant biological impacts would be expected.

Non-Target Species

The primary species taken incidentally and discarded in the directed *Illex* fishery over the most recent five years of data (2004-2008) are listed in Table 52.

The primary database used to assess discarding is the NMFS Observer Program database, which includes data from trips that had trained observers onboard to document discards. One critical aspect of using this database to describe discards is to correctly define the trips that constitute a given directed fishery. Presumably some criteria of what captains initially intend to target, how they may adjust targeting over the course of a trip, and what they actually catch would be ideal. Thus to begin this process, staff first reviewed 2004-2008 trips in the dealer weighout database to see if a certain trip definition could account for most *Illex* landed. The result of this review resulted in the following definition for *Illex* trips using landings: All trips that had at least 50%

Illex by weight. This definition results in capturing 98% of all *Illex* landings in the dealer weighout database and was applied to the observer database to examine discards in the *Illex* fishery. The resulting set of trips in the observer database included 17 on average for each year 2004-2008. Information for the 21 species (99% of all discards) that make up most discards on these trips is presented in Table 52.

While a very rough estimate, especially given the low observer coverage in small mesh fisheries and non-accounting for spatial and temporal trends, one can use the information in Table 52 and the fact that about 15,677 MT of *Illex* were caught annually 2004-2008 to generally and very roughly estimate annual incidental catch for the species in the table. This is the last column in Table 52 (see text for Table 51 for an example) and while the information is provided, readers are strongly cautioned that while this is a reasonable approach for a general, rough, and relative estimate given the available data, it is highly imprecise. Note also that even the estimates that can be calculated would only really be valid for the 98% of landings captured by the chosen directed *Illex* trip definition. It is even more difficult to assess the other 2% because to some degree the *Illex* itself is being caught incidental to other fisheries. The *Illex*-to-other-species ratios were scaled up to the 100% of *Illex* caught to keep things relatively simple.

For non-target species that are managed under a fishery management plan, incidental catch/discards are considered as part of the management of the fishery. Alternative 2a is not expected to significantly increase or re-distribute fishing effort by gear type in 2010. Being the status quo, impacts are expected to be similar to the prior fishing year. Non-target species will be impacted to some degree by the prosecution of the Atlantic mackerel fishery. Since Alternative 2b is a smaller quota than 2a, the same applies to Alternative 2b but to a lesser degree. Regardless, the *Illex* fishery appears to have relatively insignificant levels of incidental catches.

Table 52. Key species taken and discarded in directed trips for *Illex*, based on unpublished NMFS Northeast Fisheries Observer Program data and unpublished dealer weighout data from 2004-2008 (see text for criteria). There are 2204.6 pounds in one metric ton.

NE Fisheries Science Center Common Name	Pounds Observed Caught	Pounds Observed Discarded	For every metric ton of Illex caught, pounds of given species caught.	For every metric ton of Illex caught, pounds of given species discarded.	D:K Ratio (Ratio of species discarded to Illex Kept)	Of all discards observed, percent that comes from given species	Percent of given species that was discarded	Rough Annual Catch (pounds) based on 5-year average of Illex landings (15677 mt)
Directed Illex Trip Bycatch and Discards								
SQUID, SHORT-FIN	11,486,760	206,856	2,205	40	1.83%	69.3%	2%	NA
BUTTERFISH	43,130	29,708	8	6	0.26%	10.0%	69%	129,771
HAKE, SPOTTED	19,895	19,743	4	4	0.18%	6.6%	99%	59,860
DOGFISH, SPINY	7,689	7,687	1	1	0.07%	2.6%	100%	23,134
HAKE, SILVER	9,832	5,193	2	1	0.05%	1.7%	53%	29,583
DORY, BUCKLER	6,418	4,610	1	1	0.04%	1.5%	72%	19,310
HAKE, NK	3,297	3,297	1	1	0.03%	1.1%	100%	9,920
HAKE, SOUTHERN	3,066	3,041	1	1	0.03%	1.0%	99%	9,225
BEARDFISH	2,910	2,895	1	1	0.03%	1.0%	99%	8,756
MONKFISH	9,425	2,170	2	0	0.02%	0.7%	23%	28,359
SQUID, ATL LONG-FIN	68,667	2,085	13	0	0.02%	0.7%	3%	206,607
HAKE, RED (LING)	1,316	1,316	0	0	0.01%	0.4%	100%	3,961
FLOUNDER, FOURSPOT	1,078	1,078	0	0	0.01%	0.4%	100%	3,243
SKATE, LITTLE	1,003	1,003	0	0	0.01%	0.3%	100%	3,018
MACKEREL, ATLANTIC	4,504	937	1	0	0.01%	0.3%	21%	13,550
FLOUNDER, SUMMER	966	926	0	0	0.01%	0.3%	96%	2,905
DOGFISH, SMOOTH	714	714	0	0	0.01%	0.2%	100%	2,149
OCEAN PERCH	641	641	0	0	0.01%	0.2%	100%	1,929
HADDOCK	582	582	0	0	0.01%	0.2%	100%	1,750
FISH, NK	460	460	0	0	0.00%	0.2%	100%	1,383
CRAB, TRUE, NK	357	357	0	0	0.00%	0.1%	100%	1,074

Table 52 **part B, Sharks, rays and large pelagic finfish species discarded and kept (numbers and weight, lbs) in the Illex fishery based on the NEFSC Observer Program database, 1995-2008. Highlighted species are those with stocks that are overfished and/or overfishing occurring and/or the stock is subject to a rebuilding plan.**

***Illex* Fishery**				
Common Name	Number Discarded	Weight (lbs) Discarded	Number Kept	Weight (lbs) Kept
CUTLASSFISH, ATL	418	245	0	0
GROUPER, NK	1	11	5	219
MACKEREL, FRIGATE	12	806	0	0
MOLA, OCEAN SUNFISH	28	6,279	0	0
RAY, NK	3	1,000	0	0
RAY, TORPEDO	11	129	0	0
RAY,MANTA, ATLANTIC	4	1,400	0	0
SHARK, ATL ANGEL	3	49	0	0
SHARK, BASKING	6	21,900	0	0
SHARK, BIGEYE SAND TIGER	1	150	0	0
SHARK, BIGNOSE	16	186	0	0
SHARK, BLACK TIP	2	24	0	0
SHARK, BLUE (BLUE DOG)	1	300	0	0
SHARK, CARCHARHIN,NK	5	118	0	0
SHARK, DUSKY	19	806	0	0
SHARK, FINETOOTH	1	19	0	0
SHARK, HAMMERHEAD, GREAT	7	2,000	0	0
SHARK, HAMMERHEAD, SCALL(	35	8,045	0	0
SHARK, HAMMERHEAD,NK	7	1,035	0	0
SHARK, MAKO, NK	0	0	1	300
SHARK, NIGHT	1	23	0	0
SHARK, NK	4	293	0	0
SHARK, PORBEAGLE	1	7	0	0
SHARK, SILKY	2	91	0	0
SHARK, THRESHER	2	425	0	0
SHARK, THRESHER, BIGEYE	1	300	0	0
SHARK, TIGER	2	800	0	0
SKATE, LITTLE	1	250	0	0
STINGRAY, ROUGHTAIL	2	500	0	0
SWORDFISH	216	9,199	165	14,241
TUNA, BIG EYE	3	470	2	400
TUNA, BLUEFIN	1	57	1	100
TUNA, YELLOWFIN	6	355	8	490

7.2.2 Impacts on Habitat

Illex are taken almost exclusively by bottom otter trawls. Since Alternative 2a (status quo) is not expected to change effort, no changes to impacts on EFH are expected. With Alternative 2b's DAH (19,000 mt), the potential effect of a lower DAH would be reduced bottom trawling for Illex, but the fact that catch has not been limited by the quota makes it difficult to predict what the actual change in bottom contact time would be relative to the status quo. Since catch is limited by the availability of the resource, it is difficult to predict how changes in the quota would affect effort and therefore habitat.

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. NMFS has convened a take reduction team to develop measures to reduce the take of common dolphins and pilot whales in offshore Atlantic trawl fisheries, including the *Illex* fishery. See section 6.4.2 for details on this take reduction team.

While the impact on these cetacean stocks by the *Illex* fishery is difficult to quantify, the specifications under the alternatives 2a and 2b 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 the 2009 specifications for *Illex*. 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 2a for *Illex* in 2010 represents the 2009 status quo, so no reductions in landings or revenues due to the 2010 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. Compared to the 2004 *Illex* landings, alternative 2b would represent a restriction on landings of about 6,000 mt. However, compared to average landings over 2005-2008, alternative 2b would represent no constraint on landings. Therefore, while there is some chance that alternative 2b could have negative socio-economic consequences for the relevant vessels and ports described in section 6.6.2 of this document, it appears more likely that in any one year there would be no negative economic consequences as a result of this alternative. While the IOYs under 2a or 2b are unlikely to be constraining, should availability be sufficient the IOY will constrain mortality so as to preserve the long-term socio-economic benefits associated with a healthy *Illex* stock.

7.3 Impacts of Alternatives for Butterfish

7.3.1 Biological Impacts on Managed Resource and Non-Target Species

Managed Resource

Changes to measures other than quotas were not considered. Thus all alternatives maintain the trip limit of 5,000 pounds for moratorium butterfish permits, and maintain the threshold for butterfish minimum mesh requirement (3.0 inches) at 1,000 pounds. Also, the threshold level for directed butterfish fishery closure will still be 80% of DAH. If 80% of DAH is reached prior to Oct 1, a 250 pound daily trip limit results. If 80% of DAH is reached on/after Oct 1, a 600 pound daily trip limit results. Incidental limits are 600 pounds, reduced to 250 pound if the directed fishery closes before Oct 1. Also, Up to 3% of the IOY for butterfish may be set aside for scientific research.

The specifications under Alternative 3a (the status quo and preferred alternative) would be Max OY = 12,175 mt, ABC = 1,500 mt, and IOY, DAH, and DAP = 500 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. The purpose of this alternative is to cap the fishery at recent levels (minimal directed fishing) while a rebuilding plan is developed and implemented under Amendment 10 to the FMP. No changes to gear or trip limits were considered. The catch expected under Alternative 3a should achieve a fishing mortality rate well below the target rate specified in the FMP and therefore, Alternative 3a should result in positive benefits to the butterfish stock, but no change from last year.

The specifications under Alternative 3b would be Max OY = 12,175 mt, ABC = 4,525 mt, and IOY, DAH, and DAP = 1,861 mt and JVP and TALFF = 0 mt. This alternative would revert to the 2007 specifications for 2010. Under Alternative 3c, the specifications would be Max OY = 12,175 mt, ABC = 9,131 mt, and IOY, DAH, and DAP = 3,044 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. The yield under this alternative assumes that the stock would be at or above B_{msy} in 2010. Hence, ABC, which includes landings and discards, would be equal to the yield at 75% F_{msy} and the ratio of 1/3 for landings and 2/3 set aside for discards would be maintained. Alternative 3c has been included because the butterfish stock has the potential to rebuild quickly, and once rebuilt these are the specifications that would result from the FMP control rule. Given the current level of the stock (i.e., designated as overfished), higher landings compared to the status quo from directed fishing 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.

For Alternatives 3b and 3c, while the quota would go up, recent analyses indicate that most of the butterfish landings are taken incidentally to the prosecution of other directed fisheries. As such, an increase in butterfish quotas would not be expected to increase effort toward butterfish. Also, other measures in place (3" mesh requirement to keep 1000 pounds or more of butterfish, 5000 pound trip limit, and very low incidental trip limit) make significantly increased directed fishing unlikely even if the quota was higher.

The reader will note in Table 37 that from 1999-2008 between 8% and 36% of butterfish landings have come from vessels without federal permits. These landings do not present a critical problem in terms of generally tracking landings and closing the fishery, but if they are from vessels with only state permits, they could theoretically keep landing butterfish in state waters after a federal directed fishery closure and cause a quota overage. Given the lack of a strong butterfish market demand, the trajectory of landings in recent years, and the 20% closure buffer, this seems unlikely. In fact, there was a closure in 2008 and only 89% of the total quota was harvested. The SMB Monitoring committee tracks the performance of the fishery on an annual basis, and if landings by unpermitted vessels become a problem, then the Monitoring Committee would likely recommend appropriate management measures, such as lowering the quota for federal vessels or increasing the closure buffer, so that overall mortality goals are reached.

Since Alternative 3a is not expected to impact butterfish abundance, it is not expected to negatively affect the large number of species and stocks of marine mammals and fish that prey on butterfish. If Alternatives 3b or 3c led to increased directed effort on butterfish and thus a smaller stock size, butterfish predators could be impacted.

Non-Target Species

The list of species taken incidentally and discarded in the butterfish fishery is not calculated because currently there is very limited directed fishing for butterfish (because of both regulations and market demand) and it is very difficult to identify a directed butterfish trip in the observer database (and double counting with other fisheries would likely occur). Prior specifications identified butterfish, red hake, silver hake, spiny dogfish, scup, unclassified skates, fourspot flounder, *Loligo* squid, Atlantic mackerel, and little skate as primary bycatch and/or discard species in the butterfish fishery. All of these species would be expected to be negatively impacted to some degree by the re-establishment of the butterfish fishery.

7.3.2 Impacts on Habitat

Butterfish are taken with a number of gears. The gear of concern relative to habitat is bottom otter trawls which account for most of the landings in any given year. However, because as described above in section 7.3.1, Alternative 3a is not likely to change directed effort, impacts on habitat are likely to be similar to the previous fishing year. In fact most of the butterfish caught are caught incidentally so the butterfish quota may not be as strongly related to effort as is often the case. If Alternatives 3b or 3c increased directed effort (higher IOY), negative impacts on habitat could increase. However, other restrictions in place on butterfish retention would mean that any increase in effort would likely be minimal. In addition, since catch is limited by the availability of the resource, it is difficult to predict how changes in the quota would affect effort and therefore habitat.

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 were listed as Category 1 fisheries but have recently been changed to Category 2 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 should be minimal based on available data. If effort did increase (via alternatives 3b or 3c), negative impacts with those endangered or other protected species could also increase. However, the restrictions in place on butterfish retention would mean that any increase in effort would be likely to be minimal, thus the impacts on relevant endangered or other protected species would likely be minimal, as long as the existing restrictions on butterfish fishing (described above) remain in place.

7.3.4 Impacts on Human Communities

Since Alternative 3a represents the 2009 status quo specifications, no reductions in landings or revenues are expected. Therefore, no change in economic and/or social impacts to the US fishing industry would be expected. Alternatives 3b and 3c, as described in section 7.3.1, may or may not lead to increased effort toward butterfish. However, they could allow greater retention of incidentally caught bycatch later in the year because closures of the butterfish fishery would be less likely with a higher quota, providing some additional revenue. Thus the impacts on human communities from 3b or 3c are possibly minimally positive.

7.4 Impacts of Alternatives for *Loligo - Quota and associated measures.*

7.4.1 Biological Impacts on Managed Resource and Non-Target Species

Changes to quotas were not considered; there is no information supporting an increase or decrease from the status quo at this time (SARC 34 [2002] recommended keeping landings at or below 19,000 MT - see section 5.4). Other than how Trimester underages are handled, changes to other measures were not considered- no issues with those other measures have been reported. Under all alternatives quota will be allocated by trimesters: January-April (43%), May-August (17%) and September-December (40%). When 95% of the total annual quota has been taken (i.e., 18,050 mt), a 2,500 pound trip limit will be implemented. Vessels with *Loligo* incidental permits may land up to 2,500 pounds per trip at all times. Up to 3% of the IOY may be set aside for research. These measures represent the status quo. Changes to how Trimester underages are handled are considered in Alternatives 4a and 4c, with 4b being the status quo (overages and underages from Trimesters 1 and 2 apply to Trimester 3).

With 4a, Trimester 1 underages would be split between Trimester 2 and 3 (50%-50%) if the Trimester 1 underage is greater than 25%. If the Trimester 1 underage is less than 25% of the Trimester 1 quota then the underage is applied to Trimester 3 (as is currently done), avoiding potentially small transfers that could lead to unfeasible season openings/closures in Trimester 2. Trimester 1 overages should be small and would still be applied to Trimester 3. Trimester 2 underages or overages would still be applied to Trimester 3.

4b is the Status Quo - Overages and Underages from Trimesters 1 and 2 would be applied to Trimester 3. With 4c, Trimester closures would be based on cumulative percentages related to the sum of the Trimester allocations. Thus Trimester 1 would close at 90% of "17% of the annual quota," Trimester 2 would close at 90% of "60% (Trimester 1's 17% + Trimester 2's 43%) of the annual quota," and Trimester 3 would close at "95% of the total annual quota."

Managed Resource Impacts

Since for ABC, all Alternatives are 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 19,000 mt is not expected to have any negative biological effects on the *Loligo* stock compared to 2009 (including impacts on the availability of *Loligo* to predators).

4a, which potentially would cause half of a Trimester 1 underage to be given to Trimester 2 and half to be given to Trimester 3, could spread the catch out more evenly throughout the year which could have positive impacts for the *Loligo* stock. Given *Loligo* lives less than one year and the stock has multiple cohorts (generations) within a year, harvest strategies which do not concentrate fishing pressure in any one time period are preferred. 4a could lead to a higher harvest than would otherwise occur since underages are available for use during a greater part of the year, but harvests would still be constrained by the overall quota. 4b, the status quo, can potentially result in a large transfer from Trimester 1 to Trimester 3, which means that Trimester 3 could see a disproportionate amount of fishing effort. 4c, which uses a rolling quota, could mean that much more quota is available in Trimester 2 than has occurred recently, but could also minimize disproportionate availability of quota in any one Trimester (since only a small portion of the quota is available in Trimester 2 to begin with). Overall, there should be minimal impacts on the Loligo stock related to any of the measures since the overall harvest is controlled with a hard quota with proactive accountability measures.

While butterfish is a managed resource, impacts related to butterfish are described below under Non-Target Species given the incidental nature of butterfish catch in the *Loligo* fishery.

Non-Target Species

The primary species taken incidentally and discarded in the directed *Loligo* fishery over the most recent five years of data (2004-2008) are listed in Table 53.

The primary database used to assess discarding is the NMFS Observer Program database, which includes data from trips that had trained observers onboard to document discards. One critical aspect of using this database to describe discards is to correctly define the trips that constitute a given directed fishery. Presumably some criteria of what captains initially intend to target, how they may adjust targeting over the course of a trip, and what they actually catch would be ideal. Thus to begin this process, staff first reviewed 2004-2008 trips in the dealer weighout database to see if a certain trip definition could account for most *Loligo* landed. The result of this review resulted in the following definition for *Loligo* trips using landings: All trips that had at least 50% *Loligo* by weight. This definition results in capturing almost 86% of all *Loligo* landings in

the dealer weighout database and captures 92% of the landings on identifiable trips (about 7% of landings in the dealer weighout database can not be attributed to a specific trip, usually because there is not an associated permit number - these are often aggregated state records). This definition was applied to the observer database to examine discards in the *Loligo* fishery. The resulting set of trips in the observer database included 62 on average for each year 2004-2008.

While a very rough estimate, especially given the low observer coverage in small mesh fisheries and non-accounting for spatial and temporal trends, one can use the information in Table 53 and the fact that about 14,794 MT of *Loligo* were caught annually 2004-2008 generally and very roughly estimate annual incidental catch for the species in the table. This is the last column in Table 53 (see text for Table 51 for an example) and while this information is provided, readers are strongly cautioned that while this is a reasonable approach for a general, rough, and relative estimate given the available data, it is highly imprecise. Note also that even the estimates that can be calculated would only really be valid for the 86% of landings captured by the chosen directed trip definition. It is even more difficult to assess the other 14% because to some degree the *Loligo* is being caught incidental to other fisheries. The *Loligo* -to-other-species ratios were scaled up to the 100% of *Loligo* catch to keep things relatively simple.

These species, including butterfish, will be impacted to some degree by the prosecution of the *Loligo* fishery. However, an IOY specification of 19,000 mt is not expected to significantly increase or re-distribute fishing effort by gear type in 2010 since this level of IOY represents the 2009 status quo. The quota rollover provisions in 4a and 4c could both lead to more quota being available in Trimester 2, which could shift some effort from Trimester 3 to Trimester 2. The low sampling in Trimester 2 makes such a shift very difficult to evaluate quantitatively. However, if one examines the observer database 2004-2008 and compares the ratios of *Loligo* caught to all other species caught in Trimester 2 versus Trimester 3 for trips landings ≥ 50% *Loligo*, the ratios are almost the same, approximately 2:5 for both Trimesters (for every 5 pounds of *Loligo* caught there are 2 pounds of other species caught). However, there are differences between species, and these differences are described in Table 54 for all species where the ratio of the given species caught to *Loligo* caught was at least 2:100, or 2% in either Trimester. The percentages in Table 54 are the ratios of the given species caught to *Loligo* caught (weight). Thus for example, in Trimester 3 for every 100 pounds of *Loligo* caught there have been 5 pounds of Spiny Dogfish caught while in Trimester 2 there have been 16 pounds of Spiny Dogfish caught for every 100 pounds of *Loligo* caught. In Summary, Table 54 suggests that if effort shifts from Trimester 3 to Trimester 2, all else being equal, one would expect **more** bycatch of striped bass, smooth dogfish, spiny dogfish, summer flounder, winter flounder, scup, little skate, and winter skate and **less** bycatch of bluefish, butterfish, hakes, unclassified herrings, monkfish, and *Illex*.

Given the low observer coverage and given one does not know how much (if any) quota that would have been transferred from Trimester 1 to Trimester 3 could now get transferred from Trimester 1 to Trimester 2, it is infeasible to more precisely and meaningfully quantify what effects the net shift from Trimester 3 to Trimester 2 would have on bycatch species. However, in 2 of the 3 years since trimesters have been instituted there have been underages in Trimester 1 greater than 25% (which would then trigger some transfer to Trimester 2). In these 2 years, the underage averaged approximately 53%, which means that approximately 27% of the Trimester 1 quota (which equates to 11% of the annual quota) would have been transferred to Trimester 2

under 4a and 53% (or 22% of the annual quota) would have been transferred under 4c. It is not anticipated that moving 11% of the annual *Loligo* quota from Trimester 3 to Trimester 2 would have significant impacts (positive or negative) on the overall productivity of the affected bycatch species. Shifting 22% could have more of an impact but it is not possible to reliably quantify.

Table 53. Key species taken and discarded in directed trips for *Loligo* based on unpublished NMFS Northeast Fisheries Observer Program data and dealer weighout data from 2004-2008. (see text for criteria). There are 2204.6 pounds in one metric ton.

NE Fisheries Science Center Common Name	Pounds Observed Caught	Pounds Observed Discarded	For every metric ton of Loligo caught, pounds of given species caught.	For every metric ton of Loligo caught, pounds of given species discarded.	D:K Ratio (Ratio of species discarded to Loligo Kept)	Of all discards observed, percent that comes from given species	Percent of given species that was discarded	Rough Annual Catch (pounds) based on 5-year average of Loligo catch (14794 mt)
Directed Loligo Trip Bycatch and Discards								
HAKE, SILVER (WHITING)	507,365	390,394	189	145	6.76%	13.3%	77%	2,150,997
SQUID, SHORT-FIN	398,333	366,695	148	137	6.35%	12.5%	92%	2,142,201
HAKE, SPOTTED	327,100	321,866	122	120	5.57%	11.0%	98%	1,802,262
DOGFISH, SPINY	321,858	321,280	120	120	5.56%	11.0%	100%	1,773,376
BUTTERFISH	290,792	259,239	108	97	4.49%	8.9%	89%	1,602,212
HAKE, RED (LING)	200,521	189,745	75	71	3.28%	6.5%	95%	1,104,836
MACKEREL, ATLANTIC	379,303	163,418	141	61	2.83%	5.6%	43%	2,089,887
SQUID, ATL LONG-FIN	5,919,350	141,737	2,205	53	2.45%	4.8%	2%	NA
FLOUNDER, FOURSPOT	99,214	99,201	37	37	1.72%	3.4%	100%	546,649
SKATE, LITTLE	62,258	62,182	23	23	1.08%	2.1%	100%	343,029
FLOUNDER, SUMMER	146,678	57,363	55	21	0.99%	2.0%	39%	808,170
HAKE, NK	57,440	56,410	21	21	0.98%	1.9%	98%	316,485
HERRING, NK	50,893	50,862	19	19	0.88%	1.7%	100%	280,413
MONKFISH	80,274	39,627	30	15	0.69%	1.4%	49%	442,293
HERRING, ATLANTIC	39,289	39,156	15	15	0.68%	1.3%	100%	216,476
DOGFISH, SMOOTH	32,473	29,660	12	11	0.51%	1.0%	91%	178,920
SKATE, NK	29,017	28,922	11	11	0.50%	1.0%	100%	159,879
SCUP	53,853	25,963	20	10	0.45%	0.9%	48%	296,722
HAKE, WHITE	25,019	22,702	9	8	0.39%	0.8%	91%	137,848
BLUEFISH	45,477	20,781	17	8	0.36%	0.7%	46%	250,567
BASS, STRIPED	16,317	14,620	6	5	0.25%	0.5%	90%	89,903
CRAB, JONAH	13,962	13,284	5	5	0.23%	0.5%	95%	76,926
SKATE, WINTER (BIG)	12,772	12,577	5	5	0.22%	0.4%	98%	70,369
SCALLOP, SEA	17,048	12,104	6	5	0.21%	0.4%	71%	93,931
SKATE, BARNDOOR	11,580	11,555	4	4	0.20%	0.4%	100%	63,805
FLOUNDER, WINTER	10,497	10,302	4	4	0.18%	0.4%	98%	57,837
DORY, BUCKLER (JOHN)	27,666	9,937	10	4	0.17%	0.3%	36%	152,435
LOBSTER, AMERICAN	14,362	9,450	5	4	0.16%	0.3%	66%	79,134
HAKE, RED/WHITE MIX	8,282	7,824	3	3	0.14%	0.3%	94%	45,632
FLOUNDER, WITCH	7,814	7,693	3	3	0.13%	0.3%	98%	43,054
HERRING, BLUEBACK	7,598	7,598	3	3	0.13%	0.3%	100%	41,865
DOGFISH, CHAIN	7,601	7,564	3	3	0.13%	0.3%	100%	41,877
SEA BASS, BLACK	21,686	7,407	8	3	0.13%	0.3%	34%	119,487
STARFISH, SEASTAR,NK	5,791	5,777	2	2	0.10%	0.2%	100%	31,910
PORGY, NK	5,422	5,311	2	2	0.09%	0.2%	98%	29,874
SEA ROBIN, NORTHERN	5,038	5,034	2	2	0.09%	0.2%	100%	27,756
SKATE, CLEARNOSE	5,023	5,003	2	2	0.09%	0.2%	100%	27,676
SEA ROBIN, NK	4,973	4,973	2	2	0.09%	0.2%	100%	27,399
SKATE, ROSETTE	4,822	4,822	2	2	0.08%	0.2%	100%	26,568
ROCKWEED, NK	4,710	4,710	2	2	0.08%	0.2%	100%	25,951
SEA ROBIN, ARMORED	4,414	4,414	2	2	0.08%	0.2%	100%	24,321
HAKE, SOUTHERN	4,357	3,985	2	1	0.07%	0.1%	91%	24,006
ALEWIFE	4,072	3,874	2	1	0.07%	0.1%	95%	22,438

Table 53 Part B. Sharks, rays and large pelagic finfish species discarded and kept (numbers and weight, lbs) in the Loligo fishery based on the NEFSC Observer Program database, 1995-2008. Highlighted species are those with stocks that are overfished and/or overfishing occurring and/or the stock is subject to a rebuilding plan.

***Loligo* Fishery**				
Common Name	Number Discarded	Weight (lbs) Discarded	Number Kept	Weight (lbs) Kept
AMBERJACK, NK	1	1	1	3
BARRACUDA, NK	4	7	0	0
BONITO, ATLANTIC	3	6	5	37
COBIA	0	0	1	15
GROUPER, NK	2	17	13	335
MOLA, OCEAN SUNFISH	9	2,750	0	0
NEEDLEFISH, ATLANTIC	4	1	0	0
OILFISH	1	23	0	0
RAY, BUTTERFLY, SPINY	3	153	0	0
RAY, NK	3	134	0	0
RAY, TORPEDO	162	5,716	0	0
SHARK, ATL ANGEL	5	60	0	0
SHARK, BASKING	23	86,050	0	0
SHARK, BLUE (BLUE DOG)	3	240	0	0
SHARK, BULL	0	0	4	34
SHARK, DUSKY	11	564	1	42
SHARK, HAMMERHEAD, SCALLOPED	6	1,825	0	0
SHARK, HAMMERHEAD, SMOOTH	2	270	0	0
SHARK, HAMMERHEAD,NK	11	2,640	0	0
SHARK, MAKO, NK	1	3	1	65
SHARK, NIGHT	1	10	0	0
SHARK, NK	7	355	0	0
SHARK, PORBEAGLE	5	540	0	0
SHARK, SAND TIGER	2	79	1	50
SHARK, SANDBAR	45	1,844	0	0
SHARK, SEVENGILL SHARPNOSE	1	8	0	0
SHARK, THRESHER	3	115	1	11
SHARK, THRESHER, BIGEYE	1	80	0	0
SHARK, TIGER	3	155	0	0
STINGRAY, ATLANTIC	2	40	0	0
STINGRAY, NK	1	9	0	0
STINGRAY, PELAGIC	1	10	0	0
STINGRAY, ROUGHTAIL	11	1,765	0	0
STURGEON, ATLANTIC	13	627	0	0
SWORDFISH	43	1,396	32	1,253
TUNA, BIG EYE	1	1	0	0
TUNA, BLUEFIN	3	113	0	0
TUNA, LITTLE (FALSE ALBACORE)	17	139	5	47
TUNA, NK	1	1	0	0
TUNA, SKIPJACK	1	3	0	0
TUNA, YELLOWFIN	2	3	1	28
WRECKFISH	0	0	4	41

Table 54. Bycatch Impacts from effort switch from Trimester 3 to Trimester 2.

Species	T3	T2	Change
BASS, STRIPED	0.1%	3.3%	+
BLUEFISH	1.5%	1.4%	-
BUTTERFISH	5.6%	3.3%	-
DOGFISH, SMOOTH	0.3%	6.0%	+
DOGFISH, SPINY	5.2%	16.3%	+
FLOUNDER, SUMMER (FLUKE)	1.3%	4.4%	+
FLOUNDER, WINTER (BLACKBACK)	0.0%	2.6%	+
HAKE, NK	2.0%	0.0%	-
HAKE, RED (LING)	3.7%	0.0%	-
HAKE, SILVER (WHITING)	10.4%	2.1%	-
HAKE, SPOTTED	11.1%	0.1%	-
HERRING, NK	1.7%	0.0%	-
MONKFISH (ANGLER, GOOSEFISH)	1.5%	0.8%	-
SCUP	0.1%	5.6%	+
SKATE, LITTLE	0.7%	9.3%	+
SKATE, WINTER (BIG)	0.1%	1.6%	+
SQUID, SHORT-FIN (Illex)	10.1%	0.0%	-

For non-target species that are managed under a fishery management plan, incidental catch/discards are considered as part of the management of the fishery.

7.4.2 Impacts on Habitat

Loligo are taken with a number of gears, but the gears of concern relative to habitat are bottom otter trawls which account for most of the *Loligo* landings in any given year. All of the Alternatives propose the same overall quota, which is the status quo from last year. Thus effort is likely to be approximately equivalent to last year which means habitat impacts are expected to be similar to the previous fishing year. In addition, since catch is limited by the availability of the resource, it is difficult to predict how changes in the quota would affect effort and therefore habitat. Compared to the status quo (4b), 4a and 4c to a greater degree could shift some potential effort from Trimester 3 to Trimester 2, but the overall effect on habitat impact is difficult to quantify.

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. All of the Alternatives propose the same overall quota, which is the status quo from last year. As discussed in 7.4.2, Alternative 4a could transfer somewhere in the range of 11% of

the annual quota from Trimester 3 to Trimester 2 and Alternative 4c could transfer somewhere in the range of 22% from Trimester 3 to Trimester 2. Given these transfers likely most impact when the fishery closes (i.e. the end of each Trimester), one could predict that such transfers could translate to effort shifts from the months of Nov-Dec in Trimester 3 to the months of July-Aug in Trimester 2. In terms of marine mammals, such a transfer could result in some benefit (albeit unquantifiable) to Common dolphins and Pilot whales since the only observed interactions with these species have occurred in the winter. However, such a transfer could result in some increased (albeit unquantifiable) risk to sea turtles relative to the status quo since turtle interactions with the *Loligo* fishery are more likely in the warmer months. The risk would be greatest with 4c compared to 4a since 4c would transfer more quota than 4a. However, given the relatively small transfers involved and the relatively low overall encounter rates compared to other fisheries, neither benefits to marine mammals nor risks for turtles are likely to be significant. No impacts would be expected with 4b, the status quo.

7.4.4 Impacts on Human Communities

All of the Alternatives propose the same overall quota, which is the status quo from last year, so impacts are expected to be similar to the previous fishing year. The specifications should serve to maintain the health of the Loligo stock and preserve the long-run benefits associated with a healthy stock. In 2008 a significant amount of overall quota was unharvested while Trimester 2 was closed early - *Loligo* were available but Trimester 2 has a relatively small quota and the Trimester 1 underage was applied to Trimester 3. The transfer provision would reduce such occurrences of lost revenue opportunities. There was some concern voiced by the MSB Advisory Committee that squid in Trimester 2 are less valuable than squid in Trimester 3 due to their post-spawn condition, which is why the SMB Committee picked 4a as preferred, i.e. a partial transfer of Trimester 1 underage versus the full transfer (4c). Since it is difficult to predict how much quota could transfer it is difficult to quantify impacts. However, if in 2008 this transfer process had been in operation, approximately 1,700 mt more quota would have been available in Trimester 2. Had *Loligo* continued to be available, at 2008 Trimester 2 prices ($2,019/mt, only slightly below the 2008 annual average of $2,046), that could have theoretically resulted in an additional $3.4 million in revenue for the fishery.

7.5 Impacts of Alternatives for *Loligo - Codend Cover Minimum Mesh*

7.5.1 Biological Impacts on Managed Resource and Non-Target Species

Alternative Set 5 considers increases to the codend cover minimum mesh size as detailed in Section 5.

Managed Resource Impacts

Most of the selectivity occurs in the codend ("liner") versus the codend cover so impacts are likely to be similar whether or not cover requirements change. All else being equal, larger cover sizes would tend to increase escapement, though the impact is not possible to quantify (see Appendix A, which summarizes the SMB Monitoring Committee's review of this issue for

additional details and references). 5b, the status quo would maintain the current level of escapement and the action alternatives requiring larger cover meshes (5a, 5c, 5d, and 5e in increasing order) would increase escapement. To the extent that juvenile *Loligo* that would have otherwise been hauled on deck and discarded dead are more likely to escape (and survive incidental contact with netting) with larger codend covers, increasing the cover size may benefit the *Loligo* stock.

Non-Target Species

Refer to Table 53 for the complete list of non-target species taken as part of the Loligo squid fishery. Since most of the selectivity occurs in the codend ("liner") versus the codend cover, impacts are likely to be similar whether or not cover requirements change. All else being equal, larger cover sizes would tend to increase escapement, though the impact is not possible to quantify (see Appendix A, which summarizes the SMB Monitoring Committee's review of this issue for additional details and references). 5b, the status quo would maintain the current level of escapement and the action alternatives requiring larger cover meshes (5a, 5c, 5d, and 5e in increasing order) would increase escapement. To the extent that bycatch species (including butterfish) that would have otherwise been hauled on deck and discarded dead or injured are more likely to escape (and survive incidental contact with netting) with larger codend covers, increasing the cover size may benefit the relevant species (see Table 53), probably mostly juveniles since the change in selectivity is likely to be slight with a change in the codend cover (compared to what might happen with changes in the codend/liner).

7.5.2 Impacts on Habitat

Since selectivity is likely to be minimally affected, effort should not be impacted whether or not cover requirements change. In addition, since catch is limited by the availability of the resource, it is difficult to predict how changes in the quota would affect effort and therefore habitat.

7.5.3 Impacts on Endangered and Other Protected Species

Since selectivity is likely to be minimally affected, effort should not be impacted whether or not cover requirements change. In addition, since catch is limited by the availability of the resource, it is difficult to predict how changes in the quota would affect effort and therefore protected species.

7.5.4 Impacts on Human Communities

No significant changes to escapement/selectivity are expected so effort should not change as a result of these alternatives. It was reported to the Council by industry that most vessels that fish for *Loligo* would already have older nets of the status quo or smaller proposed increases. With the larger proposed increases, more vessels may have to buy covers just for using it as a cover, but the proportions are impossible to quantify. Codend prices were investigated in Amendment 10 and found to cost in the range of $200-$700. Wrapped square mesh codends used by vessels currently fishing with the largest proposed cover size requirements can cost $5,000-6,000, but may last for 4-5+ years so impacts are difficult to quantify. If juvenile Loligo are avoided and

vessels can avoid sorting out undesirable juvenile catch, then there may be some associated efficiency gains. If increased escapement leads to more marketable squid or less bycatch (which could cause additional future regulatory actions) there could also be associated benefits for *Loligo* fishermen. Overall impact is difficult to predict but probably low overall in either direction.

7.6 Impacts of Research Set-Asides (RSA) Recommendations

Per Framework Adjustment 1 to the Atlantic Mackerel, Squid and Butterfish (MSB) FMP, the annual RSA amount may vary between 0 and 3% of each species' total allowable landing level, which is the IOY value for MSB species. The Council has recommended that up to 3-percent of the 2010 *Loligo* (570mt for a 19,000mt quota), *Illex* (720mt for a 24,000mt quota), butterfish (15mt for a 500mt quota), and Atlantic mackerel (3,450 mt for a 115,000mt quota) IOYs be set-aside to fund projects selected under the 2010 Mid-Atlantic RSA Program. The project selection and award process for the 2010 Mid-Atlantic RSA Program has not concluded and therefore, the research quota awards are not known. If any portion of the research quota is not awarded, NMFS will return any un-awarded set-aside amount to the commercial fishery either through the 2010 MSB specification rulemaking process or through the publication of a separate notice in the *Federal Register* notifying the public of a quota adjustment.

Vessels harvesting research quota in support of approved research projects would be issued exempted fishing permits (EFP) authorizing them to exceed Federal possession limits and to fish during Federal quota closures. MSA requires that interested parties are provided an opportunity to comment on all proposed EFPs. These exemptions are necessary to allow project investigators to recover research expenses as well as adequately compensate fishing industry participants harvesting research quota. Vessels harvesting research quota would operate within all other regulations that govern the commercial fishery, unless otherwise exempted through a separate EFP. Because RSA is deducted from the quota, exemption from quota closures will have no additional environmental impact. Exemption from possession limits could result in compensation fishing vessels altering their normal fishing behavior; altering tow duration or fishing longer or shorter than they otherwise would for example. However, these slight alterations in fishing behavior will not likely impact the environment beyond that of the commercial fishery otherwise operating within the full suite of regulations.

7.6.1 Biological Impacts on Managed Resource and Non-Target Species

The RSA quota is part of the overall quota. If any portion of the 3-precent RSA quota is not awarded to an RSA project, the remainder will be returned to the commercial quota. With the exception of exemptions from possession limits and quota closures, the RSA quota will be harvested in the same manner as the commercial quota. Therefore, it is unlikely that the retention of MSB species under RSA projects would have negative biological impacts on the managed resource and non-target species compared to if the quota had been utilized by the directed fishery, especially since differences in how an RSA project used the quota compared to directed fishery are minor. Also, from 2007-2009 only *Loligo* has been used for RSA, and only 3%, <1%, and 1% of the *Loligo* IOY was used for RSA in those years, further strengthening the concept that any impacts should be minimal.

7.6.2 Impacts on Habitat

The amount of research quota likely to be used for RSA relative to the overall annual quotas for MSB species is minimal compared to the overall quotas. Therefore, it is unlikely that the retention of MSB species under RSA projects would have negative habitat impacts compared to if the quota had been utilized by the directed fishery, especially since differences in how an RSA project used the quota compared to directed fishery are likely to be relatively minor. RSA fishing could result in fishing vessels altering their normal fishing behavior; altering tow duration or fishing longer or shorter than they otherwise would for example. However, these slight alterations in fishing behavior will not likely impact the environment beyond that of the commercial fishery otherwise operating within the full suite of regulations.

Because all MSB landings count against the overall quota regardless of whether or not an RSA is implemented, the level of fishing effort for these species will not change. In addition it is not expected that the possession limit and quota closure exemptions will redistribute effort or gear type or change the manner in which these fisheries are prosecuted. Also, from 2007-2009 only *Loligo* has been used for RSA, and only 3%, <1%, and 1% of the *Loligo* IOY was used for RSA in those years, further strengthening the concept that any impacts should be minimal.

7.6.3 Impacts on Endangered and Other Protected Species

Because all MSB landings count against the overall quota regardless of whether or not an RSA is implemented, the RSA program is not expected to change the level of fishing effort for these species.

Vessels harvesting research quota in support of approved research projects would be issued EFPs authorizing them to exceed Federal possession limits and to fish during Federal quota closures. These exemptions are necessary to allow project investigators to recover research expenses as well as adequately compensate fishing industry participants harvesting research quota. Vessels harvesting research quota would operate within all other regulations that govern the commercial fishery, unless otherwise exempted through a separate EFP. Because quota closures may or may not occur during a given fishing year, exemption from these closures will have no additional environmental impact. Exemption from possession limits could result in compensation fishing vessels altering their normal fishing behavior; extending tow duration or fishing longer than they otherwise would for example. However, this slight alteration in fishing behavior is not expected to have any impact on protected resources. Also, from 2007-2009 only *Loligo* has been used for RSA, and only 3%, <1%, and 1% of the *Loligo* IOY was used for RSA in those years, further strengthening the concept that any impacts should be minimal.

7.6.4 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. Given the impacts of using a minimal amount of the quota are spread among the fishery, impacts to vessels are not expected to be substantial. Also, even these losses may be recouped in the long term because the scientific benefits derived from RSA projects could lead to more efficient management of the fisheries. Also, from 2007-2009 only *Loligo* has been used for RSA, and only 3%, <1%, and 1% of the *Loligo* IOY was used for RSA in those years, further strengthening the concept that any impacts should be minimal.

7.7 Cumulative Impacts of Preferred Alternatives on Identified VECs

The biological, economic and social impacts of the proposed specifications (preferred alternatives) for 2010 action for *Loligo*, *Illex*, Atlantic mackerel, and butterfish are expected to be minimal since they maintain the status quo relative to 2009. 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 Table 1 (see Executive Summary).

7.7.1 Cumulative Effects

Definition on 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.

Temporal Scope

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, 2010) and 2011, the year in which Amendment 11 to the MSB FMP (Mackerel Limited Access, EFH Updates, recreational-commercial mackerel allocation, at-sea mackerel processing cap) and 13 (Omnibus Annual Catch Limit and Accountability Measures) are expected to be implemented. The temporal scope of this analysis does not extend beyond 2011 because the FMP and the issues facing these fisheries may change in ways that can't be predicted or assessed at this time within the framework of an Environmental Assessment.

Geographic Scope

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.

Summary of the Past, Present and Reasonably Foreseeable Future Actions

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* landings 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 landings 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 overfishing definitions 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 8. Amendment 9 established multi-year specifications for all four species managed under the FMP (mackerel, butterfish, *Illex* squid (*Illex*), and *Loligo* squid (*Loligo*)) for up to 3 years; extended the moratorium on entry into the *Illex* fishery, without a sunset provision; adopted biological reference points recommended by the SARC 34 (2002) for *Loligo*; designated essential fish habitat (EFH) for *Loligo* eggs based on best available scientific information; and prohibited bottom trawling by MSB-permitted vessels in Lydonia and Oceanographer Canyons.

Future actions include implementing a stock rebuilding plan for butterfish and general bycatch reduction measures in Amendment 10, and Amendment 11 which considers: a limited access program for mackerel; updated EFH designations for all species; a recreational-commercial mackerel allocation; and a cap on at-sea processing of mackerel. Finally, the NMFS convened the Atlantic Trawl Gear (ATG) Take Reduction Team (TRT) in 2006 as a result of a 2003 settlement agreement with the Center for Biological Diversity, with the goal of reducing serious injury and mortality (bycatch) of long-finned pilot whales (*Globicephala melas*), short-finned pilot whales (*Globicephala macrorhynchus*), white-sided dolphins (*Lagenorhynchus acutus*), and common dolphins (*Delphinus delphis*) in the Mid-Atlantic Mid-water Trawl fishery, which is part of the MSB fishery. There is no timeline within the MMPA requiring the ATGTRT to submit a draft TRP because all the fisheries affected by the ATGTRT are Category II fisheries and none of the stocks under the ATGTRP are strategic at this time. However, NMFS requested that the TRT make the best effort possible to meet the original 11 month obligation to develop a TRP. While unable to agree on whether to develop a TRP within the 11 month timeframe, TRT members did agree that developing a research plan would maintain progress towards reducing the serious injury and mortality of marine mammals in Atlantic trawl fisheries. The finalized consensus strategy, which is not a TRP, was described in previous specifications EAs and can be found, along with other ATGTRT documentation at : http://www.nero.noaa.gov/prot_res/atgtrp/.

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. Additional inter-agency coordination would also prove beneficial.

Generally 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 has received capacity analyses 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.

Cumulative Effects Analysis

The cumulative impacts of this FMP were last fully addressed in the FSEIS for Amendment 10 (see Section 8.9 of Amendment 10's FSEIS at http://www.nero.noaa.gov/nero/regs/com.html) and are currently being re-addressed in the EIS for Amendment 11, 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 FMP 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 current domestic 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 strived to meet 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.

7.7.2 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 US management under the Magnuson Act and then were subsequently rebuilt under the FMP and subsequent 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 considered overfished. *Illex* and mackerel have never been designated as overfished since passage of the SFA. In the case of butterfish, the species was designated as overfished in 2005 and the Council is developing a remedial action through the development of Amendment 10. The measures taken as part of the annual specifications process in 2009 and proposed for 2010 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 occurs as a result of fishing mortality. 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 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.

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, and remedial measures as appropriate.

The quotas and other measures under the preferred alternatives for 2010 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 (i.e., achieve optimum yield). These measures in conjunction with previous actions, including establishment of limited access for the squids and butterfish in Amendment 5, overfishing definitions in Amendment 8, and the extension of the *Illex* moratorium in Amendment 9, help maximize social and economic benefits from these resources for both the industry and the nation. Future actions such as rebuilding the butterfish stock under Amendment 10 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.

7.7.3 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 substantially increase 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.

None of the management measures recommended by the Council for 2010 under the preferred alternatives is expected to substantially promote or result in increased overall levels of bycatch relative to the status quo because none are expected to substantially increase effort. The codend cover mesh increases considered could marginally decrease bycatch. 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 considered a number of additional measures to address discards in these fisheries in Amendment 10, 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*, and creation of an incidental catch allowance for the *Loligo* fishery. The proposed measures, an increase in the Loligo minimum mesh size and a butterfish incidental catch allowance, should result in a reduction in bycatch and discards of non-target species in these fisheries.

In addition to mortality on these stocks due to fishing, there are other indirect effects 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.

7.7.4 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 others 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 2010 under the preferred alternatives are expected to promote or result in increased levels of effort relative to the status quo, since the quota specifications under the preferred alternatives are equal to levels in the prior year. 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 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 butterfish stock rebuilding measures in Amendment 10 and the controlled access plan for Atlantic mackerel being developed in Amendment 11. All of these actions will control entry of new fishing effort into or reduce current effort in these fisheries. The cumulative effect of the proposed measures for 2010 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.

7.7.5 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

The Atlantic mackerel fishery primarily uses mid-water trawls. Otter trawls are the principal gear used in the squid and butterfish fisheries. In general, bottom tending mobile gears 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.

The Council analyzed MSB gear impacts on EFH in Amendment 9, which also included measures which address gear impacts on essential fish habitat. To reduce MSB gear impacts on EFH, Amendment 9 prohibited bottom trawling by MSB-permitted vessels in Lydonia and Oceanographer Canyons. All EFH designations are being updated in Amendment 11. These updated designations should improve fishery-effect mitigation and non-fishing impact consultations in the near future.

In addition to impacts on habitat due to fishing, there are other habitat effects from non-fishing anthropogenic activities in and near the Atlantic Ocean, but these are generally not quantifiable at present. Based on the MSB species EFH descriptions (see Section 6.3), only those non-fishing activities that occur in nearshore/estuarine and marine/offshore pelagic habitats have the potential to adversely impact EFH for the four species managed under the MSB FMP. Relevant

high, medium, and low potential effects for these habitats from a variety of activity types are evaluated in Johnson et al. (2008). The general conclusion from Johnson et al 2008 would be that nearshore and estuarine habitats are more affected by non-fishing activities than offshore and that impacts on habitat from non-fishing habitats are many and varied. Johnson et al 2008, available at http://www.nefsc.noaa.gov/publications/tm/tm209/index.html details the expected level of habitat impact by activity type, potential impacts, and ecosystem type.

7.7.6 Human Communities

National Standard 8 requires that management measures take into account the fishing communities. Communities from Maine to North Carolina are involved in the harvesting of Atlantic mackerel, squid and butterfish. The Amendment 9 FSEIS and the Amendment 10 FSEIS contain descriptions of the communities most dependent on the MSB fisheries. 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 2010, in conjunction with the past and future actions described above, will have positive cumulative impacts for the communities which depend on these resources by maintaining a stock size that provides for optimal sustainable harvests.

7.7.7 Summary of cumulative impacts

The impacts of the preferred alternatives on the biological, physical, and human environment are described in section 7. The overall interactions of improvements in the efficiency of the fisheries are expected to generate positive impacts. These impacts will be felt most strongly in the social and economic dimension of the environment. These benefits are addressed in the RIR and IRFA which are appended to 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.

These fisheries have been generally effectively 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 and the Council has proposed measures

to rebuild butterfish. As long as management continues to prevent overfishing and rebuild overfished stocks, the fisheries and their associated communities should continue to benefit. 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 2010 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 2010.

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. Although Amendment 8 was partially approved in 1999, NOAA Fisheries Service noted that the amendment inadequately addressed some Magnuson-Stevens Act requirements for Federal FMPs. Specifically, Amendment 8 was considered deficient with respect to: Consideration of fishing gear impacts on EFH as they relate to MSB fisheries; designation of EFH for *Loligo* eggs; and the reduction of bycatch and discarding of target and non-target species in the MSB fisheries. Amendment 9 evaluated fishing gear impacts on EFH and designated EFH for *Loligo* eggs. Amendment 10 is intended to bring the MSB into compliance with Magnuson-Stevens Act rebuilding and bycatch requirements. The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 will require annual catch limits and accountability measures for Atlantic mackerel and butterfish, and these requirements will be addressed in an upcoming Omnibus Amendment. In Amendment 11, the Council is currently considering limited access in the mackerel fishery, EFH designation updates for all species, a recreational/ commercial mackerel allocation, and at-sea mackerel processing caps. The Council is also just beginning consideration of catch shares/ LAPPs in the squid fisheries and river herring bycatch issues via Amendment 14.

8.1.1 Essential Fish Habitat Assessment

The quotas under the preferred alternatives proposed in this action maintain the status quo relative to 2009 specifications. Therefore, the Council concluded in section 7.1-7.6 of this document that the 2010 quota specifications proposed for Atlantic mackerel, squid, and butterfish will have no adverse impacts on EFH than those that may currently exist. Thus no mitigation of the adverse effects of the 2010 *Loligo* quota is necessary. The adverse impacts of bottom trawls used in MSB fisheries on other managed species (not MSB), which were determined to be more than minimal and not temporary in Amendment 9, were minimized by the Lydonia and Oceanographer canyon GRAs. Therefore, the adverse habitat impacts of MSB fisheries “continue to be minimized” by the canyon GRAs.

8.2 NEPA

8.2.1 Finding of No Significant Impact (FONSI)

National Oceanic and Atmospheric Administration Administrative Order 216-6 (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality regulations at 40 C.F.R. '1508.27 state that the significance of an action should be analyzed both in terms of “context” and “intensity.” Each criterion listed below is relevant 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 CEQ's 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 2010 are expected to jeopardize the sustainability of any target species affected by the action (see section 7 of this document). All of the proposed quota specifications under the preferred alternatives for each species are consistent with the FMP overfishing definitions and best available scientific information. 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 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 section 7 of this document). The proposed measures maintain the quota specifications of IOY for the upcoming fishing year for Atlantic mackerel, *Illex*, butterfish, and Loligo. Therefore, none of these specifications are expected to result in substantially increased fishing effort. In addition, none of the measures are expected to substantially 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 2009 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, which are used to harvest mackerel, squid, and butterfish, have the potential to adversely affect EFH for the benthic lifestages of a number of species in the Northeast region that are managed by other FMPs. However, because none of the management measures proposed in this action would cause any substantial increase in fishing effort relative to status quo, they are not expected to have any substantial negative impact on EFH or on coastal and ocean habitats relative to the 2009 specifications.

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

None of the measures substantially alter the manner in which the industry conducts fishing activities for the target species. Therefore, the proposed actions in these fisheries, are not expected to adversely impact public health or safety.

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. Fishing effort is not expected to substantially 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. The proposed action is not expected to substantially 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.)?

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 substantially 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?

These fisheries are primarily prosecuted using mid-water and bottom otter trawls. Bottom otter trawls 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 substantially 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. As noted in Section 7 of this 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?

As described in section 7.0 of this EA, the proposed action would continue the 2009 IOY quota specifications for Atlantic mackerel, *Illex* squid, and butterfish in 2010. 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. As a result of these facts, the specifications in 2010 are not expected to be 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?

The Atlantic mackerel, *Loligo* and *Illex* squid and butterfish 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 proposed action is not expected to substantially increase effort. In addition, none of the proposed specifications are expected to substantially alter fishing methods, activities. As a result, the effects on the human environment of the proposed specifications for 2010 are expected to be minimal or non-existent compared to the 2009 specifications, and effects 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 overall interaction of the proposed action with other actions are expected to generate positive impacts, but 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?

The Atlantic mackerel, *Loligo*, *Illex*, and butterfish 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?

There is no evidence or indication that these fisheries have ever resulted or would ever result in the introduction or spread of nonindigenous species.

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

The proposed action has been proposed and evaluated consistent with prior year's specification setting procedures and therefore is neither likely to establish a precedent for future actions with significant effects nor to represent a decision in principle about a future consideration.

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?

Fishing effort is not expected to substantially 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. Thus, 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?

Fishing effort is not expected to substantially 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. Therefore the proposed action is unlikely to result in cumulative adverse effects (including any that could have a substantial effect on the target species or non target species).

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for 2010 Atlantic Mackerel, Squid and Butterfish fisheries, it is hereby determined that the proposed specifications for 2010 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.

_____ _____

Northeast Regional Administrator, NOAA Date

8.3 Marine Mammal Protection Act

The various 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 2010 which are already in place for 2009 for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish. None of the specifications are expected to significantly alter fishing methods or activities or result in substantially increased effort. The Council has reviewed the impacts of the proposed specifications for the 2010 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 Sections 6 and 7 of the EA.

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 2010 specifications for Atlantic mackerel, *Illex* and butterfish and the prosecution of the associated fisheries are 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 analysis 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 on April 3, 2008. The previous formal consultation on the MSB fisheries was completed on April 28, 1999, and concluded that the operation of the MSB fisheries was not likely to jeopardize the continued existence of listed species and would not result in the destruction or adverse modification of designated critical habitat. Formal consultation on the MSB fisheries was reinitiated on March 6, 2008, after new information revealed that the MSB fisheries may affect sea turtles to an extent not previously considered. Additional information will be evaluated as it becomes available.

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, NMFS has determined that this action would have no effect on any coastal use or resources of any state. Letters documenting the NMFS 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 should be 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 2008. 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 12.0 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 2010 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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9.0 LITERATURE CITED

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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 within the management unit reviewing the consistency of the proposed action relative to each state's Coastal Zone Management Program: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia and Florida.

11.0 LIST OF PREPARERS AND POINT OF CONTACT

This environmental assessment was prepared by the following members of the MAFMC staff: Jason Didden and Richard Seagraves. Questions about this environmental assessment or additional copies may be obtained by contacting Jason Didden, 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 NMFS Northeast Region website at http://www.nero.noaa.gov/nero/regs/com.html.

12.0 INITIAL REGULATORY FLEXIBILITY ANALYSIS (IRFA) & REGULATORY IMPACT REVIEW FOR THE 2010 CATCH SPECIFICATIONS FOR ATLANTIC MACKEREL, SQUID, AND BUTTERFISH

12.1 INTRODUCTION

E.O. 12866 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.

Purpose of and Need for the Action

The purpose of this action is to establish annual quotas and other measures, where necessary, that will meet the need to prevent overfishing and achieve optimum yield. 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 implement the preferred measures described in this document could result in overfishing and stock depletion. In the case of butterfish, failure to restrict fishing mortality would impede efforts to rebuild this overfished stock.

Regulations at 50 CFR Part 648 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 MSB FMP. The term IOY is used in these fisheries 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.

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 a period of one year only (i.e., 2010) due to the impending implementation of Amendment 10 to the MSB FMP and pending (late 2009) stock assessments for mackerel and butterfish.

Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

This action does not contain any new collection-of-information, reporting, recordkeeping, or other compliance requirements. It does not duplicate, overlap, or conflict with any other Federal rules.

12.2 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 $38.6 million in 2008 so the measures considered in this regulatory action should 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 10 is the most recent Amendment for which an FSEIS is available. The economic analysis presented with Amendment 10 was largely qualitative in nature but used quantitative measures whenever possible to describe the MSB fisheries and the impacts of the alternatives being considered.

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 2010 are fully described in section 5.1 and are summarized in Table 55 below (alternative 1a is the preferred alternative). Changes to measures other than ABCs were not considered. For all measures the Regional Administrator can increase the IOY up to, but not to exceed, the ABC specification if applicable through an in-season adjustment (see section 648.21 of the Federal Code of Regulations). Also, up to 3% of the IOY may be set aside for scientific research.

Table 55. Proposed specifications for Atlantic mackerel for the 2010 fishing year (mt).

	ABC	IOY	DAH	DAP	JVP	TALFF	Inc. Trip Limits
Alt. 1a	156,000	115,000	115,000	100,000	0	0	20,000/50,000
Alt. 1b	56,000	56,000	56,000	100,000	0	0	20,000/50,000
Alt. 1c	186,000	115,000	115,000	100,000	0	0	20,000/50,000

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 (1a's IOY) for 2010 is the status quo, so no change in the domestic harvest of Atlantic mackerel would be expected as a result of the specifications in 2010. Both the specification of IOY and ABC far exceed recent landings of Atlantic mackerel. If landings begin to approach IOY in 2010, the Regional Administrator can increase OY up to ABC. In the case where an in-season adjustment to IOY is applicable (1a, 1c), landings would be expected to increase compared to either recent landings or IOY. 1b would be a reduction in IOY but would be unlikely to be significantly restraining based on recent harvest levels.

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 2010 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 the status quo IOY. If landings increased, 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 2010. 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 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, consumer surplus to US consumers would be expected to decrease.

Harvest Costs

No changes to harvest costs relative to the status quo for the MSB fisheries are expected as a result of the considered measures; only the IOY varies between the considered 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.

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 put; and 3) the price of the commodity relative to the consumer's purchasing power (income). There are other factors that may also determine the elasticity of demand but are not mentioned 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).

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 increase enforcement costs.

[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 a change in quantity demanded and price are the same.

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 2a (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 alternative 2b 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 2010. On average over the past five years, the landings for *Illex* have been below the alternatives considered for this species. Therefore, none of the specifications considered by the Council under the alternatives for 2010 for *Illex* are expected to result in an increase or decrease in landings in 2010.

Prices

Given the likelihood that the alternatives considered for *Illex* would not affect landings in 2010, 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 3a (status quo and preferred alternative) would be max OY = 12,175 mt, ABC = 1,500 mt, and IOY, DAH, and DAP = 500 mt and JVP and TALFF = 0 mt. The specifications under alternative 3b would be Max OY = 12,175 mt, ABC = 4,525 mt, and IOY, DAH, and DAP = 1,681 mt and JVP and TALFF = 0 mt. The specifications under alternative 3c would be Max OY = 12,175 mt and ABC = 9,131 mt, and IOY, DAH, and DAP = 3,044 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

Alternative 3a, the preferred alternative of a 500 mt landings quota, is the status quo so no change in landings compared to 2009 would be expected. There was a closure in 2008 at the current quota level, so Alternatives 3b and 3c (which have higher quotas) could lead to increased landings. Alternatives 3b and 3c would likely represent no constraint on butterfish landings. In 2005-2007, when the quota did not constrain landings, average butterfish landings were 555mt. As such, Alternatives 3b and 3c might be expected to lead to 55 mt (555-500) of additional landings. At 2008 average prices, a 55mt addition of butterfish translates to $92,235 additional ex-vessel revenues. With 307 vessels landing butterfish in 2008, the average additional revenue would be $300 annually per vessel.

Prices

Given the likelihood that the alternatives considered will result in no significant change in butterfish landings in 2010, 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.

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 the alternatives considered. As such, no distributional effects are expected for these fisheries.

Alternatives for *Loligo*

The alternatives considered for *Loligo* squid are fully described in section 5.4. The specifications under all alternatives specify that Max OY =32,000 mt, ABC, IOY, DAH, and DAP = 19,000 mt and JVP and TALFF = 0. In terms of the annual quota, these specifications represent the 2008 status quo. The alternatives do consider alternative methods for applying quota overages/ underages from one Trimester to the next. Under the status quo (4b), quota underages and overages transfer from Trimesters 1 and 2 to Trimester 3. The preferred alternative (4a) would keep Trimester 2 the same but transfer half of any Trimester 1 underage to Trimester 2 if the underage is greater than 25% of the Trimester 1 quota. Alternative 4c proposes to use a cumulative tally. There is also a small increase in the codend cover for Loligo proposed, with non-preferred alternatives evaluating larger increases. Since the majority of the selectively takes place in the codend or "liner," these measures are not expected to have and significant impacts on landings, prices, Consumer Surplus, Producer Surplus, Enforcement

Costs, or Distributive effects. Some harvest cost issues are discussed below.

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

All else being equal, 4a and 4c increase fishing opportunities and may increase landings, but probably not significantly. See Section 7.4.4 for details.

Prices

Given the overall likelihood that the alternatives considered for *Loligo* would not significantly affect landings in 2010, it is assumed that there will not be a change in the price for this species. The spreading out of catch possible under 4a and 4c may make prices more stable than under the status quo, 4b.

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. If vessels had costs increased due to the codend cover requirements and passed on the costs to consumers, consumer surplus could decline, but probably only marginally.

Harvest Costs

No changes to harvest costs are expected as a result of the quota alternatives considered for *Loligo*. The preferred codend cover mesh size increase alternative is unlikely to increase harvest costs because vessels likely already have nets that meet the new size and most vessels are already using nets lager than the proposed minimum. The larger sizes could require some vessels to purchase new nets, which could cost anywhere from $200 to $6,000 depending on the size and configuration (See section 7.5). Escapement of juveniles (squid and incidental species) could lower sorting time.

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*. If vessels had costs increased due to the codend cover requirements producer surplus could decline, but probably only marginally.

Enforcement Costs

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

Distributive Effects

There are no changes to the quota allocation process for *Loligo* under the alternatives considered. As such, no distributional effects are expected for this fishery.

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 is summarized in Table 56. 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 "-" indicates that the level of the given feature would be reduced given the action as compared to the base year. A "+" 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 2008 landings. This comparison will allow for the evaluation of the potential fishing opportunities associated with each alternative in 2010 versus the fishing opportunities that occurred in 2008. Since the preferred alternative for IOY for each species are similar to the 2008 status quo, each may be expected to have similar overall impacts.

The Council has concluded that no change in the competitive nature of these fisheries should result from implementation of the quota specifications under the preferred alternatives. No changes in enforcement costs or harvest costs have been identified for any of the alternatives considered for each species.

It is important to note that although the measures that are evaluated in this specification package are for the 2010 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 the intended objectives and the extent to which mitigating measures compensated for any quota overages. Section 7 of this EA has a description or of the cumulative impacts of the measures established under the FMP since it was implemented.

Table 56. IRFA-1. Qualitative comparative summary of economic effects of regulatory alternatives for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish in 2010 relative to 2008.

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

"-" denotes a reduction relative 2008; "0" denotes no change relative 2008; and "+" denotes an increase relative to 2008. "0/" before a "-" or "+" indicates a minor change.

12.3 INITIAL REGULATORY FLEXIBILITY ANALYSIS

12.3.1 INTRODUCTION AND METHODS INCLUDING NUMBER OF REGULATED ENTITIES

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 sector as a firm with receipts (gross revenues) of up to $4.0 million. Party/charter small businesses are included in NAICS code 487210 and are defined as a firm with gross receipts of up to $7 million.

The measures regarding the 2010 quotas could affect any vessel holding an active Federal permit for Atlantic mackerel, *Loligo, Illex* or butterfish (see Table 57 below), as well as vessels that fish for any one of these species in state waters. According to NMFS permit file data, 2,342 commercial vessels possessed Atlantic mackerel permits, 371 vessels possessed *Loligo*/butterfish moratorium permits, 77 vessels possessed *Illex* permits, 2193 vessels possessed incidental catch permits in 2008, and 829 vessels possessed squid/mackerel/butterfish party/charter permits. In 2008 all of the commercial vessels were within the definition of a small business. While gross revenue data is not available for the party/charter sector, it is a reasonably safe presumption that almost all if not all of the party/charter vessels would qualify as a small business. Many vessels participate in more than one of these fisheries; therefore, permit numbers are not additive. The distribution of permitted and active vessels by state may be found in Section 6.

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 active vessel tables in Section 6 above). 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 2008. 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 2008

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. 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.

12.3.2 ANALYSIS OF THE IMPACTS OF ALTERNATIVES

For the purpose of ease of comparison, the specifications in recent years compared to actual fishery performance are given by species in Tables 57-60 IRFA 2-5 below.

Table 57. IRFA-2. Summary of specifications and landings for Mackerel (mt).

	2004	2005	2006	2007	2008	2009
ABC[1]	347,000	335,000	335,000	186,000	156,000	156,000
IOY	170,000	115,000	115,000	115,000	115,000	115,000
DAH[2]	170,000	115,000	115,000	115,000	115,000	115,000
DAP	150,000	100,000	100,000	100,000	100,000	100,000
JVP	5,000	0	0	0	0	0
TALFF	0	0	0	0	0	0
US Commercial	54,998	42,213	56,646	25,547	21,749	-
US Value (m $)	13.1	11.0	23.7	6.6	6.2	-
US Recreational	530	1,033	1,633	882	691	-
Total US	55,528	43,246	58,279	26,429	22,440	-
Canadian	53,565	54,279	53,649	50,578	28,288	-

[1] ABC = F_{target} - estimated Canadian landings.
[2] Includes recreational allocation of 15,000 mt.

Table 58. IRFA-3. Summary of specifications and landings for *Illex* (mt).

	2004	2005	2006	2007	2008	2009
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)	26,098	12,032	13,944	9,022	15,900	-
Value (millions $)	16.8	8.4	7.9	3.9	8.3	-

Table 59. IRFA-4. Summary of specifications and landings for butterfish (mt).

	2004	2005	2006	2007	2008	2009
Max OY	16,000	12,175	12,175	12,175	12,175	12,175
ABC	7,200	4,525	4,545	4,545	4,545	1,500
IOY	5,900	1,681	1,681	1,681	1,681	500
DAH	5,900	1,681	1,681	1,681	1,681	500
DAP	5,900	1,681	1,681	1,681	1,681	500
JVP	0	0	0	0	0	0
TALFF[2]	0	0	0	0	0	0
Landings (mt)	537	437	554	671	451	-
Value (millions $)	0.7	0.7	0.8	1.1	.8	-

Table 60. IRFA-5. Summary of specifications and landings for *Loligo* (mt).

	2004	2005	2006	2007	2008	2009
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	19,000
IOY	17,000	17,000	17,000	17,000	17,000	19,000
DAH	17,000	17,000	17,000	17,000	17,000	19,000
DAP	17,000	17,000	17,000	17,000	17,000	19,000
JVP	0	0	0	0	0	0
TALFF	0	0	0	0	0	0
Landings (mt)	15,447	16,984	15,880	12,342	11,400	-
Value (millions $)	25.7	28.9	27.8	23.2	23.3	-

12.3.2.1 Impacts of Alternatives for Atlantic mackerel

The three alternatives considered for Atlantic mackerel specifications for 2010 are fully described in section 5.1 of the EA and are summarized in Table 61 below.

Table 61. Proposed specifications for Atlantic mackerel for the 2010 fishing year (mt):

	ABC	IOY	DAH	DAP	JVP	TALFF	Inc. Trip Limits
Alt. 1a	156,000	115,000	115,000	100,000	0	0	20,000/50,000
Alt. 1b	56,000	56,000	56,000	100,000	0	0	20,000/50,000
Alt. 1c	186,000	115,000	115,000	100,000	0	0	20,000/50,000

In the cases of 1a (preferred) and 1c, these alternatives exceed recent landings of the mackerel and would likely be unconstraining for 2010. In the absence of any constraints on vessels in the mackerel fishery in aggregate or individually, there is no impact on revenues under the Regulatory Flexibility Act. Alternative 1b would have represented a small constraint in 2006 only, so it is likely that none of the considered alternatives would represent any constraint on vessels in the mackerel fishery in aggregate or individually. As a result, the specifications considered for Atlantic mackerel are unlikely to have any negative impacts on businesses involved in the commercial harvest of Atlantic mackerel in 2010. Given 2008 landings of mackerel were approximately 22,438 MT, all of the proposed 2010 specifications could allow for an increase in ex-vessel revenues in 2010 compared to 2008.

12.3.2.2 Impacts of Alternatives for *Illex*

The specifications for *Illex* under alternative 2a (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 alternative 2b would be Max OY, ABC, IOY, DAH, and DAP = 19,000 mt and JVP and TALFF = 0 mt.

In both cases, the alternatives considered for *Illex* for the 2010 specifications of IOY exceed recent landings. Therefore, the 2010 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 2010 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 2010. Given 2008 landings of *Illex* were approximately 15,900 MT, all of the proposed 2010 specifications could allow for an increase in ex-vessel revenues in 2010 compared to 2008.

12.3.2.3 Impacts of Alternatives for butterfish

The specifications under alternative 3a would be max OY = 12,175 mt, ABC = 1,500 mt, and IOY, DAH, and DAP = 500 mt and JVP and TALFF = 0 mt. The specifications under alternative 3b would be Max OY = 16,000 mt, ABC = 4,525 mt, and IOY, DAH, and DAP = 1,861 mt and JVP and TALFF = 0 mt. The specifications under alternative 3c would be Max OY = 12,175 mt and ABC = 9,131 mt, and IOY, DAH, and DAP = 3,044 mt and JVP and TALFF = 0 mt.

The ABC specifications for butterfish under alternatives 3b and 3c exceed the landings of the species in recent years. Therefore, the 2010 quota specifications under these alternatives would represent no substantial 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. The ABC specifications under alternative 3a could lead to a small constraint compared to how the fishery operated 2006-2008.

For butterfish, Alternative 3a would constrain the butterfish fishery to 500mt, however this is the same as last year so there would be no change compared to how the fishery operated last year. In 2005-2007, when the quota did not constrain landings, average butterfish landings were 555mt. As such, Alternatives 3b and 3c might be expected to lead to 55 mt (555-500) of additional landings. At 2008 average prices, a 55mt addition of butterfish translates to $92,235 additional ex-vessel revenues. With 307 vessels landing butterfish in 2008, the average additional revenue would be $300 annually per vessel, so the impact is considered minimal and analysis concluded at this point. Additionally, since the 2009 specifications included a 500mt quota and were designed to keep the butterfish fishery below 500mt, and will likely do so, no changes from 2009 to 2010 in terms of fishing opportunities are expected as a result of the 2010

specifications. As a total result, the specifications under alternatives 3a, 3b, and 3c will have no substantial negative impacts on businesses involved in the commercial harvest of this species.

12.3.2.4 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 =32,000 mt, ABC, IOY, DAH, and DAP = 19,000 mt and JVP and TALFF = 0 mt. In terms of the annual quota, these specifications represent the 2009 status quo (no action - status quo). Since the 2010 quota specifications under all alternatives would likely represent no constraint on vessels in this fishery in aggregate or individually, there are likely no negative impacts on revenues under the Regulatory Flexibility Act. In fact, the consideration of transferring quota over to Trimester 2 from Trimester 1 (Alternatives 4a and 4c) may provide some economic benefits to this fishery compared to how the fishery was prosecuted under the 2008 and 2009 specifications, as described in Section 7.4.4. Given 2008 landings of *Loligo* were approximately 11,400 MT, all of the proposed 2010 specifications could allow for an increase in ex-vessel revenues in 2010 compared to 2008.

There is also a small increase in the codend cover for Loligo proposed (Alternative Set 5), with non-preferred alternatives evaluating larger increases. Since the majority of the selectively takes place in the codend or "liner," these measures are not expected to have and significant impacts on vessels fishing effectiveness. Since selectivity is likely to be only minimally affected, effort should not be impacted. It was reported to the Council by industry that most vessels that fish for *Loligo* would already have older nets of the status quo or smaller proposed increases. With the larger proposed increases, more vessels may have to buy covers just for using it as a cover, but the proportions are impossible to quantify. Codend prices were investigated in Amendment 10 and found to cost in the range of $200-$700. Wrapped square mesh codends used by vessels currently fishing with the largest proposed cover size requirements can cost $5,000-6,000, but may last for 4-5+ years so impacts are difficult to quantify. If juvenile Loligo are avoided and vessels can avoid sorting out undesirable juvenile catch, then there may be some associated efficiency gains. If increased escapement leads to more marketable squid or less bycatch (which could cause additional future regulatory actions) there could also be associated benefits for Loligo fishermen. Overall impact is difficult to predict but probably low overall in either direction.

13.0 APPENDIX A - SMB MONITORING COMMITTEE REVIEW OF CODEND COVER ISSUE

Recommendation: Improve codend cover selectivity in the *Loligo* fishery to reduce the bycatch of juvenile *Loligo* and finfish.

Background: Vessels in the *Loligo* fishery use strengtheners or codend covers around the outside of their diamond mesh codend liners, ostensibly to prevent the small mesh liners from tearing under heavy load. The modal mesh size of liners used in the *Loligo* fleet is 51 mm (refer to Amendment 10 to the SMB FMP). However, the fleet uses a variety of square and diamond mesh sizes as codend covers (Fig. 1). The regulations state:

"…owners or operators of otter trawl vessels fishing for and/or possessing *Loligo* may use net strengtheners (covers), splitting straps, and/or bull ropes or wire around the entire circumference of the codend, provided they do not have a mesh opening of less than 4 ½ inches (114mm) diamond mesh, inside stretch measure".

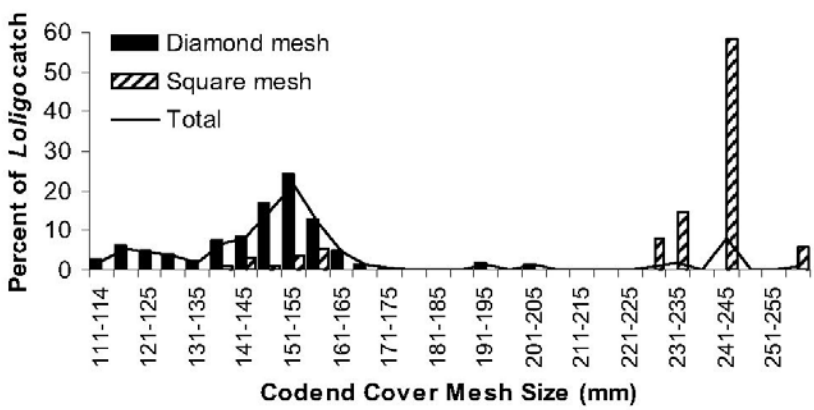

Figure 1. Percentage of *Loligo* landings for directed fishery trips by type of codend cover and by mesh size, for diamond versus square mesh covers, and for both types combined, based on NEFOP data for 1996-2006.

Issue: The use of codend covers has been shown to significantly reduce codend selectivity (i.e., to reduce the level of escapement), acting as a visual as well as a physical barrier to escapement related to the overlay of the two nets (Kynoch et al. 2004). Also, diamond mesh covers result in less escapement than square mesh covers. Reduced escapement occurs because the openings of diamond meshes become restricted and do not retain their shape under load conditions (Stewart and Robertson 1985). Square mesh codends have been shown to reduce bycatch in mixed trawl fisheries that catch both squid and hake species (Ordines et al. 2006) and selectivity study of *Loligo vulgaris* showed an increase in the length at 50% retention when square mesh codends rather than diamond mesh codends were fished (Tosunoglu 2009). The Monitoring Committee decided that it was likely that these codend mesh findings could be extended to covers in principle.

The *Loligo* fleet uses a variety of square and diamond mesh sizes as codend covers. However, both cover types generally consist of mesh sizes larger than the regulatory minimum (4.5 inches/ 114mm); with a mode at the 151-155 mm size bin (5.9-6.1 in.) for diamond mesh covers and a mode at the 241-245 mm size bin (mainly consisting of 241 mm mesh or 9.5 in.) for square mesh covers (Fig. 1). Most of the *Loligo* catch during 1996-2006 was taken with 136-165 mm (5.5-6.5 in.) diamond mesh codend covers (Fig. 1).

Kynoch et al. (2004) noted that the twine types currently used to construct codends are much stronger than those used in the past; thereby reducing the likelihood of a burst codend. In addition to this fact, most *Loligo* covers are constructed of double twine which further increases the strength, but which also acts to further reduce selectivity. NEFOP data also indicate that girth ropes, which limit the expansion of the codend, and chafing gear are also commonly used in the fishery to strengthen the codend. Girth ropes have also been shown to reduce selectivity; the length at 50% retention (Hermann et al. 2006).

Squid selectivity has been suggested to be similar to that of finfish (Hastie 1996). The current lack of a standard type of codend cover in the *Loligo* fishery results in varying selectivities within the fleet and thus differential affects on the sizes and amounts of bycatch species and juvenile *Loligo*. For example, squid smaller than 10 cm dorsal mantle length (DML) are discarded by a major portion of the fleet which uses Millionaire nets with 153 mm (6 in.) diamond mesh covers (Powell et al. 2004; King et al. 2007). As indicated in Fig. 1, a majority of the *Loligo* landings are taken using this mesh size. *Loligo* landings include a substantial fraction of juveniles. The median length at maturity (L_{50}) for female *Loligo* (for pooled winter- and summer-hatched squid) is 185 mm DML (Macy and Brodziak 2001). The length compositions of the landings (Fig. 2) indicate that the sizes at 50% retention are less than 185 mm (140 mm during Nov-Feb and 150 mm during June-Oct). Thus, the stock would benefit from a codend mesh size increase to reduce the fishing mortality of juvenile *Loligo* (assuming escaped squid are not mortally injured). A codend cover mesh size increase, especially a change to square mesh, would aid in this regard. A portion of the fleet, fishermen using 9.5 in. square mesh covers, are reportedly doing so because their bycatch and catches of juvenile *Loligo* are reduced. Clearly, this gear would not be used if it didn't work and if it was not economically feasible, at least for some portion of the fleet.

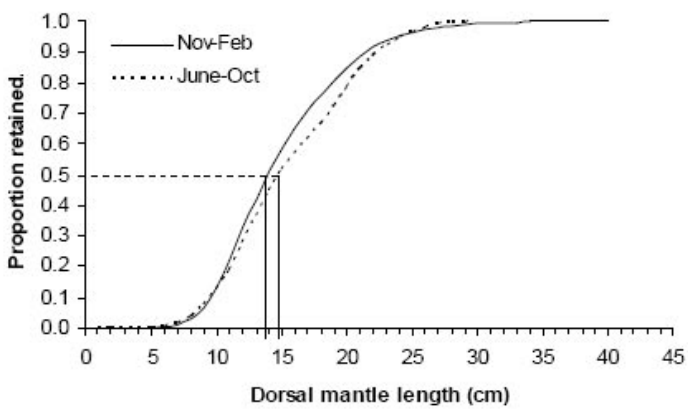

Fig. 2. Proportion of *Loligo pealeii* landed, by DML, in the directed fishery during November-February versus June-October, 1991-2001 (Source: Amendment 10 to the SMB FMP).
Codend covers are often replaced one or more times per year as part of normal fishing operations. Most of the *Loligo* catch is taken with approximately 6 in. diamond mesh covers (mode = 151mm to 155mm). The largest of existing mesh sizes and types used in the fishery is the 9.5 in. square mesh cover. *Loligo* fishermen who are currently using 9.5 in. square mesh covers have reported that this mesh type and size has reduced the quantities of bycatch and juvenile squid in their catches, and that because the meshes are wrapped, the covers last for multiple years. Regardless of whether the cover meshes are wrapped or consist of double twine that is not wrapped, the use of large square mesh covers will likely offer the most benefit to sustainability of the *Loligo* stock as well as the stocks of butterfish and other bycatch species.

As part of the MSA requirement to reduce bycatch to the extent practicable, specifically juvenile *Loligo* and finfish, the Monitoring Committee recommends that the Council consider options within the following range:

1. Require a minimum of 5.5 in. to 9.5 in. square mesh covers
2. Require a minimum of 5.5 in (fluke min. codend mesh size) to 6.5 in. (groundfish min. codend mesh size) diamond mesh covers

The table below describes the percentage of landings (1996-2006) that would have been affected by an increase to a given mesh size based on observer data. For example, an increase to 5.5 inches would have affected 22% of landings and an increase to 6.5 inches would have affected 83% of landings.

% 4.5-5.5 in.	% < 6.5 in.	%< 9.5 in.
<140 mm	< 165 mm	<241 mm
22	83	99

The Monitoring Committee could not come to consensus on a particular option, but did come to consensus on:

A) acknowledging that codend covers can decrease selectivity,
B) that increasing the codend mesh would likely improve selectivity to some degree,
C) bycatch reduction benefits would be greater with square mesh than diamond, and
D) bycatch reduction benefits increase with increasing cover mesh sizes above those already in use

The primary reason the Monitoring Committee could not come to consensus on a particular option was that the exact benefits and exact costs related to these improvements are difficult to describe, which makes an evaluation of their practicability difficult. Staff investigated codend costs and the costs for large wrapped square mesh can run up to $5,000-$6,000 (however these nets can potentially last at least 4-5 years, resulting in an average cost of $1,222 per year or less). Amendment 10 identified that costs for new codends in general can run $200-$700 depending on codend size.

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