2002 Atlantic Mackerel, *Loligo, Illex*
and Butterfish Specifications

Draft Environmental Assessment
Initial Regulatory Impact Review
Initial Regulatory Flexibility Analysis

EFH Assessment

October 2001

Mid-Atlantic Fishery Management Council
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Executive Summary

Table 1. Quota Recommendations for 2002[1] (mt)

	Loligo	*Illex*
Maximum OY - (Max. Optimum Yield)	26,000	24,000
ABC - (Allowable Biological Catch)	17,000	24,000
OY - (Optimum Yield)	17,000	24,000
DAH - (Domestic Annual Harvest)	17,000	24,000
	Mackerel	Butterfish
ABC - (Allowable Biological Catch)	347,000	7,200
IOY - (Initial Optimum Yield)	85,000	5,900
DAH - (Domestic Annual Harvest)	85,000	5,900
DAP - (Domestic Annual Processing)	50,000	5,900
JVP[2] - (Joint Venture Processing)	20,000	0
TALFF - (Total All. Lev. Foreign Fishing)	0	0

Note: DAH for Atlantic mackerel includes 15,000 mt recreational allocation (based on Amendment 5) + 50,000 DAP + 20,000 JVP.

[1] Proposed for 2002. If an MAFMC omnibus framework action regarding quota set-asides is approved and research projects are approved by December 31, 2001, 2% of ABC, IOY, DAH and DAP for 2002 may be set-aside for *Loligo* and *Illex* and up to 2% of IOY may be set-aside for scientific research for Atlantic mackerel and butterfish.

[2] The specifications for IOY, DAH, and JVP for Atlantic mackerel may increased by 10,000 mt each at the discretion of the Regional Administrator without further consultation with the Council.

Recommended Special Conditions for Atlantic mackerel specifications are:

1. Joint ventures are allowed south of 37^o 30' N. latitude, but the river herring bycatch south of that latitude may not exceed 0.25% of the over the side transfers of Atlantic mackerel.

2. The Regional Administrator should do everything within his/her power to reduce impacts on marine mammals in prosecuting the Atlantic mackerel fisheries.

3. The mackerel OY may be increased during the year, but the total should not exceed 347,000 mt.

5. Applications from a particular foreign nation for a mackerel Joint Venture allocation in 2002 may be decided based on an evaluation by the Regional Administrator of the nation's performance relative to purchase obligations for previous years.

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1.0 Introduction

1.1 Purpose and Need for Action

The Mid-Atlantic Fishery Management Council (Council) approved its 2002 recommendations for specifications at its June 2001 meeting and submitted them to the Regional Administrator, Northeast Region, National Marine Fisheries Service (Regional Administrator). A document titled "2002 Atlantic Mackerel, *Loligo*, *Illex*, and Butterfish Specifications" (quota paper) was submitted to the Regional Administrator in August 2001. This paper serves as a vehicle for the Council's formal submission of recommendations for specifications and also contains analyses upon which the recommendations are based. This Environmental Assessment is written in response to a need for analyses of the impacts of the proposed 2002 specifications for the Atlantic mackerel, squid and butterfish (specifications) on the human environment pursuant to the National Environmental Policy Act. The preferred alternatives for the proposed specification for Atlantic mackerel, *Loligo* and *Illex* squid and butterfish are summarized in the Table EA-1 below:

Table EA-1. Preferred Alternative Quota Recommendations for 2002[1] (mt)

	Loligo	*Illex*
Maximum OY - (Max. Optimum Yield)	26,000	24,000
ABC - (Allowable Biological Catch)	17,000	24,000
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Note: DAH for Atlantic mackerel includes 15,000 mt recreational allocation (based on Amendment 5) + 50,000 DAP + 20,000 JVP.

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2. The Regional Administrator should do everything within his/her power to reduce impacts on marine mammals in prosecuting the Atlantic mackerel fisheries.

4. The mackerel OY may be increased during the year, but the total should not exceed 347,000 mt.

5. Applications from a particular foreign nation for a mackerel Joint Venture allocation in 2002 may be decided based on an evaluation by the Regional Administrator of the nation's performance relative to purchase obligations for previous years.

Regulations implementing the Fishery Management Plan for the Atlantic Mackerel, Squid, and Butterfish Fisheries (FMP) prepared by the Council appear at 50 CFR Part 648. These regulations stipulate that the Secretary will publish a notice specifying the initial annual amounts of the initial optimum yield (IOY) as well as the amounts for allowable biological catch (ABC) domestic annual harvest (DAH), domestic annual processing (DAP), joint venture processing (JVP), and total allowable levels of foreign fishing (TALFF) for the species managed under the FMP. No reserves are permitted under the FMP for any of these species. Procedures for determining the initial annual amounts are found in §648.21. The term IOY is used in this fishery to reinforce the fact that the Regional Administrator may alter this specification up to the ABC if economic and social conditions warrant an increase. Therefore, this specification is no different than OY or optimum yield.

1.2 History of FMP Development

The Mid-Atlantic Fishery Management Council (MAFMC) initiated the development of the Atlantic mackerel and *Loligo* and *Illex* squid Fishery Management Plans in March of 1977. Both the mackerel and squid FMP's were adopted by the Council in March 1978 and were subsequently approved by the NMFS in July of 1979. The Atlantic butterfish FMP was submitted to NMFS in December 1978 and a revised version was approved by NMFS in November 1979.

The MAFMC began work to merge the mackerel, squid, and butterfish Plans into a single FMP in 1980. The Atlantic mackerel, *Loligo* and *Illex* squid, and Atlantic butterfish Fishery Management Plan was implemented by emergency interim regulation on 1 April 1983. Since then the FMP has been amended five times. Amendment 1 was prepared to implement the squid optimum yield mechanism, and revised the mackerel mortality rate. Amendment 2 changed the fishing year to the calendar year, revised the squid bycatch TALFF allowances, put the four species on a framework basis, and changed the fishing vessel permit from permanent to annual. Amendment 4 established definitions of overfishing for all four species.

This species complex was heavily exploited by foreign fleets during the 1960's and 1970's. With the advent of passage of the Magnuson Act in 1976 and the subsequent development of the Atlantic mackerel, Squid, and Butterfish FMP and it's amendments described above, the MAFMC has worked towards the sound management of the resource. One of the primary goals of the FMP was to "Americanize" these fisheries by maximizing opportunities for growth and by promoting the development of the U.S. mackerel, squid, and butterfish fisheries. As a result, foreign fisheries for the squids and butterfish have been eliminated.

Amendment 5 was approved by NMFS 9 February 1996. It lowered the *Loligo* MSY, eliminated the possibility of directed foreign fisheries for *Loligo*, *Illex*, and butterfish; instituted a dealer and vessel reporting system; instituted an operator permitting system; and expanded the management unit to include all Atlantic mackerel, *Loligo*, *Illex*, and butterfish under US jurisdiction. Three measures were disapproved: the proposed cap on ABC at long-term potential yield, the moratorium on entry to the *Illex* fishery, and the *Loligo* mesh exemption for the sea herring fishery. The Council chose to resubmit alternative management measures for the specification of ABC for Atlantic mackerel and qualifying criteria for an *Illex* moratorium permit which were subsequently approved by NOAA. The Council developed Amendment 6 which revised the definitions of overfishing for the squids and butterfish in recognition of the short life span of these species. Amendment 7 was developed to make the Atlantic mackerel, Squid, and Butterfish FMP consistent with other Northeastern FMP's with respect to vessel upgrade and replacement criteria. Amendment 8 was developed to bring the Atlantic mackerel, Squid, and Butterfish FMP into compliance with the Sustainable Fisheries Act. The Council is currently developing Amendment 9 to the FMP. The purpose of this document is to examine the biology, fisheries, and current stock status for this species complex and to specify the quotas and management measures recommended by the Council for 2002 pursuant to the current FMP and Amendments. As noted in the summary table, If an MAFMC omnibus framework action regarding quota set-asides is approved and research projects are approved by December 31, 2001, 2% of ABC, IOY, DAH and DAP for 2002 may be set-aside for *Loligo* and *Illex* and up to 2% of IOY may be set-aside for scientific research for Atlantic mackerel and butterfish.

1.3 Goals and Objectives of Current FMP

The current 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 U.S. 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 the understanding of the conditions of the stocks and fisheries.
6. Minimize harvesting conflicts among US commercial, US recreational and foreign fishermen.

1.4 Management Unit

The current management unit is all Atlantic mackerel, *Loligo pealei*, *Illex illecebrosus*, and butterfish under US jurisdiction.

2.0 Preferred and alternative Management Measures

2.1 Atlantic mackerel

2.1.1 Proposed specifications (preferred alternative) for Atlantic mackerel in 2002

The preferred alternative for the proposed 2002 specifications for Atlantic mackerel are contained in Table 1 below.

TABLE 1. PROPOSED (PREFERRED ALTERNATIVE) ANNUAL SPECIFICATIONS FOR ATLANTIC MACKEREL FOR THE FISHING YEAR JANUARY 1 THROUGH DECEMBER 31, 2002 (in me tons (mt))

Max OY	N/A[1]
ABC	347,000
IOY	85,000
DAH	85,000[2]
DAP	50,000
JVP[3]	20,000
TALFF	0

[1] Not applicable; see the FMP.

[2] Contains 15,000 mt projected recreational catch based on the specifications contained in the regulations (50 part 648).

[3] The specifications for IOY, DAH, and JVP may increased by 10,000 mt each at the discretion of the Regional Administrator without further consultation with the Council.

Overfishing for Atlantic mackerel is defined to occur when the catch associated with a threshold fishing mortality rate of F_{msy} is exceeded. When SSB is greater than 890,000 mt, the overfishing limit is F_{MSY} (F=0.45), and the target F is the tenth bootstrap percentile of F_{MSY} (F=0.25). To avoid low levels of recruitment, the threshold F decreases linearly from 0.45 at 890,000 mt SSB to zero at 225,000 mt SSB (1/4 B_{MSY}), and the target F decreases linearly from 0.25 at 890,000 mt SSB to zero at 450,000 mt SSB (½ B_{MSY}). Annual quotas are be specified which correspond to a target fishing mortality rate according to this control law. The yield associated with the target fishing mortality rate of F=0.25 adopted in Amendment 8 is 369,000 mt. The ABC recommendation is 347,000 mt (F=0.25 yield estimate of 369,000 mt - the estimated Canadian catch of 22,000 mt).

The Council recommended that the status quo specification for DAP for 2001 be maintained in 2002 at 50,000 mt. In addition, the Council also recommended that the JVP specification be increased to 20,000 mt and TALFF be specified at 0 mt in 2002. If the recreational allocation of 15,000 mt is summed with DAP and JVP, then DAH equals 85,000 mt. If DAH and TALFF are summed then IOY equals 85,000 mt.

The Council maintained JVP in 2002 at 20,000 mt because they recognized the need for JV's to allow US harvesters to take mackerel at levels in excess of current US processing capacity. The increased JVP specification recommendation since 2001 is based on the fact that US mackerel production in recent years has been far lower than historical levels, in spite of increases in world demand for mackerel and recent declines in world production.

2.1.2 Alternative Actions for Atlantic mackerel in 2002

2.1.2.1 Alternative 1 for Atlantic mackerel: Maintain Status Quo 2001 specifications for 2002

The first alternative action considered by the Council was to maintain the status quo 2001 specifications for Atlantic mackerel for 2002 (Table 2) .

TABLE 2. ALTERNATIVE 1 (2001 STATUS QUO) TO THE PROPOSED ANNUAL SPECIFICATIONS F ATLANTIC MACKEREL FOR THE FISHING YEAR JANUARY 1 THROUGH DECEMBER 31, (in metric tons (mt))

Max OY	N/A[1]
ABC	347,000
IOY	88,000
DAH	75,000[2]
DAP	50,000
JVP	20,000
TALFF	3,000

[1] Not applicable; see the FMP.

[2] Contains 15,000 mt projected recreational catch based on the formula contained in Amendment 5.

The status quo 2001 specification of TALFF in 2002 would not meet the policy objectives of the Council relative to further development of the US domestic harvest of Atlantic mackerel.

2.1.2.2 Alternative 2 for Atlantic mackerel: Specify ABC at long term potential catch

The second alternative action considered by the Council for Atlantic mackerel in 2002 was to specify ABC at long term potential catch. The proposed specifications under this alternative are given in Table 3 below:

TABLE 3. ALTERNATIVE 2 TO THE PROPOSED ANNUAL SPECIFICATIONS FOR ATLANTIC MACKEREL FOR THE FISHING YEAR JANUARY 1 THROUGH DECEMBER 31, 2002 (in me tons (mt))

Max OY	N/A[1]
ABC	134,000
IOY	85,000
DAH	85,000[2]
DAP	50,000
JVP	20,000
TALFF	0

[1] Not applicable; see the FMP.

[2] Contains 15,000 mt projected recreational catch based on the formula contained in Amendment 5.

The Council considered that the ABC specification for Atlantic mackerl be capped at long term potential catch (LTPC). The most recent estimate of LTPC was 134,000 mt. The use of LTPC as an upper bound on ABC was found to be inappropriate because it would not allow for variations and contingencies in the status of the stock. For example, the current adult stock was recently estimated to exceed 2.1 million mt. The specification of ABC at LTPC would effectively result in an exploitation rate of only about 6%, well below the optimal level of exploitation. The potential level of foregone yield under this alternative was considered unacceptable.

2.1.2.3 Alternative 3 for Atlantic mackerel: Specify JVP and TALFF at 0 mt

Another alternative the Council considered was the elimination of JVP and TALFF for 2002. The proposed specifications under this alternative are given in Table 4 below:

TABLE 4. ALTERNATIVE 3 TO THE PROPOSED ANNUAL SPECIFICATIONS FOR ATLANTIC MACKEREL FOR THE FISHING YEAR JANUARY 1 THROUGH DECEMBER 31, 2002 (in metric tons (mt))

Max OY	N/A[1]
ABC	347,000
IOY	65,000
DAH	65,000[2]
DAP	50,000
JVP	0
TALFF	0

[1] Not applicable; see the FMP.

[2] Contains 15,000 mt projected recreational catch based on the formula contained in Amendment 5.

The Council rejected this option because they recognized the need for JV's in 2002 to allow US harvesters to take mackerel at levels in excess of current US processing capacity. However, in the future the Council intends to re-evaluate it’s policy relative to JV's as US processing and export capacity increases.

2.2 Atlantic Squids and Butterfish

The proposed specifications (preferred alternatives) for butterfish fisheries are contained in Table 5 below.

TABLE 5. PROPOSED ANNUAL SPECIFICATIONS (PREFERRED ALTERNATIVES) FOR THE ATLAN SQUID AND BUTTERFISH FOR THE FISHING YEAR, JANUARY 1 THROUGH DECEMBER 2002 (in metric tons (mt)).

Specifica-tions	Squid		Butterfish
	Loligo	Illex	
Max OY[1]	26,000	24,000	16,000
ABC	17,000	24,000	7,200
IOY	17,000	24,000	5,900
DAH	17,000	24,000	5,900
DAP	17,000	24,000	5,900
JVP	0	0	0
TALFF	0	0	0

[1] Maximum OY as stated in the FMP.

2.3 Alternative Actions for *Loligo* and *Illex*

The following alternative actions for the squid specifications were considered in this environmental analysis as follows:

Alternatives 1 (2000 Status Quo) and 2 for *Loligo* squid are given below.

TABLE 6. ALTERNATIVE ANNUAL SPECIFICATIONS FOR THE LOLIGO SQUID FOR THE FISHING YEAR, JANUARY 1 THROUGH DECEMBER 31, 2002 (in metric tons (mt)).

Specifications	Loligo Squid	
	Alt. 1	Alt. 2
Max OY[1]	26,000	24,000
ABC	13,000	11,700
IOY	13,000	11,700
DAH	13,000	11,700
DAP	13,000	11,700
JVP	0	0
TALFF	0	0

[1] Maximum OY as stated in the FMP.

Alternatives 1 and 2 (1999 status quo) for *Illex* squid are given below:

TABLE 7. ALTERNATIVE ANNUAL SPECIFICATIONS FOR THE *ILLEX* SQUID FOR THE FISHING YEAR, JANUARY 1 THROUGH DECEMBER 31, 2002 (in metric tons (mt)).

Specifications	Illex Squid Alt. 1	Illex Squid Alt. 2
Max OY[1]	30,000	24,000
ABC	30,000	19,000
IOY	30,000	19,000
DAH	30,000	19,000
DAP	30,000	19,000
JVP	0	0
TALFF	0	0

[1] Maximum OY as stated in the FMP.

2.3.1 Alternative 1 for Loligo: Maintain 2000 Specifications in 2002

The FMP defines overfishing for *Loligo* as occurring when the catch associated with a threshold of F_{MAX} is exceeded (F_{MAX} is a proxy for F_{MSY}). When an estimate of F_{MSY} becomes available, it will replace the current overfishing proxy of F_{MAX}. Max OY is specified as the catch associated with a F_{MAX}. In addition, the biomass target is specified to equal B_{MSY}.

The most recent stock assessment for *Loligo* (the 29th Northeast Regional Stock Assessment Workshop, August 1999 (SAW-29)) concluded that the stock was approaching an overfished condition and that overfishing was occurring. More recently, NMFS' Report to Congress: Status of Fisheries of the United States (October 1999) determined that the *Loligo* stock was overfished at the time the report was written. A production model indicated that current biomass was less than B_{MSY}, and near the biomass threshold of 50 percent B_{MSY}. There was a high probability that F exceeded F_{MSY} in 1998. The average F from the winter fishery (October to March) over the last 5 years averaged 180 percent of F_{MSY}, and F from the summer fishery equaled F_{MSY}. In addition, indices of recruitment were well below average.

The Magnuson-Stevens Fishery Conservation and Management Act required the Council to take remedial action for 2000 to rebuild the stock to a level that will produce MSY (B_{MSY}) given the status determination that *Loligo* was overfished. The control rule in the FMP specifies that the target F must be reduced to zero if biomass falls below 50 percent of B_{MSY}. The target F increases linearly to 75 percent of F_{MSY} as biomass increases to B_{MSY}. However, projections made in SAW-29 indicate that the *Loligo* control rule appears to be overly conservative. The projections presented demonstrate that the stock could be rebuilt in a relatively short period of time, even at F values approaching F_{MSY}. Projections indicated that the *Loligo* biomass could be rebuilt to levels approximating B_{MSY} in 3 to 5 years if F is reduced to 90 percent of F_{MSY}. The yield associated with this F (90 percent of F_{MSY}) in 2000, assuming status quo F in 1999, was estimated to be 13,000 mt based on projections from SAW-29. The establishment of 4-month periods spread F out over the year and was expected to protect spawners. The current regulations still specify Max OY as the yield associated with $F_{MAX,}$ or 26,000 mt.

In determining the specification of ABC for the year 2000, the Council considered the SAW-29 projections. Based on these analyses, the Council chose to specify ABC as the yield associated with 90 percent of $F_{MSY,}$ or 13,000 mt. However, recent stock assessment data indicate that the Loligo stock has increased in size and is currently at or near B_{msy}. As a result, maintaining ABC at 13,000 in 2002 would cause unnecessary reductions in yield and loss of revenue to the fishery.

2.3.2 Alternative 2 for Loligo: MAX OY of 26,000 mt and ABC, IOY, DAH, DAP of 11,700 mt

In determining the specification of ABC for the year 2001, the Council considered the recommendations of SAW-29. Based on these analyses, the Council would have chosen to specify ABC as the yield associated with 75 percent of $F_{MSY,}$ or 11,700 mt. However, recent stock assessment data indicate that the *Loligo* stock has increased in size and is currently at or near B_{msy}. As a result, specifying ABC at 11,700 in 2002 would cause unnecessary reductions in yield and loss of revenue to the fishery.

2.3.3 Alternative 1 for Illex: 30,000 MT of ABC, IOY, DAH, DAP

The specifications of 30,000 mt for Max OY, ABC, IOY, DAH and DAP for the *Illex* fishery may cause a significant change in the abundance of the resource or the all size index. A yield per recruit analysis was performed for Illex using recently developed information on the age and growth of *Illex* using daily statolith growth increments. These findings indicate that Illex is an annual species that grows rapidly and is not as long-lived as previously thought, i.e. three years. As a result the biological reference points for *Illex* were re-estimated in SAW-21. The Council recently developed Amendments 6 and 8 to the FMP which incorporated the recommendations of SAW-21 in the development of a new definition of overfishing for *Illex* and also recommended that overfishing be defined to occur when fishing mortality exceeds F_{msy}. The current estimate of yield at F_{msy} equals 24,000 mt. If ABC, IOY, DAH and DAP were all specified at a level above that associated with the overfishing threshold (F_{msy}), then the Council would not be implementing the

FMP according to the most recent Amendment . In addition, SAW-21 advised that catches in excess of 24,000 mt may only be attainable in years of high abundance.

2.3.4 Alternative 2 for Illex: Max OY at 24,000 MT and ABC, IOY, DAH, DAP of 19,000 mt (1999 Status Quo)

The specifications of 24,000 mt for Max OY and , ABC, IOY, DAH and DAP of 19,000 mt for the *Illex* fishery would not be expected to cause a significant change in the abundance of the resource or the all size index. The Council recently developed Amendments 6 and 8 to the FMP which incorporated the recommendations of SAW- 21 in the development of a new definition of overfishing for *Illex* and also recommended that overfishing be defined to occur when fishing mortality exceeds F_{msy}. The current estimate of yield at F_{msy} equals 24,000 mt.

2.4 Proposed action (preferred alternative) for butterfish in 2002

The proposed specifications (preferred alternative) for the 2002 Atlantic butterfish fishery are contained in Table 3. The 2002 quota specifications for butterfish remain the same as those specified in 2001, with the exception that there is no specification of a bycatch TALFF (which was computed as 0.08% of the TALFF specified for Atlantic mackerel in 2001).

2.5 Alternative actions for butterfish in 2002

The two alternative actions for the butterfish specifications which were considered in this environmental analysis are given below.

TABLE 8. ALTERNATIVE ANNUAL SPECIFICATIONS FOR THE BUTTERFISH FOR THE FISHING YE
JANUARY 1 THROUGH DECEMBER 31, 2002 (in metric tons (mt)).

Specifications	Butterfish	
	Alt. 1	Alt. 2
Max OY[1]	16,000	16,000
ABC	7,200	10,000
IOY	7,200	10,000
DAH	7,200	10,000
DAP	7,200	10,000
JVP	0	0
TALFF	0	0

[1] Maximum OY as stated in the FMP.

2.6 Carry-over of Quarterly Quota Underages

One administrative alternative considered by the Council would modify the method for carrying over *Loligo* squid quarterly underages for 2002 and subsequent fishing years. For the 2001 fishing year, by default, quarterly underages carried over into Quarter IV because the fourth quarter does not close until 95 percent of the total annual quota has been harvested. However, under this alternative beginning with the 2002 fishing year, in the event that the first quarter landings for *Loligo* squid are less than 70 percent of the first quarter allocation, the underage below 70 percent would be applied to Quarter III. Underages from quarters II and III would continue to be added to Quarter IV by default, based on the 95-percent closure rule mentioned above.

3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 DESCRIPTION OF THE STOCK

3.1.1 *Loligo pealei*

3.1.1.1 Species Description and Distribution

Long-finned squid (*Loligo pealei*), also known as the common, bone or winter squid, are distributed in continental shelf and slope waters of the Western Atlantic Ocean from Newfoundland, Canada to the Gulf of Venezuela (Summers, 1983; Dawe et al. 1990). *Loligo* undergo seasonal migrations moving to shallow inshore waters in spring and summer to spawn and feed. In late autumn they move offshore to overwinter along the edge of the continental shelf (Summers, 1969; Serchuk and Rathjen, 1974).

Previous studies of the life history and population dynamics of this species assumed that *Loligo* died after spawning at an age of 18-36 months based on the analysis of length frequency data (which suggested a "crossover" life cycle (Mesnil 1977; Lange and Sissenwine 1980). However, recent advances in the aging of squid have been made utilizing counts of daily statolith growth increments (Dawe et al. 1985; Jackson and Choat 1992). Preliminary statolith ageing of *Loligo* indicated a life span of less than one year (Macy 1992). Consequently, the last two stock assessments for *Loligo* were conducted assuming that the species has an annual life-cycle and has the capacity to spawn throughout the year (NMFS 1994a, NMFS 1996), as now appears typical of pelagic squid species studied throughout the world (Jereb *et al.* 1991).

3.1.1.2 Status of the Stock

Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management (FMP) was developed to bring the FMP into compliance with the Sustainable Fisheries Act (SFA). The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act, that caused the Guidelines to be significantly revised. The most significant changes were made to National Standard 1, which imposed new requirements concerning definitions of overfishing in fishery management plans. The overfishing definition for Loligo was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Loligo* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{max} is exceeded (F_{max} is a proxy for F_{msy}). When an estimate of F_{msy} becomes available, it will replace the current overfishing proxy of F_{max}. Annual quotas will be specified which correspond to a target fishing mortality rate. Target F is defined as 75% of the F_{msy} when biomass is greater than B_{msy}, and decreases linearly to zero 50% of B_{MSY}. Maximum OY is specified as the catch associated with a fishing mortality rate of F_{max}. In addition, the biomass target is specified to equal B_{MSY}.

The most recent assessment of the Loligo stock (SAW 29) concluded that the stock was approaching an overfished condition and that overfishing was occurring (NMFS 1999). A production model indicated that current biomass was less than B_{msy}, and near the biomass threshold of 50% B_{MSY}. There was high probability that fishing mortality exceeded F_{msy} in 1998. The average F from the winter fishery (October to March) over the last five years averaged 180% of F_{MSY}, and F from the summer fishery equaled F_{MSY}. However, the production model also indicated that the stock has the ability to quickly rebuild from low stock sizes. Length based analyses indicated that fully-recruited fishing mortality is greater than F_{max} and stock biomass was among the lowest in the assessment time series (1987-1998). Recent survey indices of recruitment were well below average.

The new requirements of the SFA required the Council to take remedial action for 2000 to rebuild the stock to a level which will produce MSY (B_{msy}) given the status determination that *Loligo* was approaching an overfished state. The control rule in Amendment 8 specifies that the target fishing mortality rate must be reduced to zero if biomass falls below 50% of B_{msy}. The target fishing mortality rate increases linearly to 75% of F_{msy} as biomass increases to B_{msy}. However, projections made in SAW 29 indicate that the control rule appears to be overly conservative. Projections from SAW 29 indicated that the Loligo biomass could be rebuilt to levels approximating B_{msy} in three years if fishing mortality was reduced to the target mortality rate specified in Amendment 8 of 75% of F_{msy}. The yield associated with this fishing mortality rate (75% of F_{msy}) in 2000, assuming status quo F in 1999, was estimated to be 11,732 mt in SAW 29. The current regulations still specify Max OY as the yield associated F_{max} or 26,000 mt. In determining the specification of ABC for the year 2000, the Council considered advice offered by SAW 29 which indicated that the control rule adopted in Amendment 8 was too conservative. The Council chose to specify ABC as the yield associated with 90% F_{msy} or 13,000 mt in 2000.

The most recent survey data for *Loligo* squid indicate that abundance of this species has increased significantly since the most recent assessment was conducted (i.e, SAW-29). Estimates of biomass based on NEFSC fall 1999 and spring 2000 survey indices for *Loligo* indicate that the stock is currently at or near B_{msy}. In fact, the 1999 fall survey index was the sixth highest value observed in the time series since 1967 and the second highest since 1987. The 2000 spring survey index for *Loligo* was the tenth highest in the time series since 1968 and the fifth highest since 1987 (Lai, pers.comm). Based on the assumption that the stock will be at or near B_{msy} in 2001, the Council recommended that the 2001 quota be specified as the yield associated with 75% of F_{msy} . The yield associated with 75% of F_{msy} at B_{msy} is 17,000 mt based on projections in SAW-29 (NMFS 1999).

3.1.1.3 Ecological relationships and stock characteristics

Previous studies of the life history and population dynamics of this species assumed that *Loligo* died after spawning at an age of 18-36 months based on the analysis of length frequency data (which suggested a "crossover" life cycle (Mesnil 1977, Lange and Sissenwine 1980)). However, recent advances in the aging of squid have been made utilizing counts of daily statolith growth increments (Dawe *et al.* 1985, Jackson and Choat 1992). Preliminary statolith ageing of *Loligo* indicates a life span of less than one year (Macy 1992, Brodziak and Macy 1994). Consequently, the most recent stock assessment for *Loligo* was conducted assuming that the species has an 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 al*. 1991).

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

many as 175 capsules per cluster, are found in shallow waters (10-100') and may often be found washed ashore on beaches (Grosslein and Azarovitz 1982).

Loligo eggs in captivity develop in 11 to 27 days at temperatures ranging from 73 to 54 F; in nature, they may develop over a 40 F span of seawater temperature, beginning at 46 F. Little is known about the larval stages of *Loligo*; larvae are about 0.1" at hatching. They are not often found in the spawning areas and are assumed to be washed away by currents. A few 0.8" and many 1 to 2" juveniles appear in autumn research vessel catches in shallow waters. Significant numbers of these juveniles have also been found around Hudson Shelf Valley in late winter when adults are mostly found offshore. These are presumably October spawned individuals just beginning to move offshore (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.

The NEFSC bottom trawl survey data on food habits demonstrates a similar ontogenetic shift in the diet of *Loligo*. During 1973-1980, the diet of 0.4-4 in (1-10 cm) long squid was composed primarily of crustaceans (23%), while fish were the most important prey item in the diet of 4.4-16 in (11-40 cm) long squid. During 1981-90, the diet of squid 0.4-4 in (1-10 cm) in length was composed of 42% cephalopods (i.e., squid), 26% fish, and 21% crustaceans, while the diet of larger squid, 4.4-16 in (11-40 cm) in length, was dominated by fish (39%) and cephalopods (22%).

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

3.1.2 Atlantic mackerel

3.1.2.1 Species Description and Distribution

Atlantic mackerel (*Scomber scombrus*) is a fast swimming, pelagic, schooling species distributed between Labrador (Parsons 1970) and North Carolina (Anderson 1976a). The existence of separate northern and southern spawning contingents was first proposed by Sette (1950). The southern group spawns primarily in the Mid-Atlantic Bight during April-May while the northern group spawns in the Gulf of St. Lawrence in June-July. Both groups overwinter between Sable Island (off Nova Scotia; Figure 3) and Cape Hatteras in water generally warmer than 45 F (USDC 1984a).

Both groups make extensive northerly (spring) and southerly (autumn) migrations to and from spawning and summer feeding grounds (Figure 3). The southern contingent begins its spring migration from waters off North Carolina and Virginia in March- April, and moves steadily northward, reaching New Jersey and Long Island usually by April-May, where spawning occurs. These fish may spend the summer as far north as the Maine coast. In autumn this contingent moves southward and returns to deep offshore water near Block Island after October (Hoy and Clark 1967).

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

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

3.1.2.2 Status of the Stock

The Northwest Atlantic mackerel stock was most recently assessed at SAW-30 (NMFS 2000). The assessment concluded that the Atlantic mackerel stock is currently at a high level of abundance and is under-exploited. Based on trends in survey indices, recruitment has been well above average throughout most of the 1990's. However, estimates of fishing mortality and stock sizes based on virtual population analyses conducted in SAW 29 were considered unreliable.

The previous assessment of the Northwest Atlantic mackerel stock was conducted at SAW-20 and provided estimates of fishing mortality and stock sizes (NMFS 1995). In 1994, F was estimated to be 0.02 with an 80% confidence interval of 0.00-0.03, while SSB was estimated to be 2.1 million mt (with an associated 80% confidence interval of 1.2 - 8.2 million mt).

A recent Canadian assessment confirmed the conclusion that the Atlantic mackerel stock is currently at a high level of abundance (Gregoire 1996). Results of spawning stock size projections based on egg production in Canadian waters indicated that the northern (i.e., Canadian) portion of the adult stock remained constant at around 800,000 mt between 1992 and 1994. The Canadian assessment concluded that Atlantic mackerel stock biomass remains high and further that the appearance of one and two year old fish (the 1993 and 1994 year classes) in the 1995 Canadian catch indicates that two very large year classes are entering the fishery.

3.1.2.3 Ecological relationships and stock characteristics

Atlantic mackerel (*Scomber scombrus*) is a fast swimming, pelagic, schooling species distributed between Labrador (Parsons 1970) and North Carolina (Anderson 1976a). The existence of separate northern and southern spawning contingents was first proposed by Sette (1950). The southern group spawns primarily in the Mid-Atlantic Bight during April-May while the northern group spawns in the Gulf of St. Lawrence in June-July. Both groups overwinter between Sable Island (off Nova Scotia; Figure 3) and Cape Hatteras in water generally warmer than 45 F (USDC 1984a).

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

All Atlantic mackerel are sexually mature by age 3, while about 50% of the age 2 fish are mature. Average size at maturity is about 10.5-11" FL (Grosslein and Azarovitz 1982). Growth is very rapid with fish reaching 7.9 in (20 cm) by their first autumn (Anderson and Paciorkowski 1978). The maximum age observed is 17 years (Pentilla and Anderson 1976).

Fecundity estimates ranged from 285,000 to 1.98 million eggs for southern contingent mackerel between 12-17" FL. Analysis of egg diameter frequencies indicated that mackerel spawn between 5 and 7 batches of eggs per year. The eggs are 0.04-0.05" in diameter, have one 0.1" oil globule, and generally float in the surface water layer above the thermocline or in the upper 30- 50'. Incubation depends primarily on temperature; it takes 7.5 days at 52 ^{o}F, 5.5 days at 55 ^{o}F, and 4 days at 61^{o}F (Grosslein and Azarovitz 1982).

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

Atlantic mackerel are opportunistic feeders that can ingest prey either by individual selection of organisms or by passive filter feeding (Pepin *et al.* 1988). Filter feeding occurs when small plankton are abundant and mackerel swim through patches with mouth slightly agape, filtering food through their gill rakers (MacKay 1979). According to MacKay (1979) particulate feeding is the principal feeding mode in the spring and fall while filter feeding predominates in the summer in the

Gulf of St Lawrence. Moores *et al.* (1975) maintains that the diet of fish from Newfoundland suggests that particulate feeding occurs there throughout the season.

Larvae feed primarily of zooplankton (Collette in prep.). First-feeding larvae (0.140 in; 3.5 mm) collected from Long Island Sound were found to be phytophagous while slightly larger individuals (greater than 0.176 in; 4.4 mm) fed on copepod nauplii (Peterson and Ausubel 1984; Ware and Lambert 1985). Fish >0.2 in (5 mm) fed on copepodites of *Acartia* and *Temora* while diets of fish >0.24 in (6 mm) contained adult copepods (Peterson and Ausubel 1984). Larvae >0.256 in (6.4 mm) were cannibalistic, feeding on 0.14-.018 in (3.5-4.5 mm) conspecifics (Peterson and Ausubel 1984). Consumption rates of larvae average between 25 and 75% body weight per day. Larvae feed selectively, primarily on the basis of prey visibility (Peterson and Ausubel 1984). Fortier and Villeneuve (1996), studying larval mackerel from the Scotian Shelf, found that with increasing larval length, diet shifted from copepod nauplii to copepod and fish larvae including yellowtail flounder, silver hake, redfish and a large proportion of conspecifics. Predation was stage-specific: only the newly hatched larvae of a given species were ingested. However, piscivory was limited at densities of fish larvae <0.1/m^3 and declined with increasing density of nauplii and with increasing number of alternative copepod prey ingested.

Juveniles eat mostly small crustaceans such as copepods, amphipods, mysid shrimp and decapod larvae (Collette in prep.). They also feed on small pelagic molluscs (*Spiratella* and *Clione*) when available (Collette in prep.). Adults feed on the same food as juveniles but diets also include a wider assortment of organisms and larger prey items. For example, euphausid, pandalid and crangonid shrimp are common prey; chaetognaths, larvaceans, pelagic polychaetes and larvae of many marine species have been identified in mackerel stomachs (Collette in prep.). Bigelow and Schroeder (1953) found many Gulf of Maine mackerel feeding on *Calanus* as well as other copepods. Larger prey such as squids (*Loligo*) and fishes (silver hake, sand lance, herring, hakes and sculpins) are not uncommon, especially for large mackerel (Bowman *et al.* 1984). Under laboratory conditions, mackerel also fed on *Aglanta digitale*, a small transparent medusa common in temperate and boreal waters (Runge *et al.* 1987). While there is variability between the two size classes and between the two survey periods, copepods and euphausids and various crustaceans could be considered relative staples in the diet.

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; Collette in prep.). Under experimental conditions in which larval fish (0.12-0.4 in; 3-10 mm in length) were presented as part of natural zooplankton assemblages, prey preference by mackerel was positively size selective and predation rates were not influenced by larval fish density (Pepin *et al.* 1987). Subsequent studies indicated that mackerel may achieve a higher rate of energy intake by switching to larger prey and increasing search rate as prey size and total abundance increase (Pepin *et al.* 1988). Filter feeding activity also increased with increasing prey density and Pepin *et al.* (1988) conjecture that feeding rates under natural conditions of prey abundance (0.1g wet weight/m^3) indicate that mackerel would not be satiated if foraging were restricted only to daylight.

Predation has a major influence on the dynamics of Northwest Atlantic mackerel (Overholtz *et al.* 1991b). In fact, predation mortality is probably the largest component of natural mortality on this stock, and based on model predictions, may be higher than previously thought (Overholtz *et al.*

1991b). Atlantic mackerel serve as prey for a wide variety of predators including other mackerel, dogfish, tunas, bonito, striped bass, Atlantic cod (small mackerel), and squid, which feed on fish <4-5.2 in (10 to 13 cm) in length (Collette in prep.). Pilot whales, common dolphins, harbor seals, porpoises and seabirds are also significant predators (Smith and Gaskin 1974; Payne and Selzer 1983; Overholtz and Waring 1991; Montevecchi and Myers 1995). Other predators include swordfish, bigeye thresher, thresher, shortfin mako, tiger shark, blue shark, spiny dogfish, dusky shark, king mackerel, thorny skate, silver hake, red hake, bluefish, pollock, white hake, goosefish and weakfish (Scott and Tibbo 1968; Maurer and Bowman 1975; Stillwell and Kohler 1982, 1985; Bowman and Michaels 1984).

3.1.3 *Illex illecebrosus*

3.1.3.1 Species Description and Distribution

Illex is distributed on the western north Atlantic from the Labrador Sea to Florida Straits (Roper *et al.* 1998). Until recently, *Illex illecebrosus* was believed to be distributed on both sides of the North Atlantic, as was once thought (Roper et al. 1998). This confusion seems to have been a result of misidentifications of the closely related species *I. coindetii* (which does seem to be distributed on both sides of the Atlantic), as *I. illecebrosus*. It is most abundant in the Newfoundland region, moderately abundant between Newfoundland and New Jersey (Wigley 1982), and is commercial exploited from Newfoundland to Cape Hatteras (Brodziak 1995c). There is overlap in the geographic distributions of *Illex* species in the northwest Atlantic Ocean *I. illecebrosus* and *I. oxygonius* (Roper and Mangold 1998; Roper *et al.* 1998). The species are morphologically similar and difficult to distinguish and identify.

Data from the NOAA/Canada DFO East Coast of North America Strategic Assessment Project indicate that during 1975-1994 *Illex* in the northwest Atlantic were distributed from Labrador to Cape Hatteras (Figure 20). The areas of highest abundance of the species are the southern edge of the Grand Bank, the Scotian Shelf, Georges Bank, and the Middle Atlantic Bight.

Illex are highly migratory, capable of long distance migrations of more than 1,000 miles (Brodziak 1995c). They undergo seasonal inshore-offshore migrations which may be related to temperature, food, or both (MAFMC 1995). They spend winters (January to March) in dense aggregations along the outer continental shelf and upper slope where water temperatures are relatively warm, 46-57 ^oF (8-14 ^oC). In the spring (April-May), when shelf waters begin warming, they migrate shoreward, and during summer and autumn are widespread throughout the entire New England and Middle Atlantic continental shelf (Wigley 1982). In late autumn they begin their return migration to the warmer, offshore waters at the edge of and beyond the continental shelf (MAFMC 1995), where spawning is believed to occur. The hypothetical migration path of *Illex* is summarized in Figure 21 (Black *et al.* 1987).

3.1.3.2 Status of the Stock

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

The most recent assessment of the *Illex* stock (SAW 29) concluded that the stock was not in an overfished condition and that overfishing was not occurring (NMFS 1999). However, due to a lack of adequate data, an the estimate of yield at F_{msy} was not updated in SAW 29. However, an upper bound on annual fishing mortality was computed for the US EEZ portion of the stock based on a model which incorporated weekly landings and relative fishing effort and mean squid weights during 1994-1998. These estimates of F were well below the biological reference points. Current absolute stock size is unknown and no stock projections were done in SAW 29 or since then.

3.1.3.3 Ecological relationships and stock characteristics

The age and growth of *Illex* has been well studied relative to other squid species, being one of the few for which the statolith ageing method has been validated (Dawe *et al.* 1985). Research on the age and growth of *Illex* based on counts of daily statolith growth increments indicates an annual life span (Dawe *et al.* 1985).

Illex is a semelparous, terminal spawner with a protracted spawning season. There have been no direct observations of spawning in nature, but in speculation about the timing and location is based on squid size and timing of advanced male maturity stages (O'Dor and Dawe 1998), back-calculated hatch dates from aging studies, and the collection of hatchling (Hendrickson pers. comm). *Illex* spawning takes place in the deep waters of the continental slope during winter (MAFMC 1995). Spawning likely occurs throughout the year (O'Dor and Dawe 1998) with most intense spawning generally occurring from December to March (Lange and Sissenwine 1980), but this varies among years and locations. Between Cape Canaveral, Florida and Charleston, North Carolina, spawning occurs during December to January (Rowell *et al.* 1985a, MAFMC 1995), while off Newfoundland, spawning has been reported from January through June (Squires 1967).

The principal spawning area is believed to be south of Cape Hatteras over the Blake Plateau (Black *et al.* 1987, MAFMC 1995), but other spawning occurs between the Florida Peninsula and central New Jersey at depths down to 990 ft (300 m; Fedulov and Froerman 1980, MAFMC 1995). Spawning probably occurs in the northern part of the Gulf Stream/Slope Water frontal zone (Dawe and Beck 1985, O'Dor and Balch 1985, Rowell et al 1985a).

3.1.4 Atlantic butterfish

3.1.4.1 Species Description and Distribution

Atlantic butterfish, *Peprilus triacanthus*, are distributed along the Atlantic coast of North America from Newfoundland to Florida (Bigelow and Schroeder 1953), and are found in commercially exploitable concentrations from Southern New England south to Cape Hatteras (Murawski and Waring 1979). Butterfish north of Cape Hatteras exhibit migratory patterns typical of temperate fishes of the Mid-Atlantic Bight. During the winter months, butterfish are found in deep waters (ca. 200 m) along the edge of the continental shelf. During late spring and summer, butterfish move inshore and northward. Butterfish begin to move offshore again as northern inshore waters begin to cool (Murawski and Waring 1979).

Butterfish are partially recruited to the spawning stock by the end of their first year, and essentially all individuals are mature by age two (Hildebrand and Schroeder 1928; Murawski *et al*. 1978). Spawning occurs from May-July in near shore coastal waters, with chief egg production in June. Growth of butterfish is rapid with a maximum size of 30 cm being achieved in six years, however few fish are observed which are greater than 20 cm or three years of age (Murawski and Waring 1977).

3.1.4.2 Status of the Stock

SAW 17 (NMFS 1994a) offered the following management advice:

"Butterfish landings in recent years have been well below historical average yields. Japanese demand for butterfish has waned and this has had a negative impact on harvest levels. Butterfish landings are thus unlikely to increase unless market demand improves. If demand does improve, however, the stock in its current condition may not be able to sustain landings in excess of the long term historical average (1965-1992) of 7,200 mt because of recent declines in abundance as indicated by survey indices."

"Historical information suggests that discarding of butterfish may be an important source of fishing-induced mortality. The SARC recommends that data be collected that would allow discard levels to be reliably estimated."

"Given that butterfish is a short-lived species, new approaches to the assessment and management of the stock are required. A more adaptive, real-time assessment/management system will be needed to maintain full exploitation of the stock while simultaneously ensuring that adequate spawning stock levels are achieved. This would involve both real-time evaluation of stock status and in-season catch level adjustments." No new assessment information is available.

3.1.4.3 Ecological relationships and stock characteristics

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

Butterfish eggs, 0.027-0.031" in diameter, are pelagic, transparent, spherical, and contain a single oil globule. The egg membrane is thin and horny. Incubation at 65 °F takes less than 48 hours. Newly hatched larvae are 0.08" long and like most fish larvae are longer than they are deep. At 0.2" larval body depth has increased substantially in proportion to length, and at 0.6" the fins are well differentiated and the young fish takes on the general appearance of the adult. Larvae are found at the surface or in the shelter of the tentacles of large jelly fish (Grosslein and Azarovitz 1982).

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

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

3.2 Description of Habitat

3.2.1 Inventory of Environmental and Fisheries Data

According to section 600.815 (a)(2)(i)(A) an initial inventory of available environmental and fisheries data sources relevant to the managed species should be used in describing and identifying essential fish habitat (EFH).

In section 600.815 (a)(2)(i)(B) in order to identify EFH, basic information is needed on current and historic stock size, the geographic range of the managed species, the habitat requirements by life history stage, and the distribution and characteristics of those habitats.

Atlantic mackerel, *Scomber scombrus L.,* is a fast swimming, pelagic schooling species distributed in the Northwest Atlantic from the Gulf of St. Lawrence to Cape Lookout North Carolina (Sette 1943, 1950; Anderson 1976; MAFMC 1994). While there are two separate spawning contingents in the Northwest Atlantic, (Sette 1950), since 1975, all mackerel in this area have been assessed as a single unit stock (Anderson 1982) and are considered one stock for management purposes.

The long-finned squid, *Loligo pealei*, is a pelagic schooling species of the molluscan family Loliginidae. It is distributed in continental shelf and slope waters from Newfoundland to the Gulf of Venezuela, with commercial abundances occurring from southern Georges Bank to Cape Hatteras.

The short-finned squid, *Illex illecebrosus*, is a pelagic species of the family Ommastrephidae, the oceanic squids. *Illex* is distributed on the western north Atlantic from the Labrador Sea to Florida Straits (Roper *et al.* 1998). In the western Atlantic, it ranges from Greenland, Labrador and Newfoundland southward to Florida.

The Atlantic butterfish, *Peprilus triacanthus*, is a fast-growing, short-lived, pelagic fish that forms loose schools, often near the surface (Schreiber 1973, Dery 1988, Brodziak 1995a). Butterfish range from Newfoundland and the Gulf of St. Lawrence to the Atlantic and Gulf coasts of Florida, but they are most abundant from the Gulf of Maine to Cape Hatteras (Bigelow and Schroeder 1953, Haedrich 1967, Horn 1970a, Powell *et al*. 1972, Cooley 1978, Scott and Scott 1988, Brodziak 1995a, Klein-MacPhee, *in review*).

Climate, physiographic, and hydrographic differences separate the Atlantic ocean from the Gulf of Maine to Florida into two distinct areas, the New England-Middle Atlantic Area and the South Atlantic Area, with the natural division occurring at Cape Hatteras. These differences result in major zoogeographic faunal changes at Cape Hatteras (Briggs 1974). The New England region from Nantucket Shoals to the Gulf of Maine includes Georges Bank, one of the worlds most productive fishing grounds. The Gulf of Maine is a deep cold water basin, partially sealed off from the open Atlantic by Georges and Browns Banks, which fall off sharply into the continental shelf.

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

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

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

Surface circulation is generally southwesterly on the continental shelf during all seasons of the year, although this may be interrupted by coastal indrafting and some reversal of flow at the northern and southern extremities of the area. There may be a shoreward component to this drift during the warm half of the year and an offshore component during the cold half. The direction of this drift, fundamentally the result of temperature-salinity distribution, is largely determined by the wind. A persistent bottom drift at speeds of tenths of nautical miles per day extends from beyond mid-shelf toward the coast and eventually into the estuaries.

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. The vertical thermal gradient is minimized during winter. In late April to early May, a thermocline develops in shelf waters except over Nantucket Shoals where storm surges retard thermocline development. The thermocline persists through the summer until surface waters begin to cool in early autumn. By mid-November surface to bottom temperature along the shelf is nearly homogeneous.

Coastwide, an annual salinity cycle occurs as the result of freshwater stream flow and the intrusion of slope water from offshore. Water salinities nearshore average 32 ppt, increase to 34-35 ppt along the shelf edge, and exceed 36.5 ppt along the main lines of the Gulf stream..

For a complete inventory of environmental and fisheries data that describes *Illex and Loligo* squid, butterfish and Atlantic mackerel habitat, see Section 2.2.1 of Amendment 8.

3.2.2 Habitat Requirements by Life History Stage

Amendment 8 also provided an extensive literature review and synthesis which provided detailed information on the life history and habitat requirements of Atlantic mackerel, *Loligo* and *Illex* squid and butterfish by life history stage. These reviews are summarized the abundance and distribution in relation to a number of abiotic factors for eggs, larvae, juveniles, and adults for each species. For more detailed information relative to habitat requirements by life history stage, see Section 2.2.1 of Amendment 8.

3.2.3 Description and Identification of Essential Fish Habitat

The following is a summary of the descriptions and identification of essential fish habitat for each species. A complete description and identification for *Illex and Loligo* squid, butterfish and Atlantic mackerel habitat is found in Section 2.2.2 of Amendment 8.

Atlantic mackerel

Eggs: Offshore, EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from Maine through Cape Hatteras, North Carolina in areas that comprise the highest 75% of the catch where Atlantic mackerel eggs were collected in MARMAP ichthyoplankton surveys. 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 ^{o}F and 73 ^{o}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 Passamaquaddy Bay, Maine to James River, Virginia. Generally, Atlantic mackerel larvae are collected in depths between 33 ft and 425 ft and temperatures between 43 ^{o}F and 72 ^{o}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 Passamaquaddy Bay, Maine to James River, Virginia. Generally, juveniles Atlantic mackerel are collected from shore to 1050 ft and temperatures between 39 ^{o}F and 72 ^{o}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 Passamaquaddy Bay, Maine to James River, Virginia. Generally, adult Atlantic mackerel are collected from shore to 1250 ft and temperatures between 39 ^{o}F and 61 ^{o}F.

Loligo

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 ^{o}F and 27 ^{o}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 ^{o}F and 81 ^{o}F.

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

Illex

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 ^{o}F and 73 ^{o}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 ^{o}F and 66 ^{o}F.

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

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 Passamaquaddy Bay, Maine to James River, Virginia. Generally, butterfish eggs are collected from shore to 6000 ft and temperatures between 52 ^{o}F and 63 ^{o}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 Passamaquaddy Bay, Maine to James River, Virginia. Generally, butterfish larvae are collected in depths between 33 ft and 6000 ft and temperatures between 48 ^{o}F and 66 ^{o}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 Passamaquaddy 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 Passamaquaddy 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.

3.2.4 Fishing Activities that May Adversely Affect EFH

According to section 600.815 (a)(3), adverse effects from fishing may include physical, chemical, or biological alterations of the substrate, and loss of, or injury to, benthic organisms, prey species and their habitat, and other components of the ecosystem. FMPs must include management measures that minimize adverse effects on EFH from fishing, to the extent practicable, and identify conservation and enhancement measures. Councils must act to prevent, mitigate, or minimize any adverse effects from fishing, to the extent practicable, if there is evidence that a fishing practice is having an identifiable adverse effect on EFH.

The following is a summary of general impacts of mobile fishing gear from the report "Indirect Effects of Fishing" (Auster and Langton 1998).

The discussion of the wide range of effects of fishing on EFH is based on the definition of EFH within the Act and the technical guidance produced by NMFS to implement the Act. The Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." For the purpose of interpreting the definition (and for defining the scope of this report), "waters" is interpreted by NMFS as "aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate" and "substrate" is defined to include sediment, hard bottom, structures, and associated biological communities. These definitions provide substantial flexibility in defining EFH based on our knowledge of the different species, but also allows EFH to be interpreted within a broader ecosystem perspective. Disturbance has been defined as "any discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment" (Pickett and White 1985). From an ecological perspective, fishing with fixed mobile gear is the most widespread form of direct disturbance in marine systems below depths which are affected by storms (Watling and Norse 1997). Disturbance can be caused by many natural processes such as currents, predation, iceberg scour (Hall 1994). Human caused disturbance can result from activities such as harbor dredging and fishing with mobile gear. Disturbance can be gauged by both intensity (as a measure of the force of disturbance) and severity (as a measure of impact on the biotic community).

One of the most difficult aspects of estimating the extent of impacts on EFH is the lack of high resolution data on the distribution of fishing effort. Fishers are often resistant to reporting effort based on locations of individual tows or sets (for the obvious reason of divulging productive locations to competitors and regulators). Effort data in many fisheries are apportioned to particular statistical areas for monitoring purposes. Using this type of data it, has been possible to obtain averages of effort, and subsequent extrapolations of area impacted, for larger regions.

Trawling effort in the Middle Atlantic Bight off the northeast U.S. was summarized by Churchill (1989). Trawled area estimates were extrapolated from fishing effort data in 30 minute latitude x 30 minute longitude grids. The range of effort was quite variable, but the percent area impacted in some blocks off southern New England was over 200% with one block reaching 413%. Estimating the spatial impact of fixed gears is even more problematic. For example, during 1996 there were 2,690,856 lobster traps fished in the state of Maine (Maine Department of Marine Resources unpublished data). These traps were hauled on average every 4.5 d, or 81.4 times $year^{-1}$. Assuming a 1 m^2 footprint for each trap, the area impacted was 219 km^2. If each trap was dragged across an area three times the footprint during set and recovery, the area impacted was 657 km^2. A lack of data on the extent of the area actually fished makes analysis of the impacts of fishing on EFH in those fisheries difficult.

Auster and Langton (1998) summarize and interpret the current scientific literature on fishing impacts as they relate to fish habitat. These studies are discussed within three broad subject areas: effects on structural components of habitat, effects on benthic community structure, and effects on ecosystem level processes. The interpretation is based on commonalities and differences between studies. Fishing gear types are discussed as general categories (e.g., trawls, dredges, fixed gear). The necessity for these generalizations is based on two over-riding issues: (1) many studies do not specify the exact type and configuration of fishing gear used, and (2) each study reports on a limited range of habitat types. However, their interpretation of the wide range of studies is based on the type and direction of impacts, not absolute levels of impacts. Auster and Langton (1998) do not address the issues of bycatch (Alverson *et al.* 1994), mortality of gear escapees (Chopin and Arimoto 1995), or ghost fishing gear (Jennings and Kaiser 1998, p. 11-12 and references therein), as these issues do not directly relate to fish habitat, and recent reviews have been published which address these subjects.

Impacts of fishing on fish habitat (Auster and Langton 1998) include the following:

1. Effects on structural components of habitat;
2. Effects on community structure; and
3. Effects of ecosystem processes.

3.2.5 Options for Managing Adverse Effects from Fishing

According to section 600.815 (a)(4), fishery management options may include, but are not limited to: (i) fishing equipment restrictions, (ii) time/area closures, and (iii) harvest limits.

According to section 600.815 (a)(3) Councils must act to prevent, mitigate, or minimize adverse effects from fishing, to the extent practicable, if there is evidence that a fishing practice is having an identifiable adverse effect on EFH. Evidence of various gear impacts on bottom in the Mid-Atlantic Region has been presented to the Council over the past several years. It is because of this anecdotal information that the Council is considering that all mobile gear coming into contact with the seafloor within Atlantic mackerel, *Loligo*, *Illex*, and butterfish EFH is characterized as having a potential impact on their EFH. However, the effort of these bottom tending gears is largely unquantified from data that are presently collected by the NEFSC, as summarized by Auster and Langton (1999) and therefore no management measures will be proposed at this time.

The requirement concerning gear impact management is to the extent practicable given the evidence that the fishing practice is having an identifiable adverse effect. The Council feels strongly that very little evidence was provided in the synthesis document of Auster and Langton (1998) relative to identifiable adverse effects to EFH in FMPs managed by this Council at this time. Fishing gear impacts along with the description and identification of EFH are frameworked management measures which can easily and readily be changed as more information becomes available. The Council's Habitat Monitoring Committee (section 2.2.8) will be meeting annually and can provide recommendations concerning gear impacts that NMFS and the Council can act on in the future. The Council feels it would be premature, given the lack of identifiable adverse effects of gear impacts to these managed species EFH, to propose gear management measures at this time. It is simply not practicable to impose unwarranted management measures that are unjustifiable. The Council will consider implementing management measures to protect EFH if and when adverse gear impacts are identified.

3.2.6 Identification of Non-Fishing Activities and Associated Conservation and Enhancement Recommendations

According to section 600.815 (a)(5), FMPs must identify activities that have the potential to adversely affect EFH quantity or quality, or both. Broad categories of activities which can adversely affect EFH include, but are not limited to: dredging, fill, excavation, mining, impoundment, discharge, water diversions, thermal additions, actions that contribute to non-point source pollution and sedimentation, introduction of potentially hazardous materials, introduction of exotic species, and the conversion of aquatic habitat that may eliminate, diminish, or disrupt the functions of EFH.

Estuarine and coastal lands and waters are used for many purposes that often result in conflicts for space and resources (USDC 1985a). Some may result in the absolute loss or long-term degradation of the general aquatic environment or specific aquatic habitats, and pose theoretically significant, but as yet unquantified threats to biota and their associated habitats (USDC 1985a).

Multiple-use issues are constantly changing, as are the impacts of certain activities on living marine resources (USDC 1985a). Activities that occur on estuarine and coastal lands and waters and offshore waters may affect living marine resources directly and/or indirectly through habitat loss and/or modification. These effects, combined with cumulative effects from other activities in the ecosystem, may contribute to the decline of some species (USDC 1997a). The following discussion identifies and describes each multiple use issue and the potential threats associated with that issue. The adverse effects to marine organisms and their habitats resulting from any given threat are demonstrable, but usually not completely quantifiable. Environmental and socio-economic issues remain to be satisfactorily resolved with regard to impacts on marine organisms and their habitats.

The threats addressed in this section are germane to the entire Atlantic coast. All Mid-Atlantic Council managed species exist outside the geographic boundaries of Mid-Atlantic Council.

Knowledgeable NMFS/Council individuals were asked to identify and prioritize non-fishing "perceived" threats. Once this list was complete, the resulting paper was distributed for review via mail, workshops, and conferences. The list is prioritized in regards to (1) perceived threats of habitat managers and others in the environmental community and (2) potential impact to Atlantic mackerel, *Loligo*, *Illex*, and butterfish habitat. Information from the ASMFC workshop (Stephan and Beidler 1997) for habitat managers, which included a broad spectrum of constituents, was also used to identify threats.

According to section 600.815 (a)(7), FMPs must describe options to avoid, minimize, or compensate for the adverse effects identified in the non-fishing threats section including cumulative impacts (section 2.2.5). The Councils are deeply concerned about the effects of marine and estuarine habitat degradation on fishery resources.

The MSFCMA provides for the conservation and management of living marine resources (which by definition includes habitat), principally within the EEZ, although there is concern for management throughout the range of the resource. Additionally, the MSFCMA provides [305(b)(3)(A)] that "Each Council may comment on, and make recommendations to the Secretary and any federal agency concerning, any activity authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by any federal or state agency that, in the view of the Council, may affect the habitat, including essential fish habitat, of a fishery resource under its authority." [305(b)(4)(B)] "Within 30 days after receiving a comment under subparagraph (A), a federal agency shall provide a detailed response in writing to the Council commenting under paragraph (3)."

The Councils have a responsibility under the MSFCMA to consider the impact of habitat degradation on Atlantic mackerel, *Loligo*, *Illex*, and butterfish. The following recommendations are made in light of that responsibility.

The goal of the Council is to preserve all available or potential natural habitat for Atlantic mackerel, *Loligo*, *Illex*, and butterfish by encouraging management of conflicting uses to assure access by the four species and maintenance of high water quality to protect these species migration, spawning, nursery, overwintering, and feeding areas. Non-water dependent actions should not be authorized in Atlantic mackerel, *Loligo*, *Illex*, and butterfish EFH, if they adversely affect that habitat. Those non-water dependent actions in adjacent upland areas, such as agriculture, should be managed to minimize detrimental effects. Water dependent activities that may adversely affect theses species EFH, should be designed using environmentally sound engineering and best management practices to avoid or minimize those impacts. Regardless, the least environmentally damaging alternatives available should be employed to reduce impacts, both individually and cumulatively to Atlantic mackerel, *Loligo*, *Illex*, and butterfish EFH. Finally, compensatory mitigation should be provided for all unavoidable impacts to these species EFH.

Also, in general, the EPA and States should review their water quality standards relative to Atlantic mackerel, *Loligo*, *Illex*, and butterfish EFH areas and make changes as needed in estuarine and coastal areas. The EPA should establish water quality standards for the EEZ sufficient to maintain edible Atlantic mackerel, *Loligo*, *Illex*, and butterfish. Finally, water quality standards in these species EFH should be enforced rigidly by state or local water quality management agencies, whose actions should be carefully monitored by the EPA. Where state or local management efforts (standards/enforcement) are deemed inadequate, EPA should take steps to assure improvement; if these efforts continue to be inadequate, EPA should assume authority, as necessary.

Specific recommendations for the conservation and enhancement of Atlantic mackerel, *Loligo*, *Illex*, and butterfish EFH are found in Section 2.2.5 of Amendment 8 which provides a detailed discussion of individual habitat threats.

3.2.7 Research and Information Needs

Section 600.815 (a)(10), states that each FMP should contain recommendations for research efforts that the Councils and NMFS view as necessary for carrying out their EFH management mandate. There are five sets of recommendations included in Section 2.2.7 of Amendment 8.

3.2.8 Review and Revision of EFH Components of FMP

A complete description of review and revision of EFH components of the FMP is found in Section 2.2.8 of Amendment 8. The following is a summary from Section 2.2.8 of Amendment 8.

Section 600.815 (a)(11), states that Councils and NMFS should periodically review the EFH components of FMPs, including an update of the fishing equipment assessment. Each EFH FMP amendment should include a provision requiring review and update of EFH information and preparation of a revised FMP amendment if new information becomes available.

The Council will amend its FMPs at least every five years as called for in this section, but is also including a habitat framework adjustment provision that can be included in each FMP. Due to the very rapid time constraints of meeting the October-MSFMCA deadline mandated by Congress (with very limited additional funds), it was impossible to include much of the state survey data that will be available in the future, as well as, much of the unpublished literature on contaminants etc. It is important to understand that this EFH is a "work in progress" and that the process will evolve. This framework provision is envisioned to work along the existing framework provisions established for the New England Multispecies FMP by the NEFMC. A similar process is proposed in this FMP for other non-EFH management measures.

The FMP contains descriptions and identification of essential fish habitat, estimates of gear impacts on essential fish habitat, and contains recommendations that describe options to avoid, minimize, or compensate for the adverse effects and promote the conservation and enhancement of EFH. In some cases definitions, estimates, and recommendations are made in general terms because the specific content and concentrations of organic and inorganic compounds have not yet been compiled and/or specified by regulatory agencies. The purpose of this framework provision is to incorporate such specifics into the definitions, estimates, and recommendations as specifics are developed via existing data not available when the FMP was adopted. The framework provision is not to be used to add or delete the conservation and enhancement recommendations, but only to adjust designations of EFH (boundaries), habitat areas of particular concern, and revise gear management measures (such as degradable panels and lines).

The Council envisions creating a Habitat Monitoring Committee (HMC) made up of at least staff representatives from the NMFS Northeast Fisheries Science Center, the Northeast Regional Office Management and Habitat Sections, the Atlantic States Marine Fisheries Commission, and Chaired by the Council Executive Director or his/her designee. The HMC will meet at the call of the HMC Chair, to develop options for MAFMC consideration on any adjustment or elaboration of any FMP EFH definition or gear impacts of EFH recommendations necessary to achieve the habitat goals and objectives. Based on this review, the HMC will recommend specific measures to revise EFH definitions, revise gear specifications.

The MAFMC, through its Habitat Committee, will review the recommendations of the HMC and all of the options developed by the HMC and other relevant information, consider public comment, and develop a recommendation to meet the FMP’s habitat goals and objectives. If the MAFMC does not submit a recommendation that meets the FMP’s habitat goals and objectives and is consistent with other applicable law, the Regional Administrator may adopt by regulatory change any option developed by the HMC, unless rejected by the MAFMC or tabled by the MAFMC for additional consideration, provided the option meets the FMP’s habitat goals and objective and is consistent with other applicable law. The frameworked process for developing EFH and/or gear impacts will follow the same overall process as that for other non-EFH management measures.

3.3 Description of the Human Environment

3.3.1 Description of Fishing Activities and Economic Environment

3.3.1.1 *Loligo*

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

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

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

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

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

In 1992 *Loligo* landings totaled 18,172 mt, 99% of which was taken by otter trawls. Nearly half of the 1992 harvest (8,112 mt) was take from statistical area 616, while six statistical areas (616, 537, 613, 622, 612, and 526) accounted for 87% of the total landings. Seasonally, 81% of the 1992 *Loligo* landings occurred in winter and autumn (Jan-Apr and Oct-Dec)(NMFS 1994a). Total US *Loligo* landings were 22,469 mt in 1993 valued at $29.1 million ($0.59/lb; $762/mt). NMFS data for 1994 indicate that US *Loligo* landings were 22,577 mt valued at $31.9 million. Unpublished NMFS weighout data indicate that *Loligo* landings declined to 17,928 mt in 1995 (dockside value declined to $23.0 million) and increased slightly to 18,008 mt (dockside value of $23.1 million) in 1995. NMFS weighout data indicate that 1996 US *Loligo* landings decreased to 12,459 mt (valued at $18.6 million) and then increased to 16,203 mt in 1997 (valued at $26.5 million). The most recent assessment (NMFS 1999) indicated that landings of Loligo were 18,385 mt in 1998 valued at $32.2 million. Unpublished NMFS dealer data indicate that *Loligo* landings were 18,764 mt valued at $32.2 million in 1999. Unpublished preliminary Dealer Reports to NMFS indicate that *Loligo* landings were 16,965 mt in 2000.

3.3.1.2 Atlantic mackerel

3.3.1.2.1 Commercial Fishery

Atlantic mackerel have a long history of exploitation off the northeastern coast of the United States dating back to colonial times. American colonists of the 1600's considered mackerel one of their most important staple commodities (Hoy and Clark 1967). The principal commercial gear was the haul seine prior to 1800. Hook and line then became the primary gear until about 1850 when the purse seine was introduced and largely replaced the traditional hook and line method (Anderson and Paciorkowski 1978).

Formal record keeping for Atlantic mackerel in the US began in 1804. During 1804-1818, the US fishery was confined to near shore waters and annual landings averaged about 3,100 mt. Reported landings then increased sharply when the offshore salt mackerel fishery developed in 1818. As the market for salt mackerel grew, so did the fleet in both size and number of vessels. Within 20 years, more than 900 sailing vessels operated from US ports and landings subsequently reached a pre-1850 peak of 80,300 mt in 1831. Annual US landings averaged 41,700 mt from 1819 to 1885 but varied from 10,500 mt in 1840 to 81,300 in 1884. The Canadian mackerel fishery developed later than in the US, and although catch statistics were first reported in 1876, their fishery was probably significant since 1850. Combined US and Canadian landings peaked in 1889 at 106,000 mt, but declined sharply to 13,300 mt by 1889 (Anderson and Paciorkowski 1978).

Landings remained low during the period 1886-1924, averaging 18,100 mt per year (9,400 mt US, 11,700 mt Canadian). The fishery changed significantly during this period as vessels changed from sail to motor power and market demand shifted from salted to fresh mackerel. Average landings subsequently increased to 35,200 mt (23,500 mt US, 11,700 mt Canadian) for the period 1925-1949 with the highest level of 49,200 mt in 1944. Landings gradually declined during the next decade, falling to 6,100 mt in 1959 (Hoy and Clark 1967; Anderson and Paciorkowski 1978).

The modern northwest Atlantic mackerel fishery underwent dramatic change with the arrival of the European distant-water fleets (DWF) in the early 1960's. While the first DWF landings reported in 1961 were not large (11,000 mt), they increased substantially to over 114,000 mt by 1969. Total international commercial landings (NAFO Subareas 2-6,) peaked at 437,000 mt in 1973 and then declined sharply to 77,000 by 1977 (Overholtz 1989).

The Magnuson Act of 1976 established control of the portion of the mackerel fishery occurring in US waters (NAFO Subareas 5-6) under the auspices of the Mid-Atlantic Fishery Management Council. Reported foreign landings in US waters declined from an unregulated level of 385,000 mt in 1972 to less than 400 mt from 1978-1980 under Magnuson (the foreign mackerel fishery was restricted by NOAA Foreign Fishing regulations to certain areas or "windows"). Under the control of MAFMC mackerel FMP and subsequent amendments, foreign mackerel catches were permitted to increase gradually to 15,000 mt in 1984 and then to a peak of almost 43,000 mt in 1988.

Recent US management policy of no TALFF combined with political and economic changes in Eastern Europe resulted in a decline in foreign landings from 9,000 mt in 1991 to 0 in 1992 and 1993. US commercial landings of mackerel increased steadily from roughly 3000 mt in the early 1980's to greater than 31,000 mt in 1990. However, US mackerel landings declined to 12,418 mt in 1992 and 4,666 mt in 1993. NMFS weighout data indicate that US landings were 8,543 mt in 1994 and 8,442 mt in 1995. NMFS weighout data indicate that US Atlantic mackerel landings increased to 15,712 mt in 1996 (valued at $4.6 million) and then declined slightly to 15,406 mt in 1997 (valued at $9.5 million). NMFS weighout data indicate that US Atlantic mackerel landings were 12,509 mt in 1998 (valued at $4.7 million) and 12,405 mt (valued at $3.6 million) in 1999. NMFS weighout data indicate that US Atlantic mackerel landings were 5,645 mt in 2000 (valued at $2.0 million).

3.3.1.2.2 Recreational Fishery

The Atlantic mackerel is 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).

Since 1979, recreational mackerel landings have varied from 284 mt in 1992 to 4,032 mt in 1987. In recent years, recreational mackerel landings have increased steadily from 1,249 mt in 1995 to 1,736 mt in 1997. NMFS recreational fisheries data indicate that recreational mackerel landings declined to 690 mt in 1998. Recreational mackerel landings occur from Virginia to Maine, with highest catches from New Jersey to Massachusetts. New Jersey accounted for 37% of the recreational mackerel landings for the period 1979-1991, followed by Massachusetts (25%) with the remaining States landing roughly equal amounts of Atlantic mackerel.

3.3.1.2.3 Current World 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 nine criteria to be evaluated in the following sections are:

1. total world export potential by producing countries;
2. total world import demand by consuming countries;
3. US export potential based on expected US harvests, expected US consumption, relative prices, exchange rates, and foreign trade barriers;
4. increased/decreased revenues to the US from foreign fees;
5. increased/decreased revenues to US harvesters (with/without joint ventures);
6. increased/decreased revenues to US processors and exporters;
7. increases/decreases in US harvesting productivity due to decreases/increases in foreign harvest;
8. increases/decreases in US processing productivity; and
9. potential impact of increased/decreased TALFF on foreign purchases of US products and services and US caught fish, changes in trade barriers, technology transfer, and other considerations.

3.3.1.2.3.1 Recent World Production and Prices

According to the FAO, world landings of Atlantic mackerel were on an increasing trend in the early 1990's. In 1993, Atlantic mackerel world landings were estimated to be 840,833 mt. This represented a 7% increase from the 1992 landings (FAO 2000). Total world landings of Atlantic mackerel peaked in 1994 at 842,920 mt. World landings of Atlantic mackerel decreased steadily to about 560,000 mt by 1997 and then increased slightly to 657,278 mt in 1998 (FAO 2000).

Production of frozen mackerel (all species) increased from 1.2 million mt in 1994 to 1.35 million mt in 1996 (FAO 1996). However, total world production of frozen mackerel (all species) declined slightly to 1.2 million mt in 1996 (FAO 1997). Total world production of all mackerel species and products was steady at about 1.3 million mt in 1997 and 1998, down from 1.5 million mt in 1996 (FAO 2000).

Mackerel had been reported to be in short supplies in major international markets prior to 1997 (FN 1995, ITN 1996 and 1996a, FAO 1996, and SFI 1996). Limited supplies have generated intense pressure in the European Union (EU) mackerel market (ITN 1996a). This situation appeared unchanged through 1997. As a result, large quantities of mackerel were purchased by East European countries like Poland Russia, and Latvia. These purchases have increased pressure on prices, while leaving fewer supplies for more traditional markets such as Japan (SFI 1996). Quota reductions in western mackerel grounds are creating additional market uncertainty. Present market conditions might be expected to cause larger traders to increase “sourcing” and prices are likely to stay high or increase further.

Canada and Jamaica were the two most important markets for U.S. mackerel during the early to mid-1990's. Jamaica has been considered as one of the most steady and promising markets for US frozen mackerel. In 1995, the US exported 985 mt of frozen mackerel to Jamaica, this represented a 68% increase from 1994, and a 22% decrease from the 1991-1994 average. The frozen mackerel exported to Jamaica in 1995 was valued at $641/mt. US exports of frozen mackerel to Jamaica continued to increase steadily to 1,700 mt in 1999.

In 1995, Canada purchased 1,269 mt ($798/mt) of frozen mackerel from the US, this represented a 120% increase from 1994, and a 303% increase from the 1991-1994 average. The overall US export of fresh/chilled and frozen mackerel in 1995 was estimated at 3,296 mt, this represented a 12% increase from 1994, and a 22% decrease from the 1991-1994 average (Ross 1996). In 1996, the US exported 3501 mt of Atlantic mackerel to Canada.

Total US exports of all mackerel species have declined from 58,921 mt (valued at $56.7 million) in 1996 to only 11,748 mt (valued at $8.2 million) in 1999. Total US exports of all mackerel species was 17,367 mt in 1998.

Canada continued to be the largest importer of US fresh mackerel in 1999 (645 mt valued at $0.8 million)and 2000. Japan was the largest importer of US frozen mackerel in 1998 (5,804 mt valued at $3.5 million) followed by Australia (2,917 mt/$1.7 million), Jamaica (1,742 mt/ $1.65 million), Canada (1,579 mt/$1.3 million), Hong Kong (1,005 mt/$1.1 million), Philippines (901 mt/$1.1 million), and Uruguay (839 mt/$ 0.7 million). However, Japan imports of US frozen mackerel declined sharply to 751 mt in 1999. Nigeria was the largest importer of US frozen mackerel in 1998 (2,050 mt valued at $0.9 million) followed by Egypt (1,665 mt/$0.7 million), South Korea (1,641 mt/$1.3 million), Jamaica (1,614 mt/ $1.4 million), and Canada (809 mt/$0.7 million). US exporters placed an additional 102 mt of prepared/preserved mackerel products in foreign markets in 1998 valued at $0.15 million.

National Marine Fishery Service weighout data (Maine-Virginia), shows that the average exvessel prices for Atlantic mackerel in the US declined steadily from $400/mt ($0.18/lb) in 1989 to $281/mt ($0.13/lb) in 1994. Since then, however exvessel prices have moved upward from $296/mt ($0.13/lb) in 1994 to $321/mt ($0.15/lb) in 1995 (based on preliminary NMFS data). NMFS weighout data also show that US commercial landings of Atlantic mackerel increased from 4,653 mt in 1993 to 8,438 mt in 1995. Unpublished NMFS landings data indicate that US Atlantic mackerel landings increased to 15,406 mt in 1996, and subsequently declined to 12,509 mt and12,045 mt in 1998 and 1999, respectively. Ex-vessel prices for Atlantic mackerel declined slightly in 1996 to $296/mt ($0.13/lb) and then increased to $376/mt ($0.17/lb) in 1998. Ex-vessel prices for Atlantic mackerel declined again in 1999 to $299/mt ($0.13/lb) and then increased to $354/mt in 2000 ($0.16/lb).

3.3.1.2.3.2 Major Producers of Atlantic Mackerel

According to the FAO, world landings of Atlantic mackerel were on an increasing trend in the early 1990's. In 1993, Atlantic mackerel world landings were estimated to be 840,833 mt. This represented a 7% increase from the 1992 landings (FAO 2000). Total world landings of Atlantic mackerel peaked in 1994 at 842,920 mt. World landings of Atlantic mackerel decreased steadily to about 560,000mt by 1997 and then increased slightly to 657,278 mt in 1998 (FAO 2000).

The leading producers of Atlantic mackerel in 1993 were the United Kingdom, Norway, Ireland, Russian Federation, USSR, the Netherlands, and Denmark (FAO 1993):

Country	1993 Landings (mt)	1998 Landings (mt)
United Kingdom	253,058	179,711
Norway	223,838	158,255
Ireland	94,979	67,310
Russian Federation	46,716	67,837
Netherlands	42,532	30,163
Denmark	42,056	27,415
Others	94,126	126,567
Total	841,445	657,258

3.3.1.2.3.3 Major Exporters of Mackerel

According to FAO statistics, total global mackerel exports (all species of mackerel combined) in 1993 were estimated at 945,206 mt and valued at $454 million. This represented an increase in exports and value of 12% and 3.6% from 1992, respectively (FAO 1993a). Total global mackerel exports (all species of mackerel combined) in 1996 declined to 819,214 mt (a 13% decline compared to 1993). However, the total value of exports increased to $753 million. Total global mackerel exports in 1997 declined again to 789,111 mt . However, the total value of exports increased to $763 million in 1997. Total global mackerel exports in 1998 increased to 853,376 mt (total value of exports decreased to $734 million in 1998). In 1993, major exporting countries of mackerel (fresh/frozen/chilled) include Norway, United Kingdom, Ireland, and the Netherlands (FAO 1993a). In 1998, Norway, United Kingdom and Ireland continued to be the leading exporters of mackerel products, accounting for about 64 % of all exports (FAO 2000).

Country	1993 Exports (mt)	1998 Exports (mt)
Norway	293,854	247,722
United Kingdom	216,517	195,421
Ireland	161,772	104,998
Netherlands	104,777	58,548
Korea	10,329	17,515
USA	4,273	17,908
Other	153,684	211,264
Total	945,206	853,376

3.3.1.2.3.4 Major Importers of Mackerel

According to FAO statistics, global mackerel imports (fresh/frozen/chilled) in 1993 were estimated at 770,165 mt, and valued at $446 million. This represented an increase in imports and value of 12% and 6.6% from 1992, respectively (FAO 1993a). Major importing countries of mackerel (fresh/frozen/chilled) in 1999 included Japan, Norway, Philippines, Norway, Egypt, Poland and the Russian Federation (FAO 2000):

Country	1993 Imports (mt)	1998 Imports (mt)
Japan	211,030	134,731
Nigeria	99,289	26,842
Norway	60,789	125,657
Netherlands	38,387	23,566
Poland	36,940	44,602
France	26,756	18,710
Côte d'Ivory	24,440	16,836
Russian Fed.	-	78,537
Egypt	15,819	42,468
Philippines	-	43,319
Thailand	15,038	19,276
Other	241,677	292,300
Total	770,165	866,844

3.3.1.2.3.5 Key Events in the World Mackerel Market

Much of what is important in the world market for mackerel revolves around events in a few key nations and markets. In the late 70's and early 80's Japan was the world's leading producer of mackerel (FAO 1982 and USITC 1993). Since then, Japan's mackerel landings have declined annually. In 1991 Japans' mackerel landings reached an estimated low of 255 thousand mt. Since then, landings have increased to 602 thousand mt in 1997, making Japan again a leading world producer (FAO 1997) -- still, this landing figure represents over a twofold decrease from the 1978 record landings by Japan. Japan is also the leading importer of mackerel. In 1993, Japan imported over 211 thousand mt of mackerel (27% of the world total). This represented a 50% increase in Japan's mackerel imports compared to 1992 (FAO 1993a). Japan was the leading exporter of mackerel again in 1997.

In 1993, mackerel exports for Norway and the United Kingdom were over 54% of the world total

(FAO 1993a). Norway has traditionally been an important supplier to the Japanese market. However, in 1995 the Norwegian mackerel catch in the North sea declined to 202 thousand mt, which represented a 22% decrease from the previous year. Recently, Norway has also exported large quantities of mackerel to Eastern European countries like Poland, Russia, and Latvia, leaving lower quantities to be exported to traditional markets such as Japan (SFI 1996). This event has contributed to recent price pressures for this commodity.

An important advantage that Norway and the United Kingdom have over the United States is the distinct characteristics that Atlantic mackerel from European waters has compared with the same species off the northeast coast of the US. European mackerel has a higher fat content than their North American counterparts(at the time that the bulk of the commercial fishery is prosecuted), as well as reaching a larger average size and having a "blunter," deeper shape. All these characteristics appeal to the Japanese market and cause them to prefer European mackerel to our own (Ross 1994). Size is very important, 600+ gram fish command twice the price of smaller fish.

3.3.1.2.3.6 The Current World Market for Mackerel

Strong warnings were issued in 1996 by European scientists about the potential collapse of the European Atlantic mackerel stock. Large cuts in the total allowable catch (TAC) have been recommended to restore the spawning stock biomass to safe levels. While in recent years the TAC for this stock has remained high, European mackerel stocks are currently at the lowest level ever recorded (FN 1995a and FNI 1995).

As the fishing quota for the North sea mackerel was reduced for the 1996 season, canners were actively trying to execute existing orders. Reports surfaced that "processors in Denmark and Scotland may be interested in frozen mackerel from other sources if the price is competitive" (ITN 1996).

East European and Japanese buyers have been very active. This is likely to cause prices to remain high in the near future (ITN 1996a).

The Norwegian government relaxed buying controls for pelagic catches from October 15, 1995 to January 1, 1996 (FN 1995). Those buying controls -- imposed by the Norwegian fisheries department -- force all pelagic catches landed in Norway to be sold at auctions through *Norges Sildesalgslag* (the Norwegian sales organization). This prevents Norwegians processors from buying mackerel from foreign vessels until all the Norwegian quota is taken. Buying controls were relaxed following the 20% cut in the Norwegian mackerel quota, it was expected that this move would have helped processors to secure raw material to supply important markets.

Japanese cold storage of frozen mackerel (horse mackerel and chub mackerel) was 82,406 mt as of April 30, 1996, up 20% from a year earlier (ITN 1996b). Although cold storage of frozen mackerel was up in Japan, buyers in that market were still showing strong demand for European mackerel.

A new mackerel cannery began operations in Papua New Guinea under the management of Malaysia's Kumpulan Fima group. This facility is expected to produce 36,000 mt of canned mackerel per year, 4,000 more mt than is needed to supply the domestic demand. The surplus production will be exported (ITN 1995a). The cannery is expected to operate on domestic and imported fish (FAO 1995).

3.3.1.2.3.7 Future Supplies of Mackerel

Prospects for the European mackerel stock look poor. Europe's western mackerel (ICES areas VI & VII) TAC for 1996 was cut by 55% (FNI 1996). In addition, further reductions to the TAC were agreed for the 1997 fishing year. The 1996 reductions were far above the European scientific recommendations. According to European scientific recommendations, large cuts in mackerel TACs were needed in 1996 to restore the spawning stock biomass to a minimum biological threshold of 2.3 million mt by 1997-1998. That means that fishing mortality in 1996 would need to be reduced by 80% compared to 1994 in one year. In other words, to achieve this biological goal, the overall western mackerel TAC in 1996 should have been reduced to 144 thousand mt compared with 762 thousand mt in 1994 (FNI 1995 and FN 1995a). In fact, the TAC's agreed upon for the European mackerel stocks decreased from 837,000 mt in 1994 to 645,000 mt in 1995 and finally to 452,000 mt in 1996. Actual landings exceeded the TAC specifications in 1994 and 1995 when European landings of Atlantic mackerel were 823,000 and 756,000 mt, respectively.

3.3.1.2.3.8 US Production and Exports of Mackerel

NMFS weighout data showed that in 1995, Atlantic mackerel landings increased by 81% from the 1993 level. The average value of mackerel increased over 14% for the same period.

In 1991, landings peaked due to a relatively successful internal water processing venture between Russia and the state of New Jersey, and the one-year open door into the Japanese market. That year US producers were able to ship over more than 2,800 mt of frozen mackerel to Japan at an average value of $882/mt. The following year shipments fell to only 63 mt.

Overall, US exports of fresh/chilled and frozen mackerel in 1995 were estimated at 3,296 mt, this represented a 12% increase from 1994, and a 51% increase from 1993 (Ross 1996). In 1995, US producers were able to export 2,303 mt of frozen Atlantic mackerel valued at $1.7 million ($747/mt), and 992 mt of fresh/chilled mackerel valued at $1.5 million ($1,207/mt). US exports of Atlantic mackerel continued to increase in 1996 to 6,137 mt valued at $5.3 million. US exports of all mackerel species were 17,367 mt valued at $14.2 million in 1998. US exports of all mackerel species declined to 11,747 mt in 1998.

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

3.3.1.2.3.9 Trade Barriers

Japan- has started to phase in tariff reductions on 219 fisheries items entering the country. These reductions have been approved through GATT negotiations. Mackerel is one of the major fishery products subject to tariff reduction (ITN 1995b). The tariff of frozen mackerel will be reduced from a 10% base rate to a new rate of 7%. This rate will be reduced over a 5 year period beginning in 1995. The stated base rate has already had the first tariff reduction taken out. The mackerel base rate in 1995 was 10% with 0.6% reduced each year for 5 years until the rate gets to 7%. This tariff rate reduction is not "bound", therefore, rates may increase at some future date depending on market conditions in Japan (Ross 1995). The tariff for horse mackerel remain unchanged (ITN 1995b).

The Republic of Korea's- National Fisheries Administration has announced the liberalization of fish imports for 1995-1997. Liberalization of the following mackerel products are expected (ITN 1994):

Date	Item
July 1, 1996	Mackerel (excluding livers)
July 1, 1996	Mackerel (prepared/canned goods)
July 1, 1997	Mackerel (excluding livers and roes/fresh or chilled)

Korea has agreed to establish an import tariff rate of 10% on most fresh/frozen/dried seafood and 20% on prepared preserved food (Ross 1995).

The European Community- has a seasonal tariff on mackerel. During the EC peak season of June 16 - February 14, an unchanged 20% tariff is levied on foreign imports of mackerel (fresh/chilled fish excluding fillets). For fresh/chilled/frozen mackerel fillets and other mackerel meat there is a 15% year-round tariff (ITN 1994a and 1994b).

Taiwan- has requested membership in the World Trade Organization/GATT. US negotiators have been working to reduce existing Taiwanese barriers to various seafood products. In addition to significant reductions in key Taiwanese import tariffs, several Non-Tariff Measure (N.M.) which affect regional exporters are also to be reduced. At the present time, imports of squid, mackerel, sardines, herring, and catfish are not allowed into the country. The Taiwanese government has proposed to liberalize the NTM's over a 6-year phase-in period, except squid which will be liberalized in 1997 (Ross 1995).

Peoples Republic of China- is expected to drop import tariff rates once it becomes a member of GATT. The import tariff rate for frozen mackerel is expected to go from the base rate of 30% to the proposed rate of 15% (Ross 1995).

US- Has made concessions on 46 tariff lines. Canned mackerel is one of the major fishery products subject to tariff reduction, which has been reduced from 6 to 3% (ITN 1995c).

3.3.1.2.3.10 2002 Processor Survey Results for Mackerel

Each year the Mid-Atlantic Council surveys East Coast processors to ascertain their expectations on current and future mackerel production. Totals are not directly comparable between years because the respondents (and their numbers) will differ from year to year.

Production estimates for Atlantic mackerel for 2001 and 2002 were as follows (mt):

Product/Market	2001 (15 Reporting)	2002 (12Reporting)
US Food Market	4,888	8,790
US Bait Market	3,390	3,740
Foreign Export Market	15,941	26,789
TOTAL	24,219	38,789

Given the number of number of reporting units in 2002, these production estimates will likely increase due to the lower number of respondents. A number of the larger known processors failed to return the survey.

In order to more accurately assess processors' expectations, amounts expected to be processed in 2001 v. 2002 were compared for only those firms which provided estimates for both years. For these firms, projected needs increased 31% for 2001. As a result, the Council recommended that the status quo specification for DAP for 2001 be maintained in 2002 at 50,000 mt.

3.3.1.3 *Illex illecebrosus*

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

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

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

1992. Temporally, 94% of the 1992 *Illex* landings were taken during June through October. Otter trawl gear accounted for virtually all (99.9%) of the 1992 landings (NMFS 1994a).

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

3.3.1.4 Butterfish

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

During the period 1965-1976, US Atlantic butterfish landings averaged 2,051 mt. From 1977-1987, average US landings doubled to 5,252 mt, a historical peak of slightly less than 12,000 mt landed in 1983. Since then US landings have declined sharply to an average of 2,500 mt since 1988. Recent reductions in Japanese demand for butterfish has probably had a negative effect on butterfish landings.

Butterfish landings totaled 2,700 mt in 1992. Almost half (45%) of the 1992 total came from southern New England waters (Statistical area 53). Two statistical areas, 53 and 61, accounted for over 75% of the 1992 total. About half of the landings occurred during January and February, the remainder being distributed throughout the rest of the year. Butterfish landings were 3,631 mt and 2,013 mt in 1994 and 1995 , respectively. NMFS weighout data indicate that US butterfish landings increased to 3,489 mt in 1996 (valued at $5.1 million) and then decreased to 2,797 mt (valued at $3.7 million) in 1997. NMFS weighout data indicate that butterfish landings were 1,964 mt in 1998 (valued at $2.5 million) and that butterfish landings increased to 2,116 mt in 1999 (valued at $2.7 million).

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autumn through early spring. Reported foreign catches of butterfish increased from 750 mt in 1965 to 15,000 mt in 1969, and then to about 18,000 mt in 1973. With the advent of extended jurisdiction in US waters, reported foreign landings declined sharply from 10,353 mt in 1976 to 1,326 mt in 1978. Foreign landings were slowly phased out by 1987. Since 1988, foreign butterfish landings have averaged about 1 mt.

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3.3.2 Description of participants in Atlantic mackerel, squid and butterfish fisheries

According to unpublished NMFS permit file data, there were 2098 vessels with Atlantic mackerel permits in 2000. The distribution of these vessels by home port state is given in Table 9. Most of these vessels were from the states of Massachusetts (43.7%), New York (12.2%), Maine (10.7%), New Jersey (9.4%), Rhode Island (6.1%), Virginia (5.7%), New Hampshire (3.4%) and North Carolina (3.7%). In addition, there were 358 dealers which possessed Atlantic mackerel, squid and butterfish dealer permits in 2000. The distribution of these dealers is given by state in Table 10. Of the 358 dealers which possessed an Atlantic mackerel, squid and butterfish dealer permit in 2000, there were 101 dealers that reported buying Atlantic mackerel in 2000 (Table 11).

Based on NMFS dealer reports, a total of 520 vessels landed 12.4 million pounds of Atlantic mackerel valued at $2.0 million in 2000 (Table 12). Most of the vessels which landed mackerel also possessed *Loligo*/butterfish moratorium permits and *Illex* permits (Table 13). There were 231 vessels which landed 11.2 million pounds of Atlantic mackerel which possessed incidental catch permits. The landings of Atlantic mackerel by port in 2000 are given in Table 14. Cape May, NJ accounted for the majority of mackerel landings in 2000 (75.7%) , followed by North Kingstown, RI (13.3%), Chatham, MA (2.5%) and Point Judith, RI (1.5%). No ports were dependent on Atlantic mackerel for more than 10% of the value of total fishery landings in 2000 (Table 15).

According to unpublished NMFS permit file data, there were 395 vessels with *Loligo*/butterfish moratorium permits in 2000. The distribution of these vessels by home port state is given in Table 16. Most of these vessels were from the states of Massachusetts (28.0%), New York

(23.7%), Rhode Island (16.8%), New Jersey (14.5%), North Carolina (6.1%), and Virginia (4.3%). In addition, there were 348 dealers which possessed Atlantic mackerel, squid and butterfish dealer permits in 2000. The distribution of these dealers is given by state in Table 10. Of the 358 dealers which possessed Atlantic mackerel, squid and butterfish dealer permits in 2000, there were 137 dealers that reported buying *Loligo* in 2000 (Table 17). Most of these dealers were from the states of New York (28.6%), Massachusetts (21.1%), Rhode Island (20.3%), North Carolina (12.8%), New Jersey (6.8%), and Virginia (6.0%).

A total of 497 vessels landed 37.3 million pounds of *Loligo* valued at $24.0 million in 2000. Most of these landings were taken by vessels which possessed *Loligo*/Butterfish moratorium permits (Table 12). There were 208 vessels which landed 7.3 million pounds of *Loligo* in 2000 which possessed incidental catch permits. The landings of *Loligo* by port in 2000 are given in Table 18. Five ports accounted for the majority of *Loligo* landings in 2000: Point Judith, RI (28.6%), Cape May, NJ (10.6%), Montauk, NY (11.7%), Hampton Bay, NY (16.0%), and North Kingstown, RI (7.1%). There were numerous ports that were dependent on *Loligo* for more than 10% of the value of total fishery landings in 1999 (see Table 19).

According to unpublished NMFS permit file data, there were 77 vessels with *Illex* moratorium permits in 2000. The distribution of these vessels by home port state is given in Table 20. Most of these vessels were from the states of New Jersey (32.5%), Massachusetts (15.6%), New York (11.7%), Rhode Island (11.7%), and Virginia (9.1%). In addition, there were 358 dealers which possessed Atlantic mackerel, squid and butterfish dealer permits in 2000. The distribution of these dealers is given by state in Table 10. Of the 358 vessels which possessed an Atlantic mackerel, squid and butterfish dealer permits in 2000, there were 28 dealers that reported buying *Illex* in 2000 (Table 21). Most of these dealers were from the states of North Carolina (30.4%), Rhode Island (21.7%), New Jersey (13.0%), and Massachusetts (13.0%),

A total of 66 vessels landed 19.9 million pounds of *Illex* valued at $3.7 million in 2000. Virtually all of these landings were taken by vessels which possessed *Illex* moratorium permits (Table 12). There were 36 vessels which landed *Illex* in 2000 which possessed incidental catch permits. The landings of *Illex* by port in 2000 are given in Table 22. Three ports accounted for the majority of *Illex* landings in 2000: Cape May, NJ (41.9%), North Kingstown, RI (52.8%), and Hampton, VA (1.8%). North Kingstown, RI (24.4%) was the only port dependent on *Illex* for more than 10% of the value of it's total fishery landings in 2000 (Table 23).

As noted above there were 358 dealers which possessed Atlantic mackerel, squid and butterfish dealer permits in 2000. Of the 358 vessels which possessed an Atlantic mackerel, squid and butterfish dealer permit in 2000, there were 126 dealers that reported buying butterfish in 2000 (Table 24). Most of these dealers were from the states of New York (26.2%), Rhode Island (21.4%), Massachusetts (17.5%), North Carolina (16.7%), New Jersey (7.1%), and Virginia (5.6%).

A total of 520 vessels landed 3.2 million pounds of butterfish valued at $1.5 million in 2000. Most of these landings were taken by vessels which possessed *Loligo*/butterfish moratorium permits (Table 12). There were 232 vessels which landed 0.8 million pounds of butterfish in 2000 which possessed incidental catch permits. The landings of butterfish by port in 2000 are given in Table

25. Five ports accounted for the majority of butterfish landings in 2000: Point Judith, RI (28.8%), Greenport, NY (12.2%), Cape May, NJ (10.9%), Montauk, NY (7.7%), and North Kingstown, RI (7.5%). Unpublished NMFS dealer data indicated that there were no ports which were dependent on butterfish for more than 10% of the value of total fishery landings in 2000.

According to unpublished NMFS permit file data, there were 1704 vessels with squid/butterfish incidental catch permits in 2000. The distribution of these vessels by home port state is given in Table 26. In addition, there were 561 vessels which possessed Atlantic mackerel, squid and butterfish party/charter permits in 2000. The distribution of these vessels by home port state is given in Table 27.

4.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

4.1 Biological Impacts

4.1.1 Atlantic mackerel

4.1.1.1 Preferred Alternative for Atlantic mackerel in 2002: Specify ABC at 347,000 mt, IOY at 85,000 mt, DAH at 85,000 mt, DAP at 50,000 mt and JVP at 20,000 mt and TALFF at 0 mt

The proposed specifications under this alternative would be ABC = 347,000 mt, IOY=85,000 mt, DAH=85,000 mt, DAP=50,000 mt and JVP=20,000 and TALFF=0 mt. MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative based on biological reference points outlined in the Magnuson-Stevens Act. For Atlantic mackerel, maximum sustained yield (MSY) and the biomass that produces MSY in the long-term (B_{MSY}) were most recently estimated by Applegate *et al.* (1998). F_{MSY} was estimated to be 0.45 and B_{MSY} was estimated to be 890,000 mt. These values form the basis of the definition of overfishing for Atlantic mackerel. The maximum fishing mortality rate is defined as F_{MSY}=0.45 and the minimum stock biomass is defined as 1/4 B_{MSY} or 225,000 mt. The target fishing mortality rate is defined as the tenth bootstrap percentile of F_{MSY} when SSB is greater than 890,000 and decreases linearly to zero as SSB approached ½ B_{MSY}.

A control rule was developed in Amendment 8 from the age-based MSY-based reference points and uncertainty in the estimate of F_{MSY} (Applegate *et al.* 1998). When SSB is greater than 890,000 mt, the overfishing limit is F_{MSY} (0.45), and the target F is the tenth bootstrap percentile of F_{MSY} (0.25). To avoid low levels of recruitment, the limit F decreases linearly from 0.45 at 890,000 mt SSB to zero at 225,000 mt SSB (1/4 B_{MSY}), and the target F decreases linearly from 0.25 at 890,000 mt SSB to zero at 450,000 mt SSB (½ B_{MSY}). The most current estimates of SSB and F (1994) indicate that SSB is well above B_{MSY} and F is well below F_{MSY} (NMFS 1996b). The target mortality rates account for uncertainty in the estimate of F_{MSY}.

As noted above, the most recent estimate of Atlantic mackerel stock biomass was estimated to be 2.1 million mt, well above the target biomass of 890,000 mt. Therefore, the yield associated with the target fishing mortality rate of F=0.25 adopted in Amendment 8 is 369,000 mt is the appropriate basis for ABC. Therefore, the 2002 ABC recommendation is 347,000 mt (F=0.25 yield estimate of 369,000 mt - the estimated Canadian catch of 22,000 mt).

The Council recommended that the status quo specification for DAP for 2001 be maintained in 2002 at 50,000 mt. In addition, the Council also recommended that the JVP specification be maintained at 20,000 mt and TALFF be specified at 0 mt in 2002. If the recreational allocation of 15,000 mt is summed with DAP and JVP, then DAH equals 85,000 mt. If DAH and TALFF are summed then IOY equals 85,000 mt.

The Council maintained JVP in 2002 at 20,000 mt because they recognized the need for JV's to allow US harvesters to take mackerel at levels in excess of current US processing capacity. The increased JVP specification recommendation since 2001 is based on the fact that US mackerel production in recent years has been far lower than historical levels, in spite of increases in world demand for mackerel and recent declines in world production.

As noted above the preferred alternative specification of IOY for 2001 is 85,000 MT. This level of exploitation will not cause a significant change in the mean biomass estimate from its present state. The effects of a continued large stock of Atlantic mackerel on other species of fish are determined primarily through prey- predator relationships (see section 3.3). The diet of Atlantic mackerel is made up primarily of crustaceans and, to a lesser extent, other fish. However, several species of fish prey on Atlantic mackerel including commercially important species such as Atlantic cod, swordfish, and bluefin tuna. Mackerel are also an important item in the diet of numerous species of marine mammals.

4.1.1.2 Alternative 1 for Atlantic mackerel: Specify ABC at 347,000 mt, IOY at 88,000 mt, DAH at 85,000 mt, DAP at 50,000 mt and JVP at 20,000 mt and TALFF at 3,000 mt (Maintain Status Quo 2001 specifications for 2002)

The first alternative action considered by the Council was to maintain the status quo 2000 specifications for Atlantic mackerel for 2002. The proposed specifications under this alternative would be ABC = 347,000 mt, IOY=88,000 mt, DAH=85,000 mt, DAP=50,000 mt and JVP=20,000 and TALFF=3,000 mt.

The status quo 2001 specification of JVP and TALFF in 2002 would not meet the policy objectives of the Council relative to further development of the US domestic harvest of Atlantic mackerel, and therefore was rejected. Although the IOY specification under this alternative would be slightly than under the preferred alternative, this measure is expected to have the same biological consequences as the preferred alternative. Therefore, this alternative is not expected to have a negative biological impact on the Atlantic mackerel stock.

4.1.1.3 Alternative 2 for Atlantic mackerel: Specify ABC at long term potential catch

The second alternative action considered by the Council for Atlantic mackerel in 2002 was to specify ABC at long term potential catch. The proposed specifications under this alternative would be ABC=134,000 mt, IOY=85,000 mt, DAH=85,000 mt, DAP=50,000 mt and JVP=20,000 and TALFF=0 mt.

The Council considered that the ABC specification for Atlantic mackerl be capped at long term potential catch (LTPC). The most recent estimate of LTPC was 134,000 mt. The use of LTPC as an upper bound on ABC was found to be inappropriate because it would not allow for variations and contingencies in the status of the stock. For example, the current adult stock was recently estimated to exceed 2.1 million mt. The specification of ABC at LTPC would effectively result in an exploitation rate of only about 6%, well below the optimal level of exploitation. The potential level of foregone yield under this alternative was considered unacceptable. However, this measure is expected to have the even less of a biological impact than the preferred alternative. Therefore, this alternative is not expected to have a negative biological impact on the Atlantic mackerel stock.

4.1.1.4 Alternative 3 for Atlantic mackerel: Specify ABC at 347,000 mt, IOY at 65,000 mt, DAH at 65,000 mt, DAP at 50,000 mt and JVP and TALFF at 0 mt

Another alternative the Council considered was the elimination of JVP and TALFF for 2002. The proposed specifications under this alternative would be ABC=347,000 mt, IOY=65,000 mt, DAH=65,000 mt, DAP=50,000 mt and JVP and TALFF=0 mt.
The Council rejected this option because they recognized the need for JV's in 2002 to allow US harvesters to take mackerel at levels in excess of current US processing capacity. However, this measure is expected to have the same biological consequences as the preferred alternative. Therefore, this alternative is not expected to have a negative biological impact on the Atlantic mackerel stock. In the future, the Council intends to re-evaluate it's policy relative to JV's as US processing and export capacity increases.

4.1.2 *Loligo* squid

4.1.2.1 Preferred Alternative for *Loligo* squid in 2002: Specify Max OY at 26,000 mt, and ABC , IOY, DAH, DAP at 17,000 mt and JVP and TALFF at 0 mt (maintain 2001 status quo in 2002)

The proposed specifications under this alternative would be Max OY at ABC=26,000 mt, IOY, DAH, and DAP at 17,000 mt and JVP and TALFF at 0 mt. MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative based on biological reference points outlined in the Magnuson-Stevens Act. Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management (FMP) was developed to bring the FMP into compliance with the Sustainable Fisheries Act (SFA). The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act, that caused the Guidelines to be significantly revised. The most significant changes were made to National Standard 1, which imposed new requirements concerning definitions of overfishing in fishery management plans. The overfishing definition for Loligo was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Loligo* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{max} is exceeded (F_{max} is a proxy for F_{msy}). Since the development of Amendment 8, an estimate of F_{msy} has become available and will replace the previous overfishing proxy of F_{max}. Annual quotas will be specified which correspond to a target fishing mortality rate. Target F is defined as 75% of the F_{msy} when biomass is greater than B_{msy}, and decreases linearly to zero 50% of B_{MSY}. Maximum OY is specified as the catch associated with a fishing mortality rate of F_{msy}. In addition, the biomass target is specified to equal B_{MSY}.

The most recent assessment of the Loligo stock (SAW 29) concluded that the stock was approaching an overfished condition and that overfishing was occurring (NMFS 1999). A production model indicated that current biomass was less than B_{msy}, and near the biomass threshold of 50% B_{MSY}. There was high probability that fishing mortality exceeded F_{msy} in 1998. The average F from the winter fishery (October to March) over the last five years averaged 180% of F_{MSY}, and F from the summer fishery equaled F_{MSY}. However, the production model also indicated that the stock has the ability to quickly rebuild from low stock sizes. Length based analyses indicated that fully-recruited fishing mortality is greater than F_{max} and stock biomass was among the lowest in the assessment time series (1987-1998). Recent survey indices of recruitment were well below average.

The new requirements of the SFA required the Council to take remedial action for 2000 to rebuild the stock to a level which will produce MSY (B_{msy}) given the status determination that *Loligo* was approaching an overfished state. The control rule in Amendment 8 specifies that the target fishing mortality rate must be reduced to zero if biomass falls below 50% of B_{msy}. The target fishing mortality rate increases linearly to 75% of F_{msy} as biomass increases to B_{msy}. However, projections made in SAW 29 indicate that the control rule appears to be overly conservative. Projections from SAW 29 indicated that the *Loligo* biomass could be rebuilt to levels approximating B_{msy} in three years if fishing mortality was reduced to the target mortality rate specified in Amendment 8 of 75% of F_{msy}. The yield associated with this fishing mortality rate (75% of F_{msy}) in 2000, assuming status quo F in 1999, was estimated to be 11,732 mt in SAW 29. The current regulations still specify Max OY as the yield associated F_{max} or 26,000 mt. In determining the specification of ABC for the year 2000, the Council considered advice offered by SAW 29 which indicated that the control rule adopted in Amendment 8 was too conservative. Model projections presented in the most recent assessment demonstrated that the stock could be rebuilt in a relatively short period of time, even at fishing mortality rates approaching F_{msy}. Based on the SAW 29 projections, the Council chose to specify ABC as the yield associated with 90% F_{msy} or 13,000 mt in 2000 (increase to 15,000 mt by Inseason Action) .

Management advice from SAW 29 made special note of the fact that yield from this fishery should be distributed throughout the fishing year. Given that the current permitted fleet historically demonstrated the ability to land *Loligo* in excess of the quota specified for 2000, the Council recommended that the annual quota be sub-divided into three quota period or trimesters for 2000. The quota was allocated to each period based on the proportion of landings occurring in each trimester from 1994-1998. Based on the seasonal distribution of landings during this time period, the quota for January-April was 5,460 mt (42% of the total), the quota for May-August is 2,340 mt (18% of the total), and the quota for September-December is 5200 mt (40% of the total). The directed fishery during the first two trimester periods was to be closed when 90% of the amount allocated to the period was landed and then a trip limit of 2,500 pounds was to remain in effect until the quota period ended. Any underages from trimesters one and two were to be applied to the next trimester and overages were to be deducted from trimester three. The directed fishery was to be closed in the third trimester when 95% of the annual quota has been taken. The intent of the Council was for the fishery to operate at the 2,500 trip limit level for the remainder of the third quota period.

The most recent survey data for *Loligo* squid indicate that abundance of this species has increased significantly since the most recent assessment was conducted (i.e, SAW-29).

Estimates of biomass based on NEFSC fall 1999,spring 2000, and fall 2000 survey indices for *Loligo* indicate that the stock is currently at or near B_{msy}. In fact, the 1999 fall survey index was the sixth highest value observed in the time series since 1967 and the second highest since 1987. The 2000 spring survey index for *Loligo* was the tenth highest in the time series since 1968 and the fifth highest since 1987 (Lai, pers.comm). The fall 2000 survey index was the third highest on record since 1967. Based on the assumption that the stock will be at or near B_{msy} in 2001, the Council recommended that the 2001 quota be specified as the yield associated with 75% of F_{msy} . The yield associated with 75% of F_{msy} at B_{msy} is 17,000 mt based on projections in SAW-29 (NMFS 1999). Given the high index observed in the fall of 2000, the Council recommended that the 2001 status quo be maintained in 2002.

As noted above, the 2000 quota was allocated among three four month trimesters in an attempt to ensure that landings and fishing mortality were distributed throughout the fishing year. During Quota Period I in 2000, the directed fishery was closed on March 25, 2000. During Quota Period II, the directed fishery was closed on July 2, 2000. In addition, the quota for each period was exceeded, causing the dislocation of quota from the Quota Period III. As a result of these premature closures and overages, the Council allocated the 2001 quota of 17,000 mt as follows. The annual quota was allocated into quarterly quota periods based on the quarterly seasonal distribution of landings during the period 1994-1998. Based on this criteria, the 2001 quota allocations among quarters were: Quarter 1: 5,649.1 mt (33.23%), Quarter 2: 2,993.7 mt, (17.61%),Quarter 3: 2,941 mt (17.3 %),Quarter 4: 5,416.2 mt (31.86 %). In addition, the Council recommended for Quarters 1 through 3, that the directed fishery be closed when 80% of the quarter's allocation is taken and that vessels be restricted a 2,500 pound trip limit for the remainder of the quarter. In addition, the Council recommended that quarterly overages be deducted as follows: an overage in quarter 1 will be deducted from quarter 3 and an overage in quarter 2 will be deducted from quarter 4. When 95% of the total annual quota has been taken (i.e, 16,150 mt) the trip limit will be reduced to 2,500 pounds and will in remain in effect for the rest of the fishing year. The Council recommended that the same quarterly allocation system be maintained in 2002 with the following exception. If the first quarter landings are less than 70% of the first quarter allocation, the underage below 70% of the quarter will be applied to quarter 3. Underages from quarters 2 and 3 will be added to quarter 4 by default based on the 95% closure rule for the annual quota.
Since the stock is protected from overfishing by specifying the annual quota at 75% of F_{msy}, it can be concluded that this level of ABC will not have any negative biological impacts on the *Loligo* stock.

4.1.2.2 Alternative 1 for *Loligo*: Maintain 2000 Specifications in 2002

The FMP defines overfishing for *Loligo* as occurring when the catch associated with a threshold of F_{MAX} is exceeded (F_{MAX} is a proxy for F_{MSY}). When an estimate of F_{MSY} becomes available, it will replace the current overfishing proxy of F_{MAX}. Max OY is specified as the catch associated with a F_{MAX}. In addition, the biomass target is specified to equal B_{MSY}.

The most recent stock assessment for *Loligo* (the 29th Northeast Regional Stock Assessment Workshop, August 1999 (SAW-29)) concluded that the stock was approaching an overfished condition and that overfishing was occurring. More recently, NMFS' Report to Congress: Status of Fisheries of the United States (October 1999) determined that the *Loligo* stock was overfished at the time the report was written. A production model indicated that current biomass was less than B_{MSY}, and near the biomass threshold of 50 percent B_{MSY}. There was a high probability that F exceeded F_{MSY} in 1998. The average F from the winter fishery (October to March) over the last 5 years averaged 180 percent of F_{MSY}, and F from the summer fishery equaled F_{MSY}. In addition, indices of recruitment were well below average.

The Magnuson-Stevens Fishery Conservation and Management Act required the Council to take remedial action for 2000 to rebuild the stock to a level that will produce MSY (B_{MSY}) given the status determination that *Loligo* was overfished. The control rule in the FMP specifies that the target F must be reduced to zero if biomass falls below 50 percent of B_{MSY}. The target F increases linearly to 75 percent of F_{MSY} as biomass increases to B_{MSY}. However, projections made in SAW-29 indicate that the *Loligo* control rule appears to be overly conservative. The projections presented demonstrate that the stock could be rebuilt in a relatively short period of time, even at F values approaching F_{MSY}. Projections indicated that the *Loligo* biomass could be rebuilt to levels approximating B_{MSY} in 3 to 5 years if F is reduced to 90 percent of F_{MSY}. The yield associated with this F (90 percent of F_{MSY}) in 2000, assuming status quo F in 1999, was estimated to be 13,000 mt based on projections from SAW-29. The establishment of 4-month periods spread F out over the year and was expected to protect spawners. The current regulations still specify Max OY as the yield associated with $F_{MAX,}$ or 26,000 mt.

In determining the specification of ABC for the year 2000, the Council considered the SAW-29 projections. Based on these analyses, the Council chose to specify ABC as the yield associated with 90 percent of $F_{MSY,}$ or 13,000 mt. However, recent stock assessment data indicate that the Loligo stock has increased in size and is currently at or near B_{msy}. As a result, maintaining ABC at 13,000 in 2001 would cause unnecessary reductions in yield and loss of revenue to the fishery. However since the stock is protected from overfishing by specifying the annual quota at level lower than 75% of F_{msy} under this alternative, it can be concluded that this level of ABC would not have any negative biological impacts on the *Loligo* stock.

4.1.2.3 Alternative 2 for Loligo: MAX OY of 26,000 mt and ABC, IOY, DAH, DAP of 11,700 mt

In determining the specification of ABC for the year 2000, the Council considered the recommendations of SAW-29. Based on these analyses, the Council would have chosen to specify ABC as the yield associated with 75 percent of $F_{MSY,}$ or 11,700 mt based on the stock size as estimated in SAW-29. However, recent stock assessment data indicate that the *Loligo* stock has increased in size and is currently at or near B_{msy}. As a result, specifying ABC at 11,700 in 2002 would cause unnecessary reductions in yield and loss of revenue to the fishery. However since the stock is protected from overfishing by specifying the annual quota at level lower than 75% of F_{msy} under this alternative, it can be concluded that this level of ABC would not have any negative biological impacts on the *Loligo* stock.

4.1.3 *Illex* squid

4.1.3.1 Preferred Alternative for *Illex* squid in 2002: Specify Max OY, ABC, IOY, DAH, DAP

at 24,000 mt and JVP and TALFF at 0 mt (maintain 2001 status quo in 2002)

The proposed specifications under this alternative would be Max OY, ABC, IOY, DAH, and DAP at 24,000 mt and JVP and TALFF at 0 mt. MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative based on biological reference points outlined in the Magnuson-Stevens Act. Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management (FMP) was developed to bring the FMP into compliance with the Sustainable Fisheries Act (SFA). The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act, that caused the Guidelines to be significantly revised. The most significant changes were made to National Standard 1, which imposed new requirements concerning definitions of overfishing in fishery management plans. The overfishing definition for *Illex* was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Illex* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{MSY} is exceeded. Annual quotas will be specified which correspond to a target fishing mortality rate of 75% of F_{MSY}. Maximum OY will be specified as the catch associated with a fishing mortality rate of F_{MSY}. In addition, the biomass target is specified to equal B_{MSY}. The minimum biomass threshold is specified as ½ B_{MSY}.

The most recent assessment of the *Illex* stock (SAW 29) concluded that the stock was not in an overfished condition and that overfishing was not occurring (NMFS 1999). However, due to a lack of adequate data, an the estimate of yield at F_{msy} was not updated in SAW 29. However, an upper bound on annual fishing mortality was computed for the US EEZ portion of the stock based on a model which incorporated weekly landings and relative fishing effort and mean squid weights during 1994-1998. These estimates of F were well below the biological reference points. Current absolute stock size is unknown and no stock projections were done in SAW 29 or since then.

Since data limitations did not allow an update of yield estimates at the threshold and target fishing mortality rates, the Council recommends that the specification of MAX OY and ABC be specified at 24,000 mt (yield associated with F_{msy}) in 2002 (same as in 2001). Under this option, the directed fishery for *Illex* would remain open until 95% of ABC is taken (22,800 mt). When 95% of ABC is taken, the directed fishery will be closed and a 5,000 pound trip limit will remain in effect for the remainder of the fishing year.

As noted above, in SAW 29 an upper bound on annual fishing mortality was computed for the US EEZ portion of the stock based on a model which incorporated weekly landings and relative fishing effort and mean squid weights during 1994-1998. These estimates of F were well below the biological reference points. Based on the analyses presented in SAW 29, it can be concluded that this level of ABC will not have any negative biological consequences for the *Illex* stock.

4.1.3.2 Alternative 1 for Illex: Specify Max OY, ABC, IOY, DAH, DAP at 30,000 mt and JVP and TALFF at 0 mt

The proposed specifications under this alternative would be Max OY, ABC, IOY, DAH, and DAP at 30,000 mt and JVP and TALFF at 0 mt. MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative based on biological reference points outlined in the Magnuson-Stevens Act. Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management (FMP) was developed to bring the FMP into compliance with the Sustainable Fisheries Act (SFA). The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act, that caused the Guidelines to be significantly revised. The most significant changes were made to National Standard 1, which imposed new requirements concerning definitions of overfishing in fishery management plans. The overfishing definition for *Illex* was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Illex* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{MSY} is exceeded. Annual quotas will be specified which correspond to a target fishing mortality rate of 75% of F_{MSY}. Maximum OY will be specified as the catch associated with a fishing mortality rate of F_{MSY}. In addition, the biomass target is specified to equal B_{MSY}. The minimum biomass threshold is specified as ½ B_{MSY}.

Specification of ABC at 30,000 mt may not prevent overfishing in years of moderate to low abundance of *Illex* squid. This would have a negative biological impact on the *Illex* stock which, in turn, would be expected to negatively affect the large number of species and stocks of marine mammals and predatory fish which prey on *Illex* squid. Known predators of *Illex* are the fourspot flounder, goosefish, and swordfish. *Illex* is probably eaten by a substantially greater number of fish, however, partially digested animals are often difficult to identify and are simply recorded as squid remains, with no reference to the species. There are at least 47 other species of fish that are known to eat "squid". All of these species could be negatively impacted if the abundance of *Illex* were to decline as a result of overfishing.

4.1.3.3 Alternative 2 for *Illex* squid in 2002: Specify Max OY, at 24,000 mt and ABC, IOY, DAH, DAP at 19,000 mt and JVP and TALFF at 0 mt

The proposed specifications under this alternative would be Max OY=24,000mt and ABC, IOY, DAH, and DAP=24,000 mt and JVP and TALFF=0 mt. MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative based on biological reference points outlined in the Magnuson-Stevens Act. Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management (FMP) was developed to bring the FMP into compliance with the Sustainable Fisheries Act (SFA). The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act, that caused the Guidelines to be significantly revised. The most significant changes were made to National Standard 1, which imposed new requirements concerning definitions of overfishing in fishery management plans. The overfishing definition for *Illex* was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Illex* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{MSY} is exceeded. Annual quotas will be specified which correspond to a target fishing mortality rate of 75% of F_{MSY}. Maximum OY will be specified as the catch associated with a fishing mortality rate of F_{MSY}. In addition, the biomass target is specified to equal B_{MSY}. The minimum biomass threshold is specified as ½ B_{MSY}.

The most recent assessment of the *Illex* stock (SAW 29) concluded that the stock was not in an overfished condition and that overfishing was not occurring (NMFS 1999). However, due to a lack of adequate data, an the estimate of yield at F_{msy} was not updated in SAW 29. However, an upper bound on annual fishing mortality was computed for the US EEZ portion of the stock based on a model which incorporated weekly landings and relative fishing effort and mean squid weights during 1994-1998. These estimates of F were well below the biological reference points. Current absolute stock size is unknown and no stock projections were done in SAW 29 or since then.

Under this option, the directed fishery for *Illex* would remain open until 95% of ABC is taken (18,050 mt). When 95% of ABC is taken, the directed fishery will be closed and a 5,000 pound trip limit will remain in effect for the remainder of the fishing year.
As noted above, in SAW 29 an upper bound on annual fishing mortality was computed for the US EEZ portion of the stock based on a model which incorporated weekly landings and relative fishing effort and mean squid weights during 1994-1998. These estimates of F were well below the biological reference points. Based on the analyses presented in SAW 29, it can be concluded that this level ABC, which is less than the yield at F_{msy}, will not have any negative biological consequences for the *Illex* stock.

4.1.4 Butterfish

4.1.4.1 Preferred alternative for butterfish in 2002: Specify Max OY at 16,000 mt, ABC at 7,200 and IOY, DAH, DAP at 5,900 mt and JVP and TALFF at 0 mt (maintain 2001 status quo in 2002)

The proposed specifications under this alternative would be Max OY=16,000mt, ABC=7,200, IOY, DAH, and DAP=5,900 mt and JVP and TALFF=0 mt. The SAW 17 (NMFS 1994a) Advisory Report included the following concerning the state of the stock:

"The Atlantic butterfish stock is at a low to medium biomass level and current catch levels are below the MSY of 16,000, however, exploitation rate is unknown. Although recruitment of butterfish has remained high in recent years, the stock size of adults has declined since 1990 and is currently well below average. Since 1988, annual butterfish landings have averaged 2,500 mt, or only 25% of the domestic allowable harvest (DAH) of 10,000 mt. Landings in 1993 are projected to be 3,000 mt. Survey biomass indices in autumn 1992 and spring 1993 were among the lowest in the survey time series. Fishing effort increased in 1992 but, overall, has been relatively stable since 1984. Commercial landings per unit of effort (LPUE) in 1992 remained at the low levels observed since 1988."

SAW 17 (NMFS 1994a) offered the following management advice:

"Butterfish landings in recent years have been well below historical average yields. Japanese demand for butterfish has waned and this has had a negative impact on harvest levels. Butterfish landings are thus unlikely to increase unless market demand improves. If demand does improve, however, the stock in its current condition may not be able to sustain landings in excess of the long term historical average (1965-1992) of 7,200 mt because of recent declines in abundance as indicated by survey indices."

"Historical information suggests that discarding of butterfish may be an important source of fishing-induced mortality. The SARC recommends that data be collected that would allow discard levels to be reliably estimated."

"Given that butterfish is a short-lived species, new approaches to the assessment and management of the stock are required. A more adaptive, real-time assessment/management system will be needed to maintain full exploitation of the stock while simultaneously ensuring that adequate spawning stock levels are achieved. This would involve both real-time evaluation of stock status and in-season catch level adjustments."

No new assessment information is available. Based on the recommendations of SAW-17, the Monitoring Committee recommends that ABC should not exceed 7,200 mt. In addition, the Committee chose a risk averse approach by recommending DAP and DAH at 5,900 mt. This level was chosen because considerable uncertainty exists about the level of discards in the directed fishery. The quota of 5,900 mt was set to allow for discards such that the ABC of 7,200 mt should not be exceeded. In addition, if TALFF for Atlantic mackerel is specified at zero by the Council, there is no bycatch TALFF specification necessary for butterfish. Otherwise, a bycatch TALFF of 0.08% of the mackerel TALFF should be specified.

The definition of overfishing for butterfish specifies overfishing as the fishing mortality rate of Fmsy. The yield associated with Fmsy is 16,000 mt. However, the Council chose a risk averse level when specifying DAH for butterfish in 2002 based on the advice givebn in the most recent assessment. This level of landings is not expected to have any negative biological impact on the butterfish stock based on the findings of the most recent assessment,

4.1.4.2 Alternative 1 for butterfish in 2002: Specify Max OY at 16,000 mt, ABC, IOY, DAH, DAP at 7,200 mt and JVP and TALFF at 0 mt

The proposed specifications under this alternative would be Max OY=16,000mt, ABC=7,200, IOY, DAH, and DAP=5,900 mt and JVP and TALFF=0 mt. The SAW 17 (NMFS 1994a) Advisory Report included the following concerning the state of the stock:

"The Atlantic butterfish stock is at a low to medium biomass level and current catch levels are below the MSY of 16,000, however, exploitation rate is unknown. Although recruitment of butterfish has remained high in recent years, the stock size of adults has declined since 1990 and is currently well below average. Since 1988, annual butterfish landings have averaged 2,500 mt, or only 25% of the domestic allowable harvest (DAH) of 10,000 mt. Landings in 1993 are projected to be 3,000 mt. Survey biomass indices in autumn 1992 and spring 1993 were among the lowest in the survey time series. Fishing effort increased in 1992 but, overall, has been relatively stable since 1984. Commercial landings per unit of effort (LPUE) in 1992 remained at the low levels observed since 1988."

SAW 17 (NMFS 1994a) offered the following management advice:

"Butterfish landings in recent years have been well below historical average yields. Japanese demand for butterfish has waned and this has had a negative impact on harvest levels. Butterfish landings are thus unlikely to increase unless market demand improves. If demand does improve, however, the stock in its current condition may not be able to sustain landings in excess of the long term historical average (1965-1992) of 7,200 mt because of recent declines in abundance as indicated by survey indices."

"Historical information suggests that discarding of butterfish may be an important source of fishing-induced mortality. The SARC recommends that data be collected that would allow discard levels to be reliably estimated."

"Given that butterfish is a short-lived species, new approaches to the assessment and management of the stock are required. A more adaptive, real-time assessment/management system will be needed to maintain full exploitation of the stock while simultaneously ensuring that adequate spawning stock levels are achieved. This would involve both real-time evaluation of stock status and in-season catch level adjustments."

No new assessment information is available. Based on the recommendations of SAW-17, the Monitoring Committee recommends that ABC should not exceed 7,200 mt. In addition, the Committee chose a risk averse approach by recommending DAP and DAH at 5,900 mt. This level was chosen because considerable uncertainty exists about the level of discards in the directed fishery. The quota of 5,900 mt was set to allow for discards such that the ABC of 7,200 mt should not be exceeded. In addition, if TALFF for Atlantic mackerel is specified at zero by the Council, there is no bycatch TALFF specification necessary for butterfish. Otherwise, a bycatch TALFF of 0.08% of the mackerel TALFF should be specified.

The definition of overfishing for butterfish specifies overfishing as the fishing mortality rate of F_{msy}. The yield associated with Fmsy is 16,000 mt. However, the Council chose not to specify DAH at 7,200 mt for butterfish in 2002 based on the advice given in the most recent assessment. This level of landings could have a negative biological impact on the butterfish stock based on the findings of the most recent assessment.

4.1.4.3 Alternative 2 for butterfish in 2002: Specify Max OY at 16,000 mt, ABC, IOY, DAH, DAP at 10,000 mt and JVP and TALFF at 0 mt

The proposed specifications under this alternative would be Max OY=16,000mt, ABC=7,200, IOY, DAH, and DAP=5,900 mt and JVP and TALFF=0 mt. The SAW 17 (NMFS 1994a) Advisory Report included the following concerning the state of the stock:

"The Atlantic butterfish stock is at a low to medium biomass level and current catch levels are below the MSY of 16,000, however, exploitation rate is unknown. Although recruitment of butterfish has remained high in recent years, the stock size of adults has declined since 1990 and is currently well below average. Since 1988, annual butterfish landings have averaged 2,500 mt, or only 25% of the domestic allowable harvest (DAH) of 10,000 mt. Landings in 1993 are projected to be 3,000 mt. Survey biomass indices in autumn 1992 and spring 1993 were among the lowest in the survey time series. Fishing effort increased in 1992 but, overall, has been relatively stable since 1984. Commercial landings per unit of effort (LPUE) in 1992 remained at the low levels observed since 1988."

SAW 17 (NMFS 1994a) offered the following management advice:

"Butterfish landings in recent years have been well below historical average yields. Japanese demand for butterfish has waned and this has had a negative impact on harvest levels. Butterfish landings are thus unlikely to increase unless market demand improves. If demand does improve, however, the stock in its current condition may not be able to sustain landings in excess of the long term historical average (1965-1992) of 7,200 mt because of recent declines in abundance as indicated by survey indices."

"Historical information suggests that discarding of butterfish may be an important source of fishing-induced mortality. The SARC recommends that data be collected that would allow discard levels to be reliably estimated."

"Given that butterfish is a short-lived species, new approaches to the assessment and management of the stock are required. A more adaptive, real-time assessment/management system will be needed to maintain full exploitation of the stock while simultaneously ensuring that adequate spawning stock levels are achieved. This would involve both real-time evaluation of stock status and in-season catch level adjustments."

No new assessment information is available. Based on the recommendations of SAW-17, the Monitoring Committee recommends that ABC should not exceed 7,200 mt. In addition, the Committee chose a risk averse approach by recommending DAP and DAH at 5,900 mt. This level was chosen because considerable uncertainty exists about the level of discards in the directed fishery. The quota of 5,900 mt was set to allow for discards such that the ABC of 7,200 mt should not be exceeded. In addition, if TALFF for Atlantic mackerel is specified at zero by the Council, there is no bycatch TALFF specification necessary for butterfish. Otherwise, a bycatch TALFF of 0.08% of the mackerel TALFF should be specified.

The definition of overfishing for butterfish in the FMP specifies overfishing as the fishing mortality rate of Fmsy. The yield associated with F_{msy} is 16,000 mt. The target fishing mortality rate specified in the FMP is 75% F_{msy}. Therefore, based on the target fishing mortality rate specified in the FMP, annual quotas as high as 12,000 mt could be specified. A quota of 10,000 mt was considered to take into account discards of butterfish. However, the Council rejected this option based on the advice given in the most recent assessment. This level of landings could have a negative biological impact on the butterfish stock based on the findings of the most recent assessment.

4.2 Economic and Social Impacts

4.2.1 Atlantic mackerel

4.2.1.1 Preferred Alternative for Atlantic mackerel in 2002: Specify ABC at 347,000 mt, IOY at 85,000 mt, DAH at 85,000 mt, DAP at 50,000 mt and JVP at 20,000 mt and TALFF at 0 mt

The proposed specifications under this alternative would be ABC = 347,000 mt, IOY=85,000 mt, DAH=85,000 mt, DAP=50,000 mt and JVP=20,000 and TALFF=0 mt. MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative based on biological reference points outlined in the Magnuson-Stevens Act. For Atlantic mackerel, maximum sustained yield (MSY) and the biomass that produces MSY in the long-term (B_{MSY}) were most recently estimated by Applegate *et al.* (1998). F_{MSY} was estimated to be 0.45 and B_{MSY} was estimated to be 890,000 mt. These values form the basis of the definition of overfishing for Atlantic mackerel. The maximum fishing mortality rate is defined as F_{MSY}=0.45 and the minimum stock biomass is defined as 1/4 B_{MSY} or 225,000 mt. The target fishing mortality rate is defined as the tenth bootstrap percentile of F_{MSY} when SSB is greater than 890,000 and decreases linearly to zero as SSB approached ½ B_{MSY}.

A control rule was developed in Amendment 8 from the age-based MSY-based reference points and uncertainty in the estimate of F_{MSY} (Applegate *et al.* 1998). When SSB is greater than 890,000 mt, the overfishing limit is F_{MSY} (0.45), and the target F is the tenth bootstrap percentile of F_{MSY} (0.25). To avoid low levels of recruitment, the limit F decreases linearly from 0.45 at 890,000 mt SSB to zero at 225,000 mt SSB (1/4 B_{MSY}), and the target F decreases linearly from 0.25 at 890,000 mt SSB to zero at 450,000 mt SSB (½ B_{MSY}). The most current estimates of SSB and F (1994) indicate that SSB is well above B_{MSY} and F is well below F_{MSY} (NMFS 1996b). The target mortality rates account for uncertainty in the estimate of F_{MSY}.

As noted above, the most recent estimate of Atlantic mackerel stock biomass was estimated to be 2.1 million mt, well above the target biomass of 890,000 mt. Therefore, the yield associated with the target fishing mortality rate of F=0.25 adopted in Amendment 8 is 369,000 mt is the appropriate basis for ABC. Therefore, the 2002 ABC recommendation is 347,000 mt (F=0.25 yield estimate of 369,000 mt - the estimated Canadian catch of 22,000 mt).

The Council recommended that the status quo specification for DAP for 2001 be maintained in 2002 at 50,000 mt. In addition, the Council also recommended that the JVP specification be maintained at 20,000 mt and TALFF be specified at 0 mt in 2002. If the recreational allocation of 15,000 mt is summed with DAP and JVP, then DAH equals 85,000 mt. If DAH and TALFF are summed then IOY equals 85,000 mt.

The Council maintained JVP in 2002 at 20,000 mt because they recognized the need for JV's to allow US harvesters to take mackerel at levels in excess of current US processing capacity. The increased JVP specification recommendation since 2002 is based on the fact that US mackerel production in recent years has been far lower than historical levels, in spite of increases in world demand for mackerel and recent declines in world production.

The preferred alternative specification of IOY for 2002 is 85,000 mt. This level of IOY incorporates the 2001 status quo level of DAH and DAP for the 2002 fishing year. No change in economic or social impacts to the US mackerel industry are expected from this preferred alternative. Therefore, none of the vessel owners, crews, dealers, processors, or fishing communities associated with the ports given in Table 14 are expected to be adversely affected by the proposed 2002 annual specifications for Atlantic mackerel.

As noted above, no economic or social changes in 2002 are expected to occur for the US mackerel industry. However, because the Council recommended that TALFF be set at zero, the economic benefit to the nation is reduced. Foreign vessels fishing in the US EEZ for Atlantic mackerel must pay fees based on the mt of species harvested. For Atlantic mackerel, the poundage fee paid to the nation is $64.76 per mt. In 2001, TALFF was specified at 3000 mt. Assuming the entire TALFF allocation is harvested, almost $195,000 in fees will be collected for the nation. In addition, TALFF operations are often brokered by a US representative. Although the amount of income gained by the US broker is unknown, this income will also be lost with the elimination of TALFF in the 2002 fishing year.

Despite the reduction in economic gain for the nation that could result by specifying TALFF at zero, the Council felt the potential long term benefits for US Atlantic mackerel processors outweigh that loss. At the June 2001, Council meeting, Atlantic mackerel industry members and processors testified that they were against TALFF. It was noted by industry that US processors cannot compete with foreign vessels harvesting mackerel because these vessels often employ inexpensive labor and are not required to comply with the strict regulations governing US businesses. Furthermore, the Council received no testimony or comments in favor of TALFF. Although the US currently lacks sufficient processing capacity to accommodate the harvest of Atlantic mackerel, a new mackerel processing facility has recently opened and others have expanded their capabilities. Although the mackerel resource is abundant and can safely accommodate TALFF in addition to the domestic harvest, the Council is concerned that the perceived competition that TALFF represents to US processors will impede future expansion of processing facilities. This loss could far outweigh the short term gains to the nation that poundage fees collected through TALFF represent.

4.2.1.2 Alternative 1 for Atlantic mackerel: Specify ABC at 347,000 mt, IOY at 88,000 mt, DAH at 85,000 mt, DAP at 50,000 mt and JVP at 20,000 mt and TALFF at 3,000 mt (maintain status quo 2001 specifications for 2002)

The first alternative action considered by the Council was to maintain the status quo 2001 specifications for Atlantic mackerel for 2002. The proposed specifications under this alternative would be ABC = 347,000 mt, IOY=88,000 mt, DAH=85,000 mt, DAP=50,000 mt and JVP=20,000 and TALFF=3,000 mt.

The status quo 2001 specification of JVP and TALFF in 2002 would not meet the policy objectives of the Council relative to further development of the US domestic harvest of Atlantic mackerel, and therefore was rejected. The IOY specification under this alternative is slightly higher than under the preferred alternative because TALFF is specified as 3,000 mt. The Council concluded that the specification of TALFF above zero in 2002 could have negative economic and social consequences for the US mackerel industry. Table 14 lists the ports which landed Atlantic mackerel in 2000. The vessel owners, crews, dealers, processors and fishing communities associated with these ports would be expected to be affected the most by this alternative to the 2002 annual specifications for Atlantic mackerel.

4.2.1.3 Alternative 2 for Atlantic mackerel: Specify ABC at long term potential catch

The second alternative action considered by the Council for Atlantic mackerel in 2002 was to specify ABC at long term potential catch. The proposed specifications under this alternative would be ABC=134,000 mt, IOY=85,000 mt, DAH=85,000 mt, DAP=50,000 mt and JVP=20,000 and TALFF=0 mt.

The Council considered that the ABC specification for Atlantic mackerl be capped at long term potential catch (LTPC). The most recent estimate of LTPC was 134,000 mt. The use of LTPC as an upper bound on ABC was found to be inappropriate because it would not allow for variations and contingencies in the status of the stock. For example, the current adult stock was recently estimated to exceed 2.1 million mt. The specification of ABC at LTPC would effectively result in an exploitation rate of only about 6%, well below the optimal level of exploitation. The potential level of foregone yield under this alternative was considered unacceptable. The potential level of foregone yield under this alternative in 2002 could have negative economic and social consequences for the US mackerel industry. Table 14 lists the ports which landed Atlantic mackerel in 2000. The vessel owners, crews, dealers, processors and fishing communities associated with these ports would be expected to be affected the most by this alternative to the 2002 annual specifications for Atlantic mackerel.

4.2.1.4 Alternative 3 for Atlantic mackerel: Specify ABC at 347,000 mt, IOY at 65,000 mt, DAH at 65,000 mt, DAP at 50,000 mt and JVP and TALFF at 0 mt

Another alternative the Council considered was the elimination of JVP and TALFF for 2002. The proposed specifications under this alternative would be ABC=347,000 mt, IOY=65,000 mt, DAH=65,000 mt, DAP=50,000 mt and JVP and TALFF=0 mt.
The Council rejected this option because they recognized the need for JV's in 2002 to allow US harvesters to take mackerel at levels in excess of current US processing capacity. Therefore, this measure could have some negative economic and social consequences for the US mackerel industry. Table 14 lists the ports which landed Atlantic mackerel in 2000. The vessel owners, crews, dealers, processors and fishing communities associated with these ports would be expected to be affected the most by this alternative to the 2002 annual specifications for Atlantic mackerel.

4.2.2 *Loligo* squid

4.2.2.1 Preferred Alternative for *Loligo* squid in 2002: Specify Max OY at 26,000 mt, and ABC, IOY, DAH, DAP at 17,000 mt and JVP and TALFF at 0 mt (maintain 2001 status quo in 2002)

The proposed specifications under this alternative would be Max OY at ABC=26,000 mt, IOY, DAH, and DAP at 17,000 mt and JVP and TALFF at 0 mt. MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative based on biological reference points outlined in the Magnuson-Stevens Act. Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management (FMP) was developed to bring the FMP into compliance with the Sustainable Fisheries Act (SFA). The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act, that caused the Guidelines to be significantly revised. The most significant changes were made to National Standard 1, which imposed new requirements concerning definitions of overfishing in fishery management plans. The overfishing definition for Loligo was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Loligo* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{max} is exceeded (F_{max} is a proxy for F_{msy}). Since the development of Amendment 8, an estimate of F_{msy} has become available and will replace the previous overfishing proxy of F_{max}. Annual quotas will be specified which correspond to a target fishing mortality rate. Target F is defined as 75% of the F_{msy} when biomass is greater than B_{msy}, and decreases linearly to zero 50% of B_{MSY}. Maximum OY is specified as the catch associated with a fishing mortality rate of F_{msy}. In addition, the biomass target is specified to equal B_{MSY}.

The most recent assessment of the Loligo stock (SAW 29) concluded that the stock was approaching an overfished condition and that overfishing was occurring (NMFS 1999). A production model indicated that current biomass was less than B_{msy}, and near the biomass threshold of 50% B_{MSY}. There was high probability that fishing mortality exceeded F_{msy} in 1998. The average F from the winter fishery (October to March) over the last five years averaged 180% of F_{MSY}, and F from the summer fishery equaled F_{MSY}. However, the production model also indicated that the stock has the ability to quickly rebuild from low stock sizes. Length based analyses indicated that fully-recruited fishing mortality is greater than F_{max} and stock biomass was among the lowest in the assessment time series (1987-1998). Recent survey indices of recruitment were well below average.

The new requirements of the SFA required the Council to take remedial action for 2000 to rebuild the stock to a level which will produce MSY (B_{msy}) given the status determination that *Loligo* was approaching an overfished state. The control rule in Amendment 8 specifies that the target fishing mortality rate must be reduced to zero if biomass falls below 50% of B_{msy}. The target fishing mortality rate increases linearly to 75% of F_{msy} as biomass increases to B_{msy}. However, projections made in SAW 29 indicate that the control rule appears to be overly conservative. Projections from SAW 29 indicated that the *Loligo* biomass could be rebuilt to levels approximating B_{msy} in three years if fishing mortality was reduced to the target mortality rate specified in Amendment 8 of 75% of F_{msy}. The yield associated with this fishing mortality rate (75% of F_{msy}) in 2000, assuming status quo F in 1999, was estimated to be 11,732 mt in SAW 29. The current regulations still specify Max OY as the yield associated F_{max} or 26,000 mt. In determining the specification of ABC for the year 2000, the Council considered advice offered by SAW 29 which indicated that the control rule adopted in Amendment 8 was too conservative. Model projections presented in the most recent assessment demonstrated that the stock could be rebuilt in a relatively short period of time, even at fishing mortality rates approaching F_{msy}. Based on the SAW 29 projections, the Council chose to specify ABC as the yield associated with 90% F_{msy} or 13,000 mt in 2000 (increase to 15,000 mt by Inseason Action) .

Management advice from SAW 29 made special note of the fact that yield from this fishery should be distributed throughout the fishing year. Given that the current permitted fleet historically demonstrated the ability to land *Loligo* in excess of the quota specified for 2000, the Council recommended that the annual quota be sub-divided into three quota period or trimesters for 2000. The quota was allocated to each period based on the proportion of landings occurring in each trimester from 1994-1998. Based on the seasonal distribution of landings during this time period, the quota for January-April was 5,460 mt (42% of the total), the quota for May-August is 2,340 mt (18% of the total), and the quota for September-December is 5200 mt (40% of the total). The directed fishery during the first two trimester periods was to be closed when 90% of the amount allocated to the period was landed and then a trip limit of 2,500 pounds was to remain in effect until the quota period ended. Any underages from trimesters one and two were to be applied to the next trimester and overages were to be deducted from trimester three. The directed fishery was to be closed in the third trimester when 95% of the annual quota has been taken. The intent of the Council was for the fishery to operate at the 2,500 trip limit level for the remainder of the third quota period.

The most recent survey data for *Loligo* squid indicate that abundance of this species has increased significantly since the most recent assessment was conducted (i.e, SAW-29). Estimates of biomass based on NEFSC fall 1999,spring 2000, and fall 2000 survey indices for *Loligo* indicate that the stock is currently at or near B_{msy}. In fact, the 1999 fall survey index was the sixth highest value observed in the time series since 1967 and the second highest since 1987. The 2000 spring survey index for *Loligo* was the tenth highest in the time series since 1968 and the fifth highest since 1987 (Lai, pers.comm). The fall 2000 survey index was the third highest on record since 1967. Based on the assumption that the stock will be at or near B_{msy} in 2001, the Council recommended that the 2001 quota be specified as the yield associated with 75% of F_{msy} . The yield associated with 75% of F_{msy} at B_{msy} is 17,000 mt based on projections in SAW-29 (NMFS 1999). Given the high index observed in the fall of 2000, Council recommended that the status quo be maintained in 2002.

As noted above, the 2000 quota was allocated among three four month trimesters in an attempt to ensure that landings and fishing mortality were distributed throughout the fishing year. During Quota Period I in 2000, the directed fishery was closed on March 25, 2000. During Quota Period II, the directed fishery was closed on July 2, 2000. In addition, the quota for each period was exceeded, causing the dislocation of quota from the Quota Period III. As a result of these premature closures and overages, the Council allocated the the 2001 quota of 17,000 mt as follows. The annual quota was allocated to quarterly quota periods based on the quarterly seasonal distribution of landings during the period 1994-1998. Based on this criteria, the 2001 quota allocations among quarters was allocated as follows: Quarter 1: 5,649.1 mt (33.23%), Quarter 2: 2,993.7 mt, (17.61%),Quarter 3: 2,941 mt (17.3 %),Quarter 4: 5,416.2 mt (31.86 %). In addition, the Council recommended for Quarters 1 through 3, that the directed fishery be closed when 80% of the quarter's allocation is taken and that vessels be restricted a 2,500 pound trip limit for the remainder of the quarter. In addition, the Council recommended that quarterly overages be deducted as follows: an overage in quarter 1 will be deducted from quarter 3 and an overage in quarter 2 will be deducted from quarter 4. When 95% of the total annual quota has been taken (i.e, 16,150 mt) the trip limit will be reduced to 2,500 pounds and will in remain in effect for the rest of the fishing year. The Council recommended that the same quarterly allocation system be maintained in 2002 with the following exception. If the first quarter landings are less than 70% of the first quarter allocation, the underage below 70% of the quarter will be applied to quarter 3. Underages from quarters 2 and 3 will be added to quarter 4 by default based on the 95% closure rule for the annual quota.

Under this alternative, the quotas are specified in accordance with the overfishing definition required by the SFA. Since the stock is protected from overfishing, no negative biological impacts are expected from this alternative. Therefore, there are no negative economic or social impacts expected from maintaining the 2001 status quo specifications for *Loligo* squid in 2002. Since the specifications are the same as in 2001, no reductions in landings or revenues due to the 2002 specifications are expected. Therefore, no change in economic or social impacts to the US *Loligo* industry are expected from this preferred alternative. As a result, none of the vessel owners, crews, dealers, processors or fishing communities associated with the ports given in Table 18 are expected to be adversely affected by the proposed 2002 annual specifications for

Loligo.

4.2.2.2 Alternative 1 for *Loligo*: Maintain 2000 Specifications in 2002

The FMP defines overfishing for *Loligo* as occurring when the catch associated with a threshold of F_{MAX} is exceeded (F_{MAX} is a proxy for F_{MSY}). When an estimate of F_{MSY} becomes available, it will replace the current overfishing proxy of F_{MAX}. Max OY is specified as the catch associated with a F_{MAX}. In addition, the biomass target is specified to equal B_{MSY}.

The most recent stock assessment for *Loligo* (the 29th Northeast Regional Stock Assessment Workshop, August 1999 (SAW-29)) concluded that the stock was approaching an overfished condition and that overfishing was occurring. More recently, NMFS' Report to Congress: Status of Fisheries of the United States (October 1999) determined that the *Loligo* stock was overfished at the time the report was written. A production model indicated that current biomass was less than B_{MSY}, and near the biomass threshold of 50 percent B_{MSY}. There was a high probability that F exceeded F_{MSY} in 1998. The average F from the winter fishery (October to March) over the last 5 years averaged 180 percent of F_{MSY}, and F from the summer fishery equaled F_{MSY}. In addition, indices of recruitment were well below average.

The Magnuson-Stevens Fishery Conservation and Management Act required the Council to take remedial action for 2000 to rebuild the stock to a level that will produce MSY (B_{MSY}) given the status determination that *Loligo* was overfished. The control rule in the FMP specifies that the target F must be reduced to zero if biomass falls below 50 percent of B_{MSY}. The target F increases linearly to 75 percent of F_{MSY} as biomass increases to B_{MSY}. However, projections made in SAW-29 indicate that the *Loligo* control rule appears to be overly conservative. The projections presented demonstrate that the stock could be rebuilt in a relatively short period of time, even at F values approaching F_{MSY}. Projections indicated that the *Loligo* biomass could be rebuilt to levels approximating B_{MSY} in 3 to 5 years if F is reduced to 90 percent of F_{MSY}. The yield associated with this F (90 percent of F_{MSY}) in 2000, assuming status quo F in 1999, was estimated to be 13,000 mt based on projections from SAW-29. The establishment of 4-month periods spread F out over the year and was expected to protect spawners. The current regulations still specify Max OY as the yield associated with $F_{MAX,}$ or 26,000 mt.

In determining the specification of ABC for the year 2000, the Council considered the SAW-29 projections. Based on these analyses, the Council chose to specify ABC as the yield associated with 90 percent of $F_{MSY,}$ or 13,000 mt. However, recent stock assessment data indicate that the Loligo stock has increased in size and is currently at or near B_{msy}. As a result, maintaining ABC at 13,000 in 2002 would cause unnecessary reductions in yield and loss of revenue to the fishery. Under this alternative, the quotas would be specified at levels lower than those specified by the overfishing definition control rule specified in the FMP. While the stock is protected from overfishing, some negative economic and social impacts could be expected from this alternative. Table 18 lists the ports which landed *Loligo* in 2000. The vessel owners, crews, dealers, processors and fishing communities associated with these ports would be expected to be affected the most by this alternative to the 2002 annual specifications for *Loligo*.

4.2.2.3 Alternative 2 for Loligo: MAX OY of 26,000 mt and ABC, IOY, DAH, DAP of 11,700

mt

In determining the specification of ABC for the year 2000, the Council considered the recommendations of SAW-29. Based on these analyses, the Council would have chosen to specify ABC as the yield associated with 75 percent of $F_{MSY,}$ or 11,700 mt based on the stock size as estimated in SAW-29. However, recent stock assessment data indicate that the *Loligo* stock has increased in size and is currently at or near B_{msy}. As a result, specifying ABC at 11,700 in 2002 would cause unnecessary reductions in yield and loss of revenue to the fishery.

Under this alternative, the quotas would be specified at levels lower than those specified by the overfishing definition control rule specified in the FMP. While the stock is protected from overfishing, some negative economic and social impacts could be expected from this alternative. Table 18 lists the ports which landed *Loligo* in 2000. The vessel owners, crews, dealers, processors and fishing communities associated with these ports would be expected to be affected the most by this alternative to the 2002 annual specifications for *Loligo*.

4.2.3 *Illex* squid

4.2.3.1 Preferred Alternative for *Illex* squid in 2002: Specify Max OY, ABC, IOY, DAH, DAP at 24,000 mt and JVP and TALFF at 0 mt (maintain 2001 status quo in 2002)

The proposed specifications under this alternative would be Max OY, ABC, IOY, DAH, and DAP at 24,000 mt and JVP and TALFF at 0 mt. MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative based on biological reference points outlined in the Magnuson-Stevens Act. Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management (FMP) was developed to bring the FMP into compliance with the Sustainable Fisheries Act (SFA). The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act, that caused the Guidelines to be significantly revised. The most significant changes were made to National Standard 1, which imposed new requirements concerning definitions of overfishing in fishery management plans. The overfishing definition for *Illex* was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Illex* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{MSY} is exceeded. Annual quotas will be specified which correspond to a target fishing mortality rate of 75% of F_{MSY}. Maximum OY will be specified as the catch associated with a fishing mortality rate of F_{MSY}. In addition, the biomass target is specified to equal B_{MSY}. The minimum biomass threshold is specified as ½ B_{MSY}.

The most recent assessment of the *Illex* stock (SAW 29) concluded that the stock was not in an overfished condition and that overfishing was not occurring (NMFS 1999). However, due to a lack of adequate data, an the estimate of yield at F_{msy} was not updated in SAW 29. However, an upper bound on annual fishing mortality was computed for the US EEZ portion of the stock based on a model which incorporated weekly landings and relative fishing effort and mean squid weights during 1994-1998. These estimates of F were well below the biological reference points. Current absolute stock size is unknown and no stock projections were done in SAW 29 or since then.

Since data limitations did not allow an update of yield estimates at the threshold and target fishing mortality rates, the Council recommends that the specification of MAX OY and ABC be specified at 24,000 mt (yield associated with F_{msy}) in 2002 (same as in 2001). Under this option, the directed fishery for *Illex* would remain open until 95% of ABC is taken (22,800 mt). When 95% of ABC is taken, the directed fishery will be closed and a 5,000 pound trip limit will remain in effect for the remainder of the fishing year.

As noted above, in SAW 29 an upper bound on annual fishing mortality was computed for the US EEZ portion of the stock based on a model which incorporated weekly landings and relative fishing effort and mean squid weights during 1994-1998. These estimates of F were well below the biological reference points. Based on the analyses presented in SAW 29, it can be concluded that this level ABC will not have any negative consequences on the *Illex* stock. Under this alternative, the quotas are specified in accordance with the overfishing definition required by the SFA. Since the stock is protected from overfishing, no negative biological impacts are expected from this alternative. Also, since the specifications are the same as in 2001, no reductions in landings or revenues due to the 2002 specifications are expected. Therefore, no change in economic or social impacts to the US *Illex* industry are expected from this preferred alternative. As a result, none of the vessel owners, crews, dealers, processors or fishing communities associated with the ports given in Table 22 are expected to be adversely affected by the proposed 2002 annual specifications for *Illex*.

4.2.3.2 Alternative 1 for Illex: Specify Max OY, ABC, IOY, DAH, DAP at 30,000 mt and JVP and TALFF at 0 mt

The proposed specifications under this alternative would be Max OY, ABC, IOY, DAH, and DAP at 30,000 mt and JVP and TALFF at 0 mt. MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative based on biological reference points outlined in the Magnuson-Stevens Act. Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management (FMP) was developed to bring the FMP into compliance with the Sustainable Fisheries Act (SFA). The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act, that caused the Guidelines to be significantly revised. The most significant changes were made to National Standard 1, which imposed new requirements concerning definitions of overfishing in fishery management plans. The overfishing definition for *Illex* was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Illex* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{MSY} is exceeded. Annual quotas will be specified which correspond to a target fishing mortality rate of 75% of F_{MSY}. Maximum OY will be specified as the catch associated with a fishing mortality rate of F_{MSY}. In addition, the biomass target is specified to equal B_{MSY}. The minimum biomass threshold is specified as ½ B_{MSY}.

Specification of ABC at 30,000 mt would not prevent overfishing in years of moderate to low abundance of *Illex* squid. Under this alternative, the quotas would not be specified in accordance with the overfishing definition required by the SFA. Since the stock is not protected from overfishing, some negative biological impacts could be expected from this alternative. Therefore, some negative economic and social impacts could also be expected from these quota specifications for *Illex* squid in 2002. Table 22 lists the ports which landed *Illex* in 2000. The vessel owners, crews, dealers, processors and fishing communities associated with these ports would be expected to be affected the most by this alternative to the 2002 annual specifications for *Illex*.

4.2.3.3 Alternative 2 for *Illex* squid in 2002: Specify Max OY, at 24,000 mt and ABC, IOY, DAH, DAP at 19,000 mt and JVP and TALFF at 0 mt

The proposed specifications under this alternative would be Max OY=24,000mt and ABC, IOY, DAH, and DAP=24,000 mt and JVP and TALFF=0 mt. MSY, B_{MSY} and F_{MSY} form the basis for definitions of overfishing relative based on biological reference points outlined in the Magnuson-Stevens Act. Amendment 8 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management (FMP) was developed to bring the FMP into compliance with the Sustainable Fisheries Act (SFA). The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act, that caused the Guidelines to be significantly revised. The most significant changes were made to National Standard 1, which imposed new requirements concerning definitions of overfishing in fishery management plans. The overfishing definition for *Illex* was revised in Amendment 8 to comply with the SFA as follows: overfishing for *Illex* will be defined to occur when the catch associated with a threshold fishing mortality rate of F_{MSY} is exceeded. Annual quotas will be specified which correspond to a target fishing mortality rate of 75% of F_{MSY}. Maximum OY will be specified as the catch associated with a fishing mortality rate of F_{MSY}. In addition, the biomass target is specified to equal B_{MSY}. The minimum biomass threshold is specified as ½ B_{MSY}.

The most recent assessment of the *Illex* stock (SAW 29) concluded that the stock was not in an overfished condition and that overfishing was not occurring (NMFS 1999). However, due to a lack of adequate data, an the estimate of yield at F_{msy} was not updated in SAW 29. However, an upper bound on annual fishing mortality was computed for the US EEZ portion of the stock based on a model which incorporated weekly landings and relative fishing effort and mean squid weights during 1994-1998. These estimates of F were well below the biological reference points. Current absolute stock size is unknown and no stock projections were done in SAW 29 or since then.

Under this option, the directed fishery for *Illex* would remain open until 95% of ABC is taken (18,050 mt). When 95% of ABC is taken, the directed fishery will be closed and a 5,000 pound trip limit will remain in effect for the remainder of the fishing year. Specifying ABC at 19,000 in 2002 for *Illex* would cause unnecessary reductions in yield and loss of revenue to the fishery. Under this alternative, the quotas would be specified at levels lower than those specified by the overfishing definition control rule specified in the FMP. While the stock is protected from overfishing, some negative economic and social impacts could be expected from this alternative. Table 22 lists the ports which landed *Illex* in 2000. The vessel owners, crews, dealers, processors and fishing communities associated with these ports would be expected to be affected the most by this alternative to the 2002 annual specifications for *Illex*.

4.2.4 Butterfish

4.2.4.1 Preferred alternative for butterfish in 2002: Specify Max OY at 16,000 mt, ABC at 7,200 and IOY, DAH, DAP at 5,900 mt and JVP and TALFF at 0 mt (maintain 2001 status quo in 2002)

The proposed specifications under this alternative would be Max OY=16,000mt, ABC=7,200, IOY, DAH, and DAP=5,900 mt and JVP and TALFF=0 mt. The SAW 17 (NMFS 1994a) Advisory Report included the following concerning the state of the stock:

"The Atlantic butterfish stock is at a low to medium biomass level and current catch levels are below the MSY of 16,000, however, exploitation rate is unknown. Although recruitment of butterfish has remained high in recent years, the stock size of adults has declined since 1990 and is currently well below average. Since 1988, annual butterfish landings have averaged 2,500 mt, or only 25% of the domestic allowable harvest (DAH) of 10,000 mt. Landings in 1993 are projected to be 3,000 mt. Survey biomass indices in autumn 1992 and spring 1993 were among the lowest in the survey time series. Fishing effort increased in 1992 but, overall, has been relatively stable since 1984. Commercial landings per unit of effort (LPUE) in 1992 remained at the low levels observed since 1988."

SAW 17 (NMFS 1994a) offered the following management advice:

"Butterfish landings in recent years have been well below historical average yields. Japanese demand for butterfish has waned and this has had a negative impact on harvest levels. Butterfish landings are thus unlikely to increase unless market demand improves. If demand does improve, however, the stock in its current condition may not be able to sustain landings in excess of the long term historical average (1965-1992) of 7,200 mt because of recent declines in abundance as indicated by survey indices."

"Historical information suggests that discarding of butterfish may be an important source of fishing-induced mortality. The SARC recommends that data be collected that would allow discard levels to be reliably estimated."

"Given that butterfish is a short-lived species, new approaches to the assessment and management of the stock are required. A more adaptive, real-time assessment/management system will be needed to maintain full exploitation of the stock while simultaneously ensuring that adequate spawning stock levels are achieved. This would involve both real-time evaluation of stock status and in-season catch level adjustments."

No new assessment information is available. Based on the recommendations of SAW-17, the Monitoring Committee recommends that ABC should not exceed 7,200 mt. In addition, the Committee chose a risk averse approach by recommending DAP and DAH at 5,900 mt. This level was chosen because considerable uncertainty exists about the level of discards in the directed fishery. The quota of 5,900 mt was set to allow for discards such that the ABC of 7,200 mt should not be exceeded. In addition, if TALFF for Atlantic mackerel is specified at zero by the Council, there is no bycatch TALFF specification necessary for butterfish. Otherwise, a bycatch TALFF of 0.08% of the mackerel TALFF should be specified.

The definition of overfishing for butterfish specifies overfishing as the fishing mortality rate of

Fmsy. The yield associated with Fmsy is 16,000 mt. However, the Council chose a risk averse level when specifying DAH for butterfish in 2002 based on the advice given in the most recent assessment. This level of landings is not expected to have any negative biological impact on the butterfish stock based on the findings of the most recent assessment. Since the stock is protected from overfishing, no negative biological impacts are expected from this alternative. Since the specification of DAH is virtually the same as in 2001, no reductions in landings or revenues due to the 2002 specifications are expected. Therefore, no change in economic or social impacts to the US butterfish industry are expected from this preferred alternative. As a result, none of the vessel owners, crews, dealers, processors or fishing communities associated with the ports given in Table 25 are expected to be adversely affected by the proposed 2002 annual specifications for butterfish.

4.2.4.2 Alternative 1 for butterfish in 2002: Specify Max OY at 16,000 mt, ABC, IOY, DAH, DAP at 7,200 mt and JVP and TALFF at 0 mt

The proposed specifications under this alternative would be Max OY=16,000mt, ABC=7,200, IOY, DAH, and DAP=5,900 mt and JVP and TALFF=0 mt. The SAW 17 (NMFS 1994a) Advisory Report included the following concerning the state of the stock:

"The Atlantic butterfish stock is at a low to medium biomass level and current catch levels are below the MSY of 16,000, however, exploitation rate is unknown. Although recruitment of butterfish has remained high in recent years, the stock size of adults has declined since 1990 and is currently well below average. Since 1988, annual butterfish landings have averaged 2,500 mt, or only 25% of the domestic allowable harvest (DAH) of 10,000 mt. Landings in 1993 are projected to be 3,000 mt. Survey biomass indices in autumn 1992 and spring 1993 were among the lowest in the survey time series. Fishing effort increased in 1992 but, overall, has been relatively stable since 1984. Commercial landings per unit of effort (LPUE) in 1992 remained at the low levels observed since 1988."

SAW 17 (NMFS 1994a) offered the following management advice:

"Butterfish landings in recent years have been well below historical average yields. Japanese demand for butterfish has waned and this has had a negative impact on harvest levels. Butterfish landings are thus unlikely to increase unless market demand improves. If demand does improve, however, the stock in its current condition may not be able to sustain landings in excess of the long term historical average (1965-1992) of 7,200 mt because of recent declines in abundance as indicated by survey indices."

"Historical information suggests that discarding of butterfish may be an important source of fishing-induced mortality. The SARC recommends that data be collected that would allow discard levels to be reliably estimated."

"Given that butterfish is a short-lived species, new approaches to the assessment and management of the stock are required. A more adaptive, real-time assessment/management system will be needed to maintain full exploitation of the stock while simultaneously ensuring that adequate spawning stock levels are achieved. This would involve both real-time evaluation of stock status and in-season catch level adjustments."

No new assessment information is available. Based on the recommendations of SAW-17, the Council recommends that ABC should not exceed 7,200 mt. In the preferred alternative, the Council chose a risk averse approach by recommending DAP and DAH at 5,900 mt. This level was chosen because considerable uncertainty exists about the level of discards in the directed fishery. In the preferred alternative, the quota of 5,900 mt was set to allow for discards such that the ABC of 7,200 mt should not be exceeded. Under this alternative, ABC, IOY, DAH, DAP are all specified at 7,200 mt. This action would not follow the advice of the most recent stock assessment and could result in negative biological consequences for the stock. Since the stock is not protected from overfishing, some negative economic and social impacts could be expected from these quota specifications for butterfish in 2002. Table 25 lists the ports which landed butterfish in 2000. The vessel owners, crews, dealers, processors and fishing communities associated with these ports would be expected to be affected the most by this alternative to the 2002 annual specifications for butterfish.

4.2.4.3 Alternative 2 for butterfish in 2002: Specify Max OY at 16,000 mt, ABC, IOY, DAH, DAP at 10,000 mt and JVP and TALFF at 0 mt

The proposed specifications under this alternative would be Max OY=16,000mt, ABC=7,200, IOY, DAH, and DAP=5,900 mt and JVP and TALFF=0 mt. The SAW 17 (NMFS 1994a) Advisory Report included the following concerning the state of the stock:

"The Atlantic butterfish stock is at a low to medium biomass level and current catch levels are below the MSY of 16,000, however, exploitation rate is unknown. Although recruitment of butterfish has remained high in recent years, the stock size of adults has declined since 1990 and is currently well below average. Since 1988, annual butterfish landings have averaged 2,500 mt, or only 25% of the domestic allowable harvest (DAH) of 10,000 mt. Landings in 1993 are projected to be 3,000 mt. Survey biomass indices in autumn 1992 and spring 1993 were among the lowest in the survey time series. Fishing effort increased in 1992 but, overall, has been relatively stable since 1984. Commercial landings per unit of effort (LPUE) in 1992 remained at the low levels observed since 1988."

SAW 17 (NMFS 1994a) offered the following management advice:

"Butterfish landings in recent years have been well below historical average yields. Japanese demand for butterfish has waned and this has had a negative impact on harvest levels. Butterfish landings are thus unlikely to increase unless market demand improves. If demand does improve, however, the stock in its current condition may not be able to sustain landings in excess of the long term historical average (1965-1992) of 7,200 mt because of recent declines in abundance as indicated by survey indices."

"Historical information suggests that discarding of butterfish may be an important source of fishing-induced mortality. The SARC recommends that data be collected that would allow discard levels to be reliably estimated."

"Given that butterfish is a short-lived species, new approaches to the assessment and management of the stock are required. A more adaptive, real-time assessment/management system will be needed to maintain full exploitation of the stock while simultaneously ensuring that adequate spawning stock levels are achieved. This would involve both real-time evaluation of stock status and in-season catch level adjustments."

No new assessment information is available. Based on the recommendations of SAW-17, the Council recommends that ABC should not exceed 7,200 mt in the preferred alternative. In addition, the Council chose a risk averse approach by recommending DAP and DAH at 5,900 mt in the preferred alternative.. This level was chosen because considerable uncertainty exists about the level of discards in the directed fishery. In the preferred alternative, the quota of 5,900 mt was set to allow for discards such that the ABC of 7,200 mt should not be exceeded.

The definition of overfishing for butterfish in the FMP specifies overfishing as the fishing mortality rate of Fmsy. The yield associated with F_{msy} is 16,000 mt. The target fishing mortality rate specified in the FMP is 75% F_{msy}. Therefore, based on the target fishing mortality rate specified in the FMP, annual quotas as high as 12,000 mt could be specified. A quota of 10,000 mt was considered to take into account discards of butterfish. However, the Council rejected this option based on the advice given in the most recent assessment. This level of landings could have a negative biological impact on the butterfish stock based on the findings of the most recent assessment. Since the stock is not protected from overfishing, some negative economic and social impacts could be expected from quota specifications under this alternative for butterfish in 2002. Table 25 lists the ports which landed butterfish in 2000. The vessel owners, crews, dealers, processors and fishing communities associated with these ports would be expected to be affected the most by this alternative to the 2002 annual specifications for butterfish.

4.3 Endangered Species, Marine Mammals, and Seabirds

There are numerous species which inhabit the management unit of this FMP that are afforded protection under the Endangered Species Act (ESA) of 1973 (i.e., for those designated as threatened or endangered) and/or the Marine Mammal Protection Act of 1972 (MMPA). Eleven are classified as endangered or threatened under the ESA, while the remainder are protected by the provisions of the MMPA. Marine mammals include the northern right whale, humpback whale, fin whale, minke whale, harbor porpoise, white-sided dolphin, bottlenose dolphin, common dolphin, harp seal, harbor seal and gray seal. The status of these and other marine mammal populations inhabiting the Northwest Atlantic has been discussed in detail in the U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments. Initial assessments were presented in Blaylock, *et al.* (1995) and are updated in Waring *et al.* (1999).

The protected species found in New England and Mid-Atlantic waters are listed below.

Endangered: Right whale *(Eubalaena glacialis),* Humpback whale *(Megaptera novaeangliae),* Fin whale *(Balaenoptera physalus),* Sperm whale *(Physeter macrocephalus),* Blue whale *(Balaenoptera musculus),* Sei whale *(Balaenoptera borealis),* Kemp's ridley *(Lepidochelys kempi),* Leatherback turtle *(Dermochelys coriacea),* Green sea turtle *(Chelonia mydas)* Shortnose sturgeon *(Acipenser brevirostrum).*

Threatened: Loggerhead turtle *(Caretta caretta)*

Species Proposed for ESA listing: Harbor porpoise: *(Phocoena phocoena).*

Other marine mammals: Other species of marine mammals likely to occur in the management unit include the minke whale *(Balaenoptera acutorostrata),* white-sided dolphin *(Lagenorhynchus acutus),* white-beaked dolphin *(Lagenorhynchus albirostris),* bottlenose dolphin *(Tursiops truncatus),* [coastal stock listed as depleted under the MMPA], pilot whale *(Globicephala melaena),* Risso's dolphin *(Grampus griseus),* common dolphin *(Dephinis delphis),* spotted dolphin (Stenella spp.), striped dolphin *(Stenella coeruleoalba),* killer whale *(Orcinus orca),* beluga whale *(Delphinapterus leucas),* Northern bottlenose whale *(Hyperoodon ampullatus),* goosebeaked whale *(Ziphius cavirostris)* and beaked whale (Mesoplodon spp.). Pinnipeds species include harbor *(Phoca vitulina)* and gray seals *(Halichoerus grypus)* and less commonly, hooded *(Cystophora cristata)* harp *(Pagophilus groenlandicus)* and ringed seals *(Phoca hispida).*

4.3.1 Protected Species of Particular Concern

4.3.1.1 North Atlantic Right Whale

The northern right whale was listed as endangered throughout it's range on June 2, 1970 under the ESA. The current population is considered to be at a low level and the species remains designated as endangered (Waring *et al.* 1999). A Recovery plan has been published and is in effect (NMFS 1991). This is a strategic stock because the average annual fishery-related mortality and serious injury from all fisheries exceeds the Potential Biological Removal (PBR).

North Atlantic right whales range from wintering and calving grounds in coastal waters of the southeastern US to summer feeding grounds, nursery and presumed mating grounds in New England and northward to the Bay of Fundy and Scotian shelf (Waring et al. 1999). Approximately half of the species' geographic range is within the area in which the summer flounder fishery is prosecuted. In the management area as a whole, right whales are present throughout most months of the year, but are most abundant between February and June. The species uses mid-Atlantic waters as a migratory pathway from the winter calving grounds off the coast of Florida to spring and summer nursery/feeding areas in the Gulf of Maine.

NMFS designated right whale critical habitat on June 3, 1994 (59 FR 28793). Portions of the critical habitat within the action area include the waters of Cape Cod Bay and the Great South Channel off the coast of Massachusetts, where the species is concentrated at different times of the year.

The western North Atlantic population of right whales was estimated to be 295 individuals in 1992 (Waring *et al.* 1999). The current population growth rate of 2.5% as reported by Knowlton et al. (1994) suggests the stock may be showing signs of slow recovery. However, considerable uncertainty exists about the true size of the current stock (Waring *et al.* 1999).

4.3.1.2 Humpback Whale

The humpback whale was listed as endangered throughout it's range on June 2, 1970. This species is the fourth most numerically depleted large cetacean worldwide. In the western North Atlantic humpback whales feed during the spring through fall over a range which includes the eastern coast of the US (including the Gulf of Maine) northward to include waters adjacent to Newfoundland/Labrador and western Greenland (Waring *et al.* 1999). During the winter, the principal range for the North Atlantic population is around the Greater and Lesser Antilles in the Caribbean (Waring *et al.* 1999).

About half of the species' geographic range is within the management area of the summer flounder FMP. As noted above, humpback whales feed in the northwestern Atlantic during the summer months and migrate to calving and mating areas in the Caribbean. Five separate feeding areas are utilized in northern waters after their return; the Gulf of Maine (which is within the management unit of this FMP) is one of those feeding areas. As with right whales, humpback whales also use the Mid-Atlantic as a migratory pathway. Since 1989, observations of juvenile humpbacks in that area have been increasing during the winter months, peaking January through March (Swingle *et al.,* 1993). It is believed that non-reproductive animals may be establishing a winter feeding area in the Mid-Atlantic since they are not participating in reproductive behavior in the Caribbean. It is assumed that humpbacks are more widely distributed in the management area than right whales. They feed on a number of species of small schooling fishes, including sand lance and Atlantic herring.

The most recent status and trends of the for the Western North Atlantic stock of humpback whales are given by Waring *et al.* (1999). The current rate of increase of the North Atlantic humpback whale population has been estimated at 9.0% (CV=0.25) by Katona and Beard (1990) and at 6.5% by Barlow and Clapham (1997). The minimum population estimate for the North Atlantic humpback whale population is 10,019 animals, and the best estimate of abundance is 10,600 animals (CV=0.07; Waring *et al.* 1999).

4.3.1.3 Fin Whale

The fin whale was listed as endangered throughout it's range on June 2, 1970 under the ESA. The fin whale is ubiquitous in the North Atlantic and occurs from the Gulf of Mexico and Mediterranean Sea northward to the edges of the arctic ice pack (Waring et al.1999). The overall pattern of fin whale movement is complex, consisting of a less obvious north-south pattern of migration than that of right and humpback whales. However, based on acoustic recordings from hydrophone arrays, Clark (1995) reported a general southward "flow pattern" of fin whales in the fall from the Labrador/Newfoundland region, south past Bermuda, and into the West Indies. The overall distribution may be based on prey availability, and fin whales are found throughout the management area for this FMP in most months of the year. This species preys opportunistically on both invertebrates and fish (Watkins et al. 1984). As with humpback whales, they feed by filtering large volumes of water for the associated prey. Fin whales are larger and faster than humpback and right whales and are less concentrated in nearshore environments.

Hain *et al.* (1992) estimated that about 5,000 fin whales inhabit the northeastern United States continental shelf waters. Shipboard surveys of the northern Gulf of Maine and lower Bay of Fundy targeting harbor porpoise for abundance estimation provided an imprecise estimate of 2,700 (CV=0.59) fin whales (Waring *et al.* 1999).

4.3.1.4 Loggerhead Sea Turtle

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

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

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

The TEWG analysis also indicated the northern subpopulation of loggerheads may be experiencing a significant decline (2.5% - 3.2% for various beaches). A recovery goal of 12,800 nests has been assumed for the Northern Subpopulation, but current nests number around 6,200 (TEWG 1998). Since the number of nests have declined in the 1980's, the TEWG concluded that it is unlikely that this subpopulation will reach this goal given this apparent decline and the lack of information on the subpopulation from which loggerheads in the WNA originate. Continued efforts to reduce the adverse effects of fishing and other human-induced mortality on this population are necessary.

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

Sea sampling data from the sink gillnet fisheries, Northeast otter trawl fishery, and Southeast shrimp and summer flounder bottom trawl fisheries indicate incidental takes of loggerhead turtles. Loggerheads are also known to interact with the lobster pot fishery. The degree of interaction between loggerheads and the summer flounder recreational fishery is unknown. However, by analogy with other fisheries (i.e., South Atlantic) interactions are expected to be minimal.

4.3.1.5 Leatherback Sea Turtle

The leatherback is the largest living sea turtle and ranges farther than any other sea turtle species, exhibiting broad thermal tolerances (NMFS& USFWS 1995). Leatherback turtles feed primarily on cnidarians (medusae, siphonophores) and tunicates (salps, pyrosomas) and are often found in association with jellyfish. These turtles are found throughout the management unit of this FMP. While they are predominantly pelagic, they occur annually in Cape Cod Bay and Narragansett Bay primarily during the fall. Leatherback turtles appear to be the most susceptible to entanglement in lobster gear and longline gear compared to the other sea turtles commonly found in the management unit. This may be the result of attraction to gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface.

Nest counts are the only reliable population information available for leatherback turtles. Recent declines have been seen in the number of leatherbacks nesting worldwide (NMFS & USFWS 1995). The status review notes that it is unclear whether this observation is due to natural fluctuations or whether the population is at serious risk. It is unknown whether leatherback populations are stable, increasing, or declining, but it is certain that some nesting populations (e.g, St. John and St. Thomas, U.S. Virgin Islands) have been extirpated (NMFS 1998).

Sea sampling data from the southeast shrimp fishery indicate recorded takes of leatherback turtles. As noted above, leatherbacks are also known to interact with the lobster pot fishery. However, by analogy with other fisheries (i.e., South Atlantic) interactions are expected to be minimal.

4.3.1.6 Kemp’s Ridley Sea Turtle

The Kemp's ridley is probably the most endangered of the world's sea turtle species. The only major nesting site for ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963). Estimates of the adult population reached a low of 1,050 in 1985, but increased to 3,000 individuals in 1997. First-time nesting adults have increased from 6% to 28% from 1981 to 1989, and from 23% to 41% from 1990 to 1994, indicating that the ridley population may be in the early stages of growth (TEWG 1998).

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

Ridleys found in mid-Atlantic waters are primarily post-pelagic juveniles averaging 40 cm in carapace length, and weighing less than 20 kg (NMFS 1998). After loggerheads, they are the second most abundant sea turtle in Virginia and Maryland waters, arriving in there during May and June and then emigrating to more southerly waters from September to November (NMFS 1998). In the Chesapeake Bay, ridleys frequently forage in shallow embayments, particularly in areas supporting submerged aquatic vegetation (Lutcavage and Musick 1985; NMFS 1998). The juvenile population in Chesapeake Bay is estimated to be 211 to 1,083 turtles (NMFS 1998).

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

Sea sampling data from the northeast otter trawl fishery and southeast shrimp and summer flounder bottom trawl fisheries has recorded takes of Kemp's ridley turtles. However, by analogy with other fisheries (i.e., South Atlantic) interactions are expected to be minimal.

4.3.1.7 Green Sea Turtle

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

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

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

Sea sampling data from the scallop dredge fishery and southeast shrimp and summer flounder bottom trawl fisheries have recorded incidental takes of green turtles. However, by analogy with other fisheries (i.e., South Atlantic) interactions are expected to be minimal.

4.3.1.8 Shortnose Sturgeon

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

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

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

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

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

4.3.1.9 Seabirds

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

Like marine mammals, seabirds are vulnerable to entanglement in commercial and recreational fishing gear. The interaction has not been quantified in the recreational fishery, but impacts are not considered significant. Human activities such as coastal development, habitat degradation and destruction, and the presence of organochlorine contaminants are considered the major threats to some seabird populations. Endangered, threatened or otherwise protected bird species, including the roseate tern and piping plover, are unlikely to be impacted by the gear types employed in these fisheries.

The proposed action and alternatives are not expected to have any adverse impacts on endangered or threatened species or marine mammal populations.

4.3.2 Fishery Classification under Section 114 of Marine Mammal Protection Act

Under section 114 of the MMPA , the NMFS must publish and annually update the List of Fisheries (LOF), which places all US commercial fisheries in one of three categories based on the level of incidental serious injury and mortality of marine mammals in each fishery (arranging them according to a two tiered classification system). The categorization of a fishery in the LOF determines whether participants in that fishery may be required to comply with certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements. The classification criteria consists of a two tiered, stock-specific approach that first addresses the total impact of all fisheries on each marine mammal stock (Tier 1) and then addresses the impact of the individual fisheries on each stock (Tier 2). If the total annual mortality and serious injury of all fisheries that interact with a stock is less than 10% of the PBR for the stock then the stock is designated as Tier 1 and all fisheries interacting with this stock would be placed in Category III. Otherwise, these fisheries are subject to categorization under Tier 2. Under Tier 2, individual fisheries are subject to the following categorization:

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

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

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

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

The Atlantic Squid, Mackerel, Butterfish Trawl Fishery is currently listed as a Category II fishery in of the final List of Fisheries for 2000 for the taking of marine mammals by commercial fishing operations under section 114 of the Marine Mammal Protection Act (MMPA) of 1972. However, the NMFS proposes to elevate the classification of this fishery to Category I in the proposed List of Fisheries for 2001. This proposed change resulted from a Tier 1 evaluation of NMFS Sea Sampling data which demonstrated that the Atlantic Squid, Mackerel, Butterfish Trawl Fishery incidentally injured and killed the following marine mammal species and stocks during 1996-1998: common dolphin (WNA stock), white-sided dolphin (WNA stock) and Globicephala sp. (includes long-finned and short-finned pilot whales) (WNA stock). Based on data presented in the draft 2000 Stock Assessment Report (SAR), annual serious injury and mortality across all fisheries for pilot whale, common dolphin and white sided dolphin stocks exceed s 10% of the PBR (78, 184, and 107 respectively). Therefore, the Atlantic Squid, Mackerel, Butterfish Trawl Fishery is subject to Tier 2 analysis. The 2000 draft SAR analyses estimated an annual average mortality of 43 pilot whales and 367 common dolphins per year in this fishery, which is greater than 50% of PBR for each species. Therefore, the NMFS proposes to elevate this fishery Category I in the 2001 LOF. If this fishery becomes a Category I fishery in the final rule, it will receive a high priority with respect to observer coverage and consideration for measures under future Take Reduction Plans for these species.

Amendment 5 to the Atlantic Mackerel, Squid and Butterfish Fishery Management Plan pursuant to Section 7 of the Endangered Species Act of 1973, as amended, concluded that the fishery and management activities regulated by the FMP would have no significant adverse affect on any threatened or endangered species. The final specifications do not include measures that change the basis for that determination. The relationships among the final specifications and various existing applicable laws and policies are fully described is section 9.3 of Amendment 5. Section 9.3.3.1 of Amendment 5 addressed marine mammals and endangered species. The specifications proposed here are based upon the new definitions of overfishing adopted in Amendment 8. Since the new definitions of overfishing are more conservative than previous Amendments and will result in lower annual quotas relative to previous specifications, the possible interactions with and negative effects on marine mammals should be less than in those analyzed in Amendment 5. By reducing the chance of overfishing of these species, the chances that their populations will be reduced due to fishing will be greatly diminished. This should have a positive effect on marine predators, including whales and dolphins, which depend, in part, on these species as prey. The overall effect on marine mammals should be positive relative to the specifications prior to Amendment 8.

The foreign mackerel trawl fishery was known to accidentally kill pilot whales, common dolphin, offshore bottlenose dolphin, Atlantic white-sided dolphin, and grampus in their trawling operations. The domestic component of this fishery also takes marine mammals. The June 1991 Draft Legislative Environmental Impact Statement for the Proposed Regime to Govern Interactions Between Marine Mammals and Commercial Fishing Operations determined that the number of marine mammals taken in these fisheries were low in comparison to likely abundance levels. Under the current Marine Mammal Exemption Program, the foreign mackerel trawl fishery is listed as a Category I fishery. Fishermen participating in these fisheries must register for the Exemption Program, keep daily logs of fishing activities and marine mammal interactions, and the foreign fishery must take observers when requested.

4.4 Impacts on Essential Fish Habitat Assessment

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

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

Amendment 8 included overfishing definitions which are the same or more conservative than overfishing definitions from previous Amendments. As a result, the quota specifications resulting from these new overfishing definitions are the same or lower than in previous years. This should effectively result in the same or reduce gear impacts to bottom habitats by reducing or maintaining the harvest of the managed species within this FMP. Any reductions in harvesting effort may indirectly benefit EFH by creating an overall reduction of disturbance by a gear type that impacts bottom habitats. Other management actions already in place should control redirection of effort into other bottom habitats. Therefore, the Council has concluded that the 2002 quota specifications for Atlantic mackerel, squid and butterfish will have no more than minimal adverse impact upon the listed EFH.

5.0 Finding of no significant impact

For the reasons discussed above, it is hereby determined that neither approval and implementation of the proposed action nor the alternative would affect significantly the quality of the human environment, and that the preparation of an environmental impact statement for these 2002 specifications for Atlantic mackerel, *Loligo, Illex,* and butterfish is not required by section 101(2)(c) of the National Environmental Policy Act nor its implementing regulations.

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Assistant Administrator for Fisheries, NOAA Date

REGULATORY IMPACT REVIEW AND INITIAL REGULATORY FLEXIBILITY ANALYSIS FOR THE 2002 CATCH SPECIFICATIONS FOR ATLANTIC MACKEREL, SQUID, AND BUTTERFISH

1. INTRODUCTION

The National Marine Fisheries Service (NMFS) requires the preparation of a Regulatory Impact Review (RIR) for all regulatory actions that either implement a new Fishery Management Plan (FMP) or significantly amend an existing plan or regulation. The RIR is part of the process of preparing and reviewing FMPs and provides a comprehensive review of the changes in net economic benefits to society associated with proposed 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.

The RIR addresses many items in the regulatory philosophy and principles of Executive Order (E.O.) 12866. The RIR also serves as the basis for determining whether any proposed regulation is a "significant regulatory action" under certain criteria provided in E.O. 12866.

1.1. Management Objectives

The objectives of the FMP are:

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

2. METHODOLOGY AND FRAMEWORK FOR ANALYSIS

The basic approach adopted in this RIR is an assessment of management measures from the standpoint of determining the resulting changes in costs and benefits to society. The effects of actions were analyzed by employing quantitative approaches to the extent possible. Otherwise, qualitative analyses were conducted.

For each alternative, potential impacts on several areas of interest are discussed. The objective of this analysis is to describe clearly and concisely the economic effects of the various alternatives. The types of effects that should be considered include the following changes in landings, prices, consumer and producer benefits, harvesting costs, enforcement costs, and distributional effects. Due to the lack of an empirical model for these fisheries and knowledge of elasticities of supply and demand, a qualitative approach to the economic assessment was adopted. Nevertheless, quantitative measures are provided whenever possible.

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

Benefit-cost analysis is conducted to evaluate the net social benefit arising from changes in consumer and producer surpluses that are expected to occur upon implementation of a regulatory action. Total Consumer Surplus (CS) is the difference between the amounts consumers are willing to pay for products or services and the amounts they actually pay. Thus CS represents net benefits to consumers. When the information necessary to plot the supply and demand curves for a particular commodity is available, consumer surplus is represented by the area that is below the demand curve and above the market clearing price where the two curves intersect. Since an empirical model describing the elasticities of supply and demand for these species is not available, it was assumed that the price for these species was determine 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. The distributive effects detailed below describe any changes in the distribution or allocation of benefits and/or costs among the various components of the fishery and associated infrastructure as a result of the proposed actions.

3. IMPACTS OF PROPOSED ALTERNATIVES

3.1. Proposed Action

Regulations implementing the Fishery Management Plan for the Atlantic Mackerel, Squid, and Butterfish Fisheries (FMP) prepared by the Council appear at 50 CFR Part 648. These regulations stipulate that the Secretary will publish a notice specifying the initial annual amounts of the initial optimum yield (IOY) as well as the amounts for allowable biological catch (ABC) domestic annual harvest (DAH), domestic annual processing (DAP), joint venture processing (JVP), and total allowable levels of foreign fishing (TALFF) for the species managed under the FMP. No reserves are permitted under the FMP for any of these species. Procedures for determining the initial annual amounts are found in §648.21. The term IOY is used in this fishery to reinforce the fact that the Regional Administrator may alter this specification up to the ABC if economic and social conditions warrant an increase. Therefore, this specification is no different than OY or optimum yield.

3.1.1 Atlantic Mackerel

The proposed 2002 specifications for Atlantic mackerel are contained in Table RIR-1 below.

TABLE RIR-1. PROPOSED ANNUAL SPECIFICATIONS FOR ATLANTIC MACKEREL FOR THE FISHING YEAR JANUARY 1 THROUGH DECEMBER 31, 2002 (in metric tons (mt))

Max OY	N/A[1]
ABC	347,000
IOY	85,000
DAH	85,000[2]
DAP	50,000
JVP	20,000[3]
TALFF	0

[1] Not applicable; see the FMP.

[2] Contains 15,000 mt projected recreational catch based on the specifications contained in the regulations (50 CFR part 648)

[3] The specifications for IOY, DAH, and JVP may increased by 10,000 mt each at the discretion of the Regional Administrator without further consultation with the Council. .

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

Landings

No change in the domestic harvest of Atlantic mackerel is expected as a result of the proposed specifications in 2002 under the preferred alternative.

Prices

Given the likelihood that the proposed specifications 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.

Consumer Surplus

Assuming Atlantic mackerel prices will not be affected under the scenario constructed above, there will be no corresponding change in consumer surplus associated with these fisheries.

Harvest Costs

No changes to harvest costs are expected as a result of the proposed 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.

Enforcement Costs

The proposed measures are not expected to change enforcement costs.

Distributive Effects

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

Summary of Impacts

In the case of the Atlantic mackerel specifications, the 2002 specification of IOY (88,000 mt) far exceeds landings of the species for the period 1996-1999 (average=13,918 mt). The IOY specification far exceeds recent harvest in the fishery and the specification of ABC is an order of magnitude greater than recent landings. Therefore, the proposed 2002 quota specifications for the Atlantic mackerel fishery 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, the final specifications for Atlantic mackerel will have no negative impacts on businesses involved in the commercial harvest Atlantic mackerel.

3.1.2. Atlantic Squids and Butterfish

The proposed specifications for the 2002 Atlantic squid and butterfish fisheries are contained in Table RIR-2 below.

TABLE RIR-2. PROPOSED ANNUAL SPECIFICATIONS FOR THE ATLANTIC SQUID AND BUTTERFISH F
THE FISHING YEAR, JANUARY 1 THROUGH DECEMBER 31, 2002 (in metric tons (mt)).

Specifications	Squid		Butterfish
	Loligo	*Illex*	
Max OY[1]	26,000	24,000	16,000
ABC	17,000	24,000	7,200
IOY	17,000	24,000	5,900
DAH	17,000	24,000	5,900
DAP	17,000	24,000	5,900
JVP	0	0	0
TALFF	0	0	0

[1] Maximum OY as stated in the FMP.

The proposed specifications for the 2002 squid fisheries are 24,000 MT for *Illex* and 17,000 MT for *Loligo* . Recent increases in the domestic harvest of these species reflect enhanced economic opportunities emanating from the shortage of supply of *Loligo* in the world market.

The Max OY of 24,000 MT for *Illex* is based upon the recommendation of SAW-29. The Max OY of 26,000 MT of *Loligo* equals the MSY for the fishery based on the assumption that *Loligo* live only one year from SAW-21 and SAW-29. The proposed 2002 specification of IOY *Loligo*, *Illex*,and butterfish will have no effect on the fisheries for these species relative to 2001 specification of IOY because they are unchanged.

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

Landings

No change in the domestic harvest of *Loligo*, *Illex*, or butterfish is expected as a result of the proposed specifications in 2002 under the preferred alternative.

Prices

Given that the proposed specifications for *Loligo*, *Illex*, and butterfish will result in no change in landings of these species in, it is assumed that there will not be a change in the price for these species.

Consumer Surplus

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

Harvest Costs

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

Producer surplus

Assuming *Loligo*, *Illex*, and butterfish prices will not be affected under the scenario constructed above, there will be no corresponding change in producer surplus associated with these fisheries.

Enforcement Costs

The proposed measures are not expected to change enforcement costs.

Distributive Effects

There are no changes to the quota allocation process for *Illex*, and butterfish. As such, no distributional effects are identified for these fisheries. In the case of *Loligo*, the only change in the annual specifications which would affect distribution of the catch is the provision to allocate underages from quota period 1 to quota period 3. However, only underages below 70% of the quota allocation for quota 1 would be reallocated under the preferred alternative. Since the underage would have carried over into quarter 4 based on the 2001 specifications, some minimal distributional effects could occur as result of the proposed specifications for 2002 for *Loligo*.

Summary of Impacts

For the purpose of this analysis, the potential changes in revenues for the 2002 *Loligo* ABC specification can be evaluated relative to average landings for the period 1996-2000 and 2000. During the period 1996-2000, *Loligo* landings averaged 16,548 mt valued (on average) at $26.4 million. The proposed ABC specification for *Loligo* in 2001 is 17,000 mt or an increase of 452 mt relative to the 1996-2000 landings. Increases in gross revenues to vessels are expected to be about $729,076 compared to 1996-2000 average landings, assuming no increase in the price of *Loligo* in 2002. During the period, 477 vessels landed 16,548 mt of *Loligo* (on average) based on unpublished NMFS Dealer Reports. Based on these years, gross revenues for vessels engaged in the *Loligo* fishery are expected to increase, on average, by about $1528 per vessel in 2002 or about 3% of their revenue derived from *Loligo* fishing. Revenue increases would be less if the price of *Loligo* were to decrease as a result of the increased supply of the product on world markets. During the 2000, *Loligo* landings were 16,961 mt valued at $26.1 million. The proposed ABC specification for *Loligo* in 2001 is 17,000 mt or an increase of 39 mt relative to 2000 landings. Increases in gross revenues to vessels are expected to be about $55,415 compared to 2000 landings, assuming no increase in the price of *Loligo* in 2002. During 2000, 497 vessels landed 16,961 mt of *Loligo* based on unpublished NMFS Dealer Reports. Based on this year, gross revenues for vessels engaged in the *Loligo* fishery are expected to increase, on average, by about $111 per vessel in 2002.

A surplus exists between the proposed 2002 quota specification and the average landings during the period 1996-2000. Also, the proposed 2002 quota specification is the same as the 2001 specification. Therefore, the 2002 *Loligo* ABC specification does not represent a significant economic impact under the Regulatory Flexibility Act.

From 1996-2000, *Illex* landings averaged 13,941 mt valued (on average) at $6.52 million. The proposed ABC specification for *Illex* in 2002 is 24,000 mt. Hence, there exists a surplus between the 2002 ABC specification and what has been landed in recent years. Therefore, it is correct to assume for the 2002 *Illex* fishery that the ABC specification will represent no constraint on vessels in the *Illex* fishery in aggregate or individually. In the absence of such constraints, there is no impact on revenues under the Regulatory Flexibility Act.

From 1996-2000, butterfish landings averaged 2,360 mt valued (on average) at $3.3 million. The proposed ABC specification for butterfish in 2002 is 7,200 mt and the DAH specification is 5,900 mt. Hence, there exists a surplus between the 2002 ABC and DAH specifications and what has been landed in recent years. Therefore, it is correct to assume for the 2002 butterfish fishery that the ABC and DAH specifications will represent no constraint on vessels in the butterfish fishery in aggregate or individually. In the absence of such constraints, there is no impact on revenues under the Regulatory Flexibility Act.

3.2 Alternatives to the Proposed Action

3.2.1 Alternatives to the Proposed Action for Atlantic mackerel in 2002

3.2.1.1 Maintain the 2001 quota specifications for Atlantic mackerel in 2002

The Status Quo 2001 specification of TALFF in 2002 would not meet the policy objectives of the Council relative to further development of the US domestic harvest of Atlantic mackerel.

3.2.1.2 Specify ABC for Atlantic mackerel at long term potential catch

The Council had proposed in Amendment 5 that the ABC specification be capped at long term potential catch (LTPC). The most recent estimate of LTPC was 150,000 mt. The use of LTPC as an upper bound on ABC was found to be inappropriate because it would not allow for variations and contingencies in the status of the stock. For example, the current adult stock was recently estimated to exceed 2.1 million mt. The specification of ABC at LTPC would effectively result in an exploitation rate of only about 6%, well below the optimal level of exploitation. The level of foregone yield under this alternative was considered unacceptable.

3.2.1.3 Specify JVP at 0 mt for Atlantic mackerel

Another alternative the Council considered was the elimination of JVP for 2002. The Council rejected this option because they recognized the need for JV's in 2002 to allow US harvesters to take mackerel at levels in excess of current US processing capacity. However, in the future the Council intends to eliminate JV's as US processing and export capacity increases.

3.2.1.4 Impacts of the Alternatives to the Proposed Action for Atlantic mackerel

The first alternative action for Atlantic mackerel considered by the Council was to maintain the 2001 specifications for Atlantic mackerel for 2002. The Status Quo 2001 specification of TALFF in 2002 would not meet the policy objectives of the Council relative to further development of the US domestic harvest of Atlantic mackerel. Therefore, this alternative was rejected. This option would not have changed the specification of ABC, however. The 2002 specification of ABC far exceeds landings of the species for the period 1996-2000 (average=12,335 mt) and is an order of magnitude greater than recent landings. Therefore, this alternative to the proposed 2002 quota specifications for the Atlantic mackerel fishery would have represented no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there would be no impact on revenues under the Regulatory Flexibility Act under this alternative.

The second alternative action for Atlantic mackerel considered by the Council was to specify ABC at long term potential catch (LTPC). The most recent estimate of LTPC was 150,000 mt. The use of LTPC as an upper bound on ABC was found to be inappropriate because it would not allow for variations and contingencies in the status of the stock. This option would not have changed the specification of IOY, however. The 2002 specification of IOY (85,000 mt) under this alternative far exceeds landings of the species for the period 1996-2000 (average=12,335 mt). This IOY specification far exceeds recent harvest in the fishery and the specification of ABC at 150,000 mt is an order of magnitude greater than recent landings. Therefore, this alternative to the proposed 2002 quota specifications for the Atlantic mackerel fishery would have represented no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there would be no impact on revenues under the Regulatory Flexibility Act under this alternative.

The third alternative the Council considered for Atlantic mackerel was the elimination of JVP for 2002. The Council rejected this option because they recognized the need for JV's in 2002 to allow US harvesters to take mackerel at levels in excess of current US processing capacity. This option would have changed the specification of IOY to 55,000 mt. However, the specification of IOY at 55,000 mt far exceeds landings of the species for the period 1996-2000 (average=12,335 mt). This IOY specification far exceeds recent harvest in the fishery and the specification of ABC at 347,000 mt is an order of magnitude greater than recent landings. Therefore, this alternative to the proposed 2002 quota specifications for the Atlantic mackerel fishery would have represented no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there would be no impact on revenues under the Regulatory Flexibility Act under this alternative.

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

None of the alternatives considered for Atlantic mackerel would be expected to affect landings of the species.

Prices

Given the likelihood that the alternatives considered for Atlantic mackerel would not result in changes in mackerel landings and the fact that mackerel prices are a function of numerous factors including world supply and demand, it is assumed that there would be no change in the price for this species under any of the alternatives considered.

Consumer Surplus

Assuming Atlantic mackerel prices will not be affected under the alternatives described above, there would be no corresponding change in consumer surplus associated with these alternatives.

Harvest Costs

No changes to harvest costs would be expected as a result of the alternatives considered.

Producer surplus

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

Enforcement Costs

The alternatives considered would not be expected to change enforcement costs.

Distributive Effects

There were no changes to the quota allocation process for Atlantic mackerel associated with the alternatives considered. As such, no distributional effects were identified for these alternatives.

Summary of Impacts

The alternatives quota specifications considered for the Atlantic mackerel fishery for 2002 would have represented no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there would be no impact on revenues under the Regulatory Flexibility Act under the alternatives considered.

3.2.2 Alternatives to the Proposed Action for *Loligo* in 2002

3.2.2.1 Alternative 1 for *Loligo*: Maintain 2000 Specifications in 2002

The FMP defines overfishing for *Loligo* as occurring when the catch associated with a threshold of F_{MAX} is exceeded (F_{MAX} is a proxy for F_{MSY}). When an estimate of F_{MSY} becomes available, it will replace the current overfishing proxy of F_{MAX}. Max OY is specified as the catch associated with a F_{MAX}. In addition, the biomass target is specified to equal B_{MSY}.

The Magnuson-Stevens Fishery Conservation and Management Act required the Council to take remedial action for 2000 to rebuild the stock to a level that will produce MSY (B_{MSY}) given the status determination that *Loligo* was overfished.

In determining the specification of ABC for the year 2000, the Council considered the SAW-29 projections. Based on these analyses, the Council chose to specify ABC as the yield associated with 90 percent of $F_{MSY,}$ or 13,000 mt. However, recent stock assessment data indicate that the *Loligo* stock has increased in size and is currently at or near B_{msy}. As a result, maintaining ABC at 13,000 in 2002 would cause unnecessary reductions in yield and loss of revenue to the fishery. Under this alternative, the quotas would be specified at levels lower than those specified by the overfishing definition control rule specified in the FMP.

3.2.2.2 Alternative 2 for Loligo: MAX OY of 26,000 mt and ABC, IOY, DAH, DAP of 11,700 mt

In determining the specification of ABC for the year 2000, the Council considered the recommendations of SAW-29. Based on these analyses, the Council would have chosen to specify ABC as the yield associated with 75 percent of $F_{MSY,}$ or 11,700 mt based on the stock size as estimated in SAW-29. However, recent stock assessment data indicate that the *Loligo* stock has increased in size and is currently at or near B_{msy}. As a result, specifying ABC at 11,700 in 2002 would cause unnecessary reductions in yield and loss of revenue to the fishery.

3.2.3 Alternatives to the Proposed Action for *Illex* in 2002

3.2.3.1 For *Illex* specify Max OY, ABC, IOY, DAH, DAP at 30,000 mt

The specifications of 30,000 mt for Max OY, ABC, IOY, DAH and DAP for the *Illex* fishery may cause a significant change in the abundance of the resource or the all size index. A yield per recruit analysis was performed for *Illex* using recently developed information on the age and growth of *Illex* using daily statolith growth increments. These findings indicate that *Illex* is an annual species that grows rapidly and is not as long-lived as previously thought, i.e. three years. As a result the biological reference points for *Illex* were re-estimated in SAW-21. The Council recently developed Amendments 6 and 8 to the FMP which incorporated the recommendations of

SAW- 21 in the development of a new definition of overfishing for *Illex* and also recommended that overfishing be defined to occur when fishing mortality exceeds F_{msy}. The current estimate of yield at F_{msy} equals 24,000 mt. If ABC, IOY, DAH and DAP were all specified at a level above that associated with the overfishing threshold (F_{msy}), then the Council would not be implementing the FMP according to the most recent Amendment . In addition, SAW-21 advised that catches in excess of 24,000 mt may only be attainable in years of high abundance.

3.2.3.2 For Illex, Max OY at 24,000 MT and ABC, IOY, DAH, DAP of 19,000 mt (1999 Status Quo)

The specifications of 24,000 mt for Max OY, and ABC, IOY, DAH and DAP at 19,000 mt for the *Illex* fishery would not cause a significant change in the abundance of the resource or the all size index. A yield per recruit analysis was performed for *Illex* using recently developed information on the age and growth of *Illex* using daily statolith growth increments. These findings indicate that *Illex* is an annual species that grows rapidly and is not as long-lived as previously thought, i.e. three years. As a result the biological reference points for *Illex* were re-estimated in SAW-21. The Council recently developed Amendments 6 and 8 to the FMP which incorporated the recommendations of SAW- 21 in the development of a new definition of overfishing for *Illex* and also recommended that overfishing be defined to occur when fishing mortality exceeds F_{msy}. The current estimate of yield at F_{msy} equals 24,000 mt. Specification of ABC at 19,000 would result in foregone yield.

3.2.4 Alternatives to the Proposed Action for butterfish in 2002

3.2.4.1 Alternative 1 for butterfish in 2002: Specify Max OY at 16,000 mt, ABC, IOY, DAH, DAP at 7,200 mt and JVP and TALFF at 0 mt

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

No new assessment information is available since SAW-17. Based on the recommendations of SAW-17, the Council recommends that ABC should not exceed 7,200 mt. In the preferred alternative, the Council chose a risk averse approach by recommending DAP and DAH at 5,900 mt. This level was chosen because considerable uncertainty exists about the level of discards in the directed fishery. In the preferred alternative, the quota of 5,900 mt was set to allow for discards such that the ABC of 7,200 mt should not be exceeded. Under this alternative, ABC, IOY, DAH, DAP are all specified at 7,200 mt. This action would not follow the advice of the most recent stock assessment and could result in negative biological consequences for the stock. Since the stock is not protected from overfishing, some negative economic and social impacts could be expected from these quota specifications for butterfish in 2002.

3.2.4.2 Alternative 2 for butterfish in 2002: Specify Max OY at 16,000 mt, ABC, IOY, DAH, DAP at 10,000 mt and JVP and TALFF at 0 mt

The proposed specifications under this alternative would be Max OY=16,000mt, ABC, IOY, DAH, and DAP=10,000 mt and JVP and TALFF=0 mt.

No new assessment information is available since SAW-17. Based on the recommendations of SAW-17, the Council recommends that ABC should not exceed 7,200 mt in the preferred alternative. In addition, the Council chose a risk averse approach by recommending DAP and DAH at 5,900 mt in the preferred alternative.. This level was chosen because considerable uncertainty exists about the level of discards in the directed fishery. In the preferred alternative, the quota of 5,900 mt was set to allow for discards such that the ABC of 7,200 mt should not be exceeded.

The definition of overfishing for butterfish in the FMP specifies overfishing as the fishing mortality rate of Fmsy. The yield associated with F_{msy} is 16,000 mt. The target fishing mortality rate specified in the FMP is 75% F_{msy}. Therefore, based on the target fishing mortality rate specified in the FMP, annual quotas as high as 12,000 mt could be specified. A quota of 10,000 mt was considered to take into account discards of butterfish.

However, the Council rejected this option based on the advice given in the most recent assessment. This level of landings could have a negative biological impact on the butterfish stock based on the findings of the most recent assessment.

3.2.5 Impacts of Alternative Measures for *Loligo*, *Illex* and Butterfish

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 proposed alternative measures for these species, only the *Loligo* fishery is expected to experience a significant change in landings due to the specifications for the alternative measures proposed in 2002. *Loligo* landings would be expected to decrease in 2002 under either alternative 1 or 2 for *Loligo*.

Prices

Given the likelihood that the alternative measures for *Illex* and butterfish would not affect landings, it is assumed that there will not be a change in the price for these species. However, it is possible that given the substantial decrease in *Loligo* landings under either alternative 1 or 2, the price for this species could increase, holding all other factors equal.

Consumer Surplus

Assuming *Illex* and butterfish 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. However, given the potential increase in *Loligo* prices, consumer surplus associated with this fishery may decrease.

Harvest Costs

No changes to harvest costs are expected as a result of the proposed alternative measures.

Producer surplus

Assuming *Illex* and butterfish prices will not be affected under the scenario constructed above, there will be no corresponding change in producer surplus associated with these fisheries under the alternative measures considered. However, given the potential increase in *Loligo* prices under alternative measures one and two, producer surplus associated with this fishery may increase.

Enforcement Costs

The alternative measures considered are not expected to change enforcement costs.

Distributive Effects

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

4. DETERMINATIONS OF A SIGNIFICANT REGULATORY ACTION

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 was estimated at $31.3 million in 2000. The measures considered in this regulatory action will not affect total revenues generated by the commercial industry to the extent that a $100 million annual economic impact will occur. The proposed actions are necessary to maintain the harvest of 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.

5. REVIEW OF IMPACTS RELATIVE TO THE REGULATORY FLEXIBILITY ACT

5.1. Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to minimize the adverse impacts from burdensome regulations and record keeping requirements on small businesses, small organizations, and small government entities. The category of small entities likely to be affected by the final plan is that of commercial Atlantic mackerel, squid and butterfish fishermen. The impact of the proposed actions on the fishing industry and the economy as a whole are discussed above. The following discussion of impacts centers specifically on the effects of the proposed actions on the mentioned small businesses entities.

5.2. Determination of Significant Economic Impact on a Substantial Number of Small Entities

The Small Business Administration (SBA) defines a small business in the commercial fishing and recreational fishing activity, as a firm with receipts (gross revenues) of up to $2.0 and $3.0 million, respectively. According to 2002 NMFS permit file data, 2098 commercial vessels were holding Atlantic mackerel permits, 395 vessels were holding *Loligo*/butterfish moratorium permits, 77 vessels possessed *Illex* permits, 1704 vessels held incidental catch permits and 561 vessels held party/charter permits. All of these vessels readily fall within the definition of small business. A summary of the change in revenue for the all the alternatives discussed is given in Table 28.

According to guidelines on regulatory analysis of fishery management actions, a "substantial number" of small entities is more than 20 percent of those small entities engaged in the fishery (NMFS 1994). Since the proposed action will not directly affect most of these vessels, the "substantial number" criterion will not be met.

Economic impacts on small business entities are considered to be "significant" if the proposed action would result in any of the following: a) a reduction in annual gross revenues by more than 5 percent; b) an increase in total costs of production by more than 5 percent as a result of an increase in compliance costs; c) an increase in compliance costs as a percent of sales for small entities at least 10 percent higher than compliance costs as a percent of sales for large entities; d) capital costs of compliance represent a significant portion of capital available to small entities, considering internal cash flow and external financing capabilities; or, e) as a "rule of thumb," 2 percent of small businesses entities being forced to cease business operations (NMFS 1994).

5.2.1 Proposed Management Measures

The analyses under economic impacts for each of the proposed management measures analyzed in this section do not show that any business will be forced to cease operations. The implementation of the quota specifications will allow the squid, mackerel, and butterfish fisheries to operate at sustainable levels, thereby increasing revenues and profits to the industry in the long term relative to an unregulated fishery. In the case of the Atlantic mackerel fisheries, the 2002 specifications should allow for the orderly development of this underutilized species in a controlled manned. For *Loligo*, Atlantic mackerel, *Illex* squid, and butterfish, gross revenues are not expected to change as a consequence of the proposed actions. In the case of *Loligo*, butterfish and *Illex*, the proposed 2002 specifications for IOY remain unchanged relative to the 2001 specifications. In the case of Atlantic mackerel the 2002 specifications represent a slight decrease in the specification of IOY but not DAH, relative to 2001. For Atlantic mackerel, *Loligo*, *Illex*, and butterfish there exists a surplus between the 2002 ABC specification and what has been landed in recent years. Therefore it is correct to assume that the ABC specifications will represent no constraint on vessels in these fisheries in aggregate or individually. In the absence of such constraints, there is no impact on revenues under the Regulatory Flexibility Act.

From 1996-2000, *Loligo* landings averaged 16,548 mt valued (on average) at $26.4 million. The proposed ABC specification for *Loligo* in 2002 is 17,000 mt. Hence, there exists a surplus between the 2002 ABC specification and what has been landed in recent years. As noted earlier, it is correct to assume for the 2002 *Loligo* fishery that the ABC specification will represent no constraint on vessels in the *Loligo* fishery in aggregate or individually. In the absence of such constraints, there is no impact on revenues under the Regulatory Flexibility Act.

From 1996-2000, *Illex* landings averaged 13,941 mt valued (on average) at $6.52 million. The proposed ABC specification for *Illex* in 2002 is 24,000 mt. Hence, there exists a surplus between the 2002 ABC specification and what has been landed in recent years. As noted earlier, it is correct to assume for the 2002 *Illex* fishery that the ABC specification will represent no constraint on vessels in the *Illex* fishery in aggregate or individually. In the absence of such constraints, there is no impact on revenues under the Regulatory Flexibility Act.

From 1996-2000, butterfish landings averaged 2,360 mt valued (on average) at $3.3 million. The proposed ABC specification for butterfish in 2002 is 7,200 mt and the proposed DAH specification for butterfish in 2002 is 5,900 mt. Hence, there exists a surplus between the proposed 2002 ABC and DAH specifications and what has been landed in recent years. As noted earlier, it is correct to assume for the 2002 butterfish fishery that the ABC and DAH specifications will represent no constraint on vessels in the butterfish fishery in aggregate or individually. In the absence of such constraints, there is no impact on revenues under the Regulatory Flexibility Act.

In the case of the Atlantic mackerel specifications, the proposed 2002 specification of IOY (85,000 mt) far exceeds landings of the species for the period 1996-2000 (average=13,918 mt). The IOY specification far exceeds recent harvest in the fishery and the specification of ABC is an order of magnitude greater than recent landings. As noted earlier, the proposed 2002 quota specifications for the Atlantic mackerel fishery 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.

5.2.2 Alternative Management Measures

5.2.2.1 Atlantic mackerel

The first alternative action considered by the Council was to maintain the status quo 2001 specifications for Atlantic mackerel for 2002. The proposed specifications under this alternative would be ABC = 347,000 mt, IOY=88,000 mt, DAH=85,000 mt, DAP=50,000 mt and JVP=20,000 and TALFF=3,000 mt.

The status quo 2001 specification of JVP and TALFF in 2002 would not meet the policy objectives of the Council relative to further development of the US domestic harvest of Atlantic mackerel, and therefore was rejected. The IOY specification under this alternative is slightly higher than under the preferred alternative because TALFF is specified at 3,000 mt. The Council concluded that the specification of TALFF above zero in 2002 could have negative economic and social consequences for the US mackerel industry.

This option would not have changed the specification of ABC, however. The 2001 specification of ABC far exceeds landings of the species for the period 1996-2000 (average=13,918 mt) and is an order of magnitude greater than recent landings. As noted earlier, this alternative to the proposed 2002 quota specifications for the Atlantic mackerel fishery would have represented no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there would be no impact on revenues under the Regulatory Flexibility Act under this alternative.

The second alternative action considered by the Council for Atlantic mackerel in 2002 was to specify ABC at long term potential catch. The proposed specifications under this alternative would be ABC=134,000 mt, IOY=85,000 mt, DAH=85,000 mt, DAP=50,000 mt and JVP=20,000 and TALFF=0 mt. The use of LTPC as an upper bound on ABC was found to be inappropriate because it would not allow for variations and contingencies in the status of the stock. This option would not have changed the specification of IOY, however. The proposed 2002 specification of IOY (85,000 mt) far exceeds landings of the species for the period 1996-2000 (average=13,918 mt). This IOY specification far exceeds recent harvest in the fishery and the specification of ABC at 150,000 mt is an order of magnitude greater than recent landings. A noted earlier, this alternative to the proposed 2002 quota specifications for the Atlantic mackerel fishery would have represented no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there would be no impact on revenues under the Regulatory Flexibility Act under this alternative.

The third alternative the Council considered for Atlantic mackerel was the elimination of JVP for 2002. The Council rejected this option because they recognized the need for JV's in 2002 to allow US harvesters to take mackerel at levels in excess of current US processing capacity. This option would have changed the specification of IOY to 55,000 mt. However, the specification of IOY at 55,000 mt far exceeds landings of the species for the period 1996-2000 (average=13,918 mt). This IOY specification far exceeds recent harvest in the fishery and the specification of ABC at 347,000 mt is an order of magnitude greater than recent landings. As noted earlier, this alternative to the proposed 2002 quota specifications for the Atlantic mackerel fishery would have represented no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there would be no impact on revenues under the Regulatory Flexibility Act under this alternative.

5.2.2.2 *Loligo* and *Illex* squid

5.2.2.2.1 Alternatives to the Proposed Action for *Loligo* in 2002

The first alternative considered for *Loligo* in 2002 was to specify Max OY at 26,000 mt and ABC, and IOY, DAH and DAP at 13,000. The Council chose to specify ABC for 2000 at 90% of F_{msy} or 13,000 mt based on stock size information available in 1999. This specification represents a 21% reduction in landings relative to the average landings for the five year base period of 1996-2000 and a 23.3.% reduction compared to 2000 landings of *Loligo*. Therefore, this ABC specification for *Loligo* in 2002 would likely result in a reduction in revenue greater than 5% for vessels engaged in the directed fishery for *Loligo*.

Of the 497 vessels which reported landing *Loligo* 2000, 132 vessels would be expected to experience a reduction in total gross revenues (all species combined) greater than 5% as a result of the 23.3 % reduction in the *Loligo* quota under this alternative. This represents 26.6% of the vessels which landed *Loligo* during 2000. The remaining vessels (365 or 73.4%) were expected to experience a reduction in total gross revenues (all species combined) of less than 5% as a result of the 23.3% reduction in the Loligo quota under this alternative. It can be concluded that the reduction in the *Loligo* quota under this alternative would represent a significant economic impact on small entities under the Regulatory Flexibility Act.

As noted above, 132 vessels would be expected to experience a reduction of total gross revenues of greater than 5% due a 13,000 mt *Loligo* quota in 2002. The size distribution of all vessels (in terms of length and gross registered tonnage) which landed *Loligo* during the 2000 is presented in Table 29. Of the 497 vessels that reported landing *Loligo* in 2000, vessel attributes for vessel length and gross registered tonnage were available for 483 vessels from unpublished NMFS permit file data. In terms of length, about 72% of those vessels were less than 75 ft in length, while the remaining vessels (28%) were greater than 75 ft. A comparison of the length distribution of vessels affected by the quota of 13,000 mt in 2002 under Alternative 1 for *Loligo* (i.e., those vessels expected to experience a reduction in total gross revenues (all species combined) of greater than 5 %) indicated that the impact of the quota reduction appeared to be equal across all length and tonnage classes (Table 29). That is, a comparison of the frequency distributions of length and ton class for the total pool of vessels which landed *Loligo* and those affected by the alternative quota of 13,000 mt indicated that there were no disproportionate effects by vessel size class. For example, 23.1% of all vessels which landed *Loligo* in 2000 were 25-49 ft in length while 25.2% of the affected vessels in 2000 were in this length class. This comparison yields similar conclusions across all length and ton classes of vessels in the fishery.

Descriptive data for vessels which landed *Loligo* in 2000 relative to home port state, principal port of landing state and vessel owner's state of residence are given in Tables 30-32. In addition, Tables 30-32 provide a relative comparison of the same data for vessels expected to be affected by the alternative quota of 13,000 mt for *Loligo* in 2002. Overall, New York appears to be the most heavily impacted state. For example, in terms of principal port of landing, vessels landing in New York ports accounted for 19.0% of all vessels landing *Loligo* in 2000. However, vessels landing in New York ports would be expected to account for 38.2% of vessels affected by the proposed 13,000 mt quota for Loligo in 2000.

The second alternative considered for *Loligo* in 2001 was to specify Max OY at 26,000 mt and ABC, and IOY, DAH and DAP at 11,700. At this level, the Council would be specifying ABC for 2002 at 75% of F_{msy} or 11,700 mt based on the stock size observed in 1998. This specification represents a 31% reduction in landings relative to the 2000 landings of *Loligo*. This ABC specification for *Loligo*, therefore, would likely result in a reduction in revenue greater than 5% for vessels engaged in the directed fishery for *Loligo* relative to landings in the most recent years.

Of the 497 vessels which reported landing *Loligo* during 2000, 170 vessels would be expected to experience a reduction in total gross revenues (all species combined) greater than 5% as a result of the 31% reduction in the *Loligo* quota under this alternative. This represents 34.2% of the vessels which landed *Loligo* during 2000. The remaining vessels (327 or 65.8%) were expected to experience a reduction in total gross revenues (all species combined) of less than 5% as a result of the 31% reduction in the Loligo quota under this alternative. It can be concluded that the reduction in the *Loligo* quota under this alternative would represent a significant economic impact on small entities under the Regulatory Flexibility Act.

As noted above, 170 vessels would be expected to experience a reduction of total gross revenues of greater than 5% due a 11,700 mt *Loligo* quota in 2002. The size distribution of all vessels (in terms of length and gross registered tonnage) which landed *Loligo* during the 2000 is presented in Table 29. Of the 497 vessels that reported landing *Loligo* in 2000, vessel attributes for vessel length and gross registered tonnage were available for 483 vessels from unpublished NMFS permit file data. In terms of length, about 72% of those vessels were less than 75 ft in length, while the remaining vessels (28%) were greater than 75 ft. A comparison of the length distribution of vessels affected by the quota of 13,000 mt in 2002 under Alternative 1 for *Loligo* (i.e., those vessels expected to experience a reduction in total gross revenues (all species combined) of greater than 5 %) indicated that the impact of the quota reduction appeared to be equal across all length and tonnage classes (Table 33). That is, a comparison of the frequency distributions of length and ton class for the total pool of vessels which landed *Loligo* and those affected by the alternative quota of 11,700 mt indicated that there were no disproportionate effects by vessel size class. For example, 23.1% of all vessels which landed *Loligo* in 2000 were 25-49 ft in length while 25.2% of the affected vessels under this alternative were in this length class. This comparison yields similar conclusions across all length and ton classes of vessels in the fishery.

Descriptive data for vessels which landed *Loligo* in 2000 relative to home port state, principal port of landing state and vessel owner's state of residence are given in Tables 30-32. In addition, Tables 30-32 provide a relative comparison of the same data for vessels expected to be affected by the alternative quota of 13,000 mt for *Loligo* in 2002. Overall, New York appears to be the most heavily impacted state. For example, in terms of principal port of landing, vessels landing in New York ports accounted for 19.0% of all vessels landing *Loligo* in 2000. However, vessels landing in New York ports are expected to account for 31.5% of vessels affected by the alternative 11,700 mt quota for *Loligo* in 2002.

5.2.2.2.2 Alternatives to the Proposed Action for *Illex* in 2002

The alternative specifications considered for *Illex* for 2002 were 30,000 mt for Max OY, ABC, IOY, DAH and DAP and 30,000 mt for Max OY and 19,000 for ABC, IOY, DAH and DAP . These specifications far exceed recent harvest in the fishery. Therefore, these alternatives to the proposed 2002 quota specifications for the *Illex* fishery would have represented no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there would be no impact on revenues under the Regulatory Flexibility Act under this alternative.

5.2.2.2.3 Alternatives to the Proposed Action for butterfish in 2002

The first alternative considered for butterfish was to specify Max OY=16,000mt, ABC=7,200, IOY, DAH, and DAP=5,900 mt and JVP and TALFF=0 mt. These specifications far exceed recent harvest in the fishery. Therefore, these alternatives to the proposed 2002 quota specifications for the butterfish fishery would have represented no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there would be no impact on revenues under the Regulatory Flexibility Act under this alternative.

The second alternative considered for butterfish was to specify Max OY at 16,000 mt, ABC, IOY, DAH, DAP at 10,000 mt and JVP and TALFF at 0 mt in 2002. As noted above, the most recent stock assessment for butterfish advised that even though MSY was estimated to be 16,000 mt, short term yields should not exceed 7,200 mt. The current abundance level probably could not sustain levels in excess of 5,900 mt assuming an appropriate estimate of discarding is 1,300 mt. Specifications for butterfish as high as 10,000 mt would be deleterious to the stock and the fishery. These specifications far exceed recent harvest in the fishery. Therefore, this alternative to the proposed 2002 quota specifications for the butterfish fishery would have represented no constraint on vessels in the fishery in aggregate or individually. In the absence of such constraints, there would be no impact on revenues under the Regulatory Flexibility Act under this alternative.

5.2.2.2.4 Carry-over of Quarterly Quota Underages

One administrative alternative considered by the Council would modify the method for carrying over *Loligo* squid quarterly underages for 2002 and subsequent fishing years. For the 2001 fishing year, by default, quarterly underages carried over into Quarter IV because the fourth quarter does not close until 95 percent of the total annual quota has been harvested. However, under this alternative beginning with the 2002 fishing year, in the event that the first quarter landings for *Loligo* squid are less than 70 percent of the first quarter allocation, the underage below 70 percent would be applied to Quarter III. Underages from quarters II and III would continue to be added to Quarter IV by default, based on the 95-percent closure rule mentioned above. By making the underage available during Quarter III, *Loligo* squid permit holders could continue to fish during a time when the quarter may have otherwise been closed. This could provide an added economic benefit to fishers during Quarter III. However, because this provision would only shift a limited amount of quota from one period to another, and does not modify the *Loligo* squid annual quota, no overall change in revenue is expected.

5.3. Explanation of Why The Action is Being Considered

Regulations implementing the Fishery Management Plan for the Atlantic Mackerel, Squid, and Butterfish Fisheries (FMP) prepared by the Council appear at 50 CFR Part 648. These regulations stipulate that the Secretary will publish a notice specifying the initial annual amounts of the initial optimum yield (IOY) as well as the amounts for allowable biological catch (ABC) domestic annual harvest (DAH), domestic annual processing (DAP), joint venture processing (JVP), and total allowable levels of foreign fishing (TALFF) for the species managed under the FMP.

5.4. Objectives and Legal Basis for the Rule

Refer to the section on Management Objectives of the Amendment document (section 4.3). The Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265) as amended through October 11, 1996 provides the legal basis for the rule.

5.5. Demographic Analysis

In order to identify the ports important to fisheries managed by the Mid-Atlantic Council and to identify the fisheries relatively important to those ports, the Council retained Dr. Bonnie J. McCay of Rutgers University to prepare a background document (McCay *et al*. 1993). This research covered ports from Chatham, Massachusetts, to Wanchese, North Carolina. McCay *et al.*1993 and was largely based on two data sources, 1992 NMFS landing statistics and information about the ports obtained from interviews with key informants. The quality of the port descriptions, therefore, partially depends on the information supplied by the informants. More recently, McCay and Cierei (2000) provided updated port descriptions for the states from New York to North Carolina based on 1998 landings and personal interviews. The port descriptions that follow for Massachusetts to Connecticut were taken from McCay *et al*. 1993. The port descriptions for the states from New York to North Carolina were condensed from McCay and Cierei (2000). Since the port descriptions provided here are brief summaries of the material contained in McCay *et al*. (1993) and McCay and Cierei (2000), readers requiring more detailed information are encouraged to obtain the original reports.

For purposes of orientation, Barnstable County, MA includes all of Cape Cod, including the fishing port of Chatham. New Bedford is located in Bristol County, MA. The port of Newport is located in Newport County, RI. Galilee is located in Washington County, RI. Stonington is located in New London County, CT. Greenport, Shinnecock/Hampton Bays, and Montauk are located in Suffolk County, NY. Freeport is located in Nassau County, NY. Brooklyn is located in Kings County, NY. Ocean City is located in Worcester County, MD. Virginia has a system whereby certain cities exist apart from counties. Within the scope of this analysis, Hampton, Norfolk, Newport News and Virginia Beach all fall into this category. Wanchese is located in Dare County, NC.

Chatham, Massachusetts

The total landed value of fish in Chatham in 1992 was around $11 million. Groundfish and shellfish --bay scallops, quahogs, and mussels-- comprise the majority of the landed value for Chatham, accounting for over 80% of the landed value. *Loligo* accounted for 2.38% of landed value in 1992, harvested by pound-nets (65%) and fish pots (37%).

Atlantic mackerel accounted for 0.45%, caught by fish pots (77%), draggers (5%), and sink gill nets (4.6%). Pound nets and fish pots or traps accounted for only 4.6% of the total landed value of species in Chatham in 1992. However, *Loligo* accounted for 31% of the fish pot value and 86% of the pound net revenue. Atlantic mackerel accounted for 12% of the fish pot value and 3% of the pound net revenue. Butterfish accounted for 0.33% of the fish pot value and 0.20% of the pound net revenue.

New Bedford, Massachusetts

The squids, mackerel, and butterfish are not important to New Bedford. *Loligo* squid made up 0.05% of the total landed value for New Bedford in 1992. The other species covered by this FMP accounted for less than 0.01%.

Loligo is caught during the spring months of April and May by inshore boats in Nantucket Sound, and more boats are now fishing for *Loligo* offshore, reported a New Bedford port agent. Even into late fall, he said, boats are targeting squid offshore. New Bedford's *Loligo* fleet are those that summer flounder during the summer. They target squid during the spring and fall when they are not going for summer flounder. The port agent reported that some of the small boats offload at sea to freezer boats from Rhode Island.

Newport, Rhode Island

Within Newport, there are three commercial fishing packing and distributing businesses. One mainly deals with draggers, gillnetters, and some scallopers, and brings in a great deal of groundfish. Another is a lobster house, but they also handle the trappers. There is also a trap company located in Newport. Species caught in traps are discussed below. The dealer that handles mostly draggers packs and distributes the majority of species of important to this study. The trap company also deals with these species but not in as large of quantities.

Approximately 15 large draggers were tied up at the fish house that deals with draggers during a recent visit (1992) to Newport. The fish house owner, the local port agent, and fishermen spoken with on this day said that having 15 boats in port at the same time was unusual, and had to do with a storm moving through the area. Most of the boats that offload at the Newport fish house are not from Newport. They are from other ports such as New Bedford, various Long Island ports, Cape May, and Pt. Judith. These boats are going primarily for squid at the time of our visit, which was in December. This particular fish house owner does not own any of the boats that offload at his dock.

The fishermen who make up the crews in Newport are not necessarily from Newport, but some local people from the area do work on the boats. Some crew members come from Point Judith, New Jersey, New York, and New Bedford. Typically, the owners of the boats do not work the boats. Often the owners used to fish but do not anymore. As with almost all of the ports, crews are paid on the share system.

The total value of landings in Newport for 1992 was $14.5 million. Lobster ranked first, accounting for 44% of landed value. *Loligo* ranked sixth.

Other Washington County Communities, RI (including Quonset Point)

The value of the landings at Other Washington County communities including Quonset Point in 1992 was around $20 million.

Other Washington County including Quonset Point includes both traditional and innovative fisheries. Processing facilities for squid in the region have resulted in the dominance of both *Loligo* and *Illex* squid in terms of landed value, but lobster and bay quahogging and oystering remain important, as well as other inshore activities such as eel potting, trapping striped bass, and an unusual spear fishery for tautog (blackfish). There is some handlining for bluefin tuna and trolling for inshore species such as striped bass and summer flounder as well as yellowfin tuna.

Atlantic mackerel, butterfish, scup, summer flounder, and angler are among the top ten species landed by value, and they figure importantly in the catch of the otter trawl vessels. The gillnet fishery for cod and tautog includes a small amount of angler and Atlantic mackerel. The fish pots are predominantly for scup, but some black sea bass, summer flounder, bluefish, and *Loligo* squid are caught in them too.

Virtually all of the angler, butterfish, weakfish, Atlantic mackerel, and squid landed here are brought in by draggers.

A major fishing location in Washington County is located at Quonset Point, an abandoned Navy Base which houses several isolated industrial developments, including a major offloading facility for car imports. As for commercial fishing, Quonset Point is port to five factory trawlers, two of which are from Rhode Island and three from Portland, Maine. The five trawlers range in length from 117 ft. to 155 ft., and they can hold 4 to 5 hundred thousand lbs. of frozen product per trip. This contrasts with wet boats which have a 150,00 thousand lb. capacity. The Rhode Island boats are owned by the president of a service and sales facility located at Quonset Point. The other three boats are owned by a man from Portland, Maine.

The service and sales facility located at Quonset Point started out with one boat about seven to eight years ago. The two boats owned by the president of the facility at Quonset Point were built specifically as freezer boats. These boats take one to two week trips. The three boats from Maine are converted supply boats and they may stay out as long as thirty days on some trips.

On occasion, the freezer trawlers engage in joint ventures with American boats. The smaller boats will fish and offload onto the freezer boats. The freezer boats have also in the past participated in joint ventures with Russian, Dutch and Polish boats.

The freezer boats target *Loligo* squid, *Illex* squid, butterfish, mackerel, whiting and sometimes scup. They may target herring but not normally.

The *Illex* squid season lasts from June to October, and the freezer boats average 12 day trips when they are working *Illex*. November to May is the *Loligo* season, and the trawlers average 30 days out while they are targeting *Loligo*. Mackerel is caught from December to April.

The freezer trawlers do not have any significant landings of butterfish. Butterfish is available year round, but they are only desirable from December to February because of their fat content.

The Quonset Point boats will fish from North Carolina up to the Canadian border although they rarely go that far north. They fish for *Illex* up to 600 ft (100 fathoms) off the coast of New Jersey. *Loligo* fishing is mostly done around Hudson Canyon and Block Canyon.

The fish is packaged on the boats in plastic bags and placed in aluminum trays. Fiberboard boxes are also used. The boxes hold approximately 27 to 28 pounds of fish and one boat can hold approximately 13,000 boxes, or 360,000 pounds of fish.

The freezer trawlers are at sea 280 days per year. October and May are the slow months. During this time, the crew works on boat maintenance and painting.

In 1992, the average cost of operating one of these boats for two years was $2,200,000, which covered fuel, maintenance, repairs and nets.

The Rhode Island boats have from 9 to 11 crew members plus a captain and all of these crew are from the local area. The service and sales facility at Quonset Point employs twenty-two persons apart from the crews. This number includes office personnel and `lumpers' who unload the boats.

Crew size increases during the *Loligo* squid season. During *Loligo* season the crew sorts the squid into six sizes and also sorts through the bycatch. *Illex* squid catches are much cleaner and do not require sorting through bycatch.

The crews are full-time workers and are paid on a share system. Individuals can make from $40,000 to $60,000 annually. Fuel costs comes off the top of the boat's catch. The boat takes about 52 or 58 percent and the crew takes about 42 or 48 percent. Food comes from the crew share.

Point Judith, RI

Point Judith is almost exclusively a fishing community, having a core group of fishermen who fish full-time. During the summers, the streets are filled with tourists coming or going on the Block Island ferry. Yet there is little for tourists to do in Point Judith. The town does not have the condominiums, shops, and hotels that other ports such as Chatham, Newport, and Montauk have. Only one hotel stands out in Point Judith, the Dutch Inn, which is circa 1960. The few restaurants, shops, and tourist venues, such as fudge shops, are enough to take care of the summer onslaught of ferry passengers and the year round working population centered around commercial fishing.

The total value of fish landed in Point Judith in 1992 was $36.5 million. The top ten species by percent landed value in 1992 were lobster, *Loligo* squid (15%), angler, summer flounder, scup, butterfish (4%), winter flounder, yellowtail, and cod. Mackerel accounted for 1%.

Point Judith has a large fleet of trawlers, gillnetters, and lobster boats. While estimates vary, approximately 200 commercial boats dock in Point Judith, including 80 trawlers, 30 gillnetters, and 100 or so lobster boats.

One informant described Point Judith boats as diverse in their annual round and approach to the fisheries, as opposed to New Bedford boats which only go after groundfish. Point Judith boats which are not diverse are the freezer boats which only target fish for frozen markets -- the squids, butterfish, and mackerel. The diverse approach to fisheries combined with full-time experienced fishermen means the fishermen are fishing year round even if they may switch fisheries and boats during the year.

Stonington, Connecticut

The Long Island sound and its estuaries and rivers are the major foci of Connecticut fisheries. There is a small traditional haul seine fishery for alewives and other fishes (unspecified, for "industrial" uses). Dip-nets are used for blue crabs (and a few alewives). Drift gillnets are used for menhaden, bluefish, weakfish, black sea bass, alewife, Atlantic mackerel, and other species. There is a specialized drift gillnet fishery for American shad. Quahogs (hard clams) are very important, and over 70% of Connecticut's landed value comes from oysters cultivated in Long Island Sound. Second to oysters are lobsters, most of which are caught inshore in the sound. Third in value is a mixed species otter trawl fishery, most of which is based in the port of Stonington.

Stonington is the primary port in Connecticut. The main fishing fleet is out of Stonington. Stonington is the only off-shore port with a fleet consisting of trawlers, lobster boats, and ocean scallopers. People are mostly going for groundfish such as cod, haddock, and flounder.

Atlantic mackerel is seldom targeted because there is no market for it in Stonington. Atlantic mackerel accounts for 0.01% of the landed value of species and these are caught primarily by drift gillnets. One vessel specializes in *Loligo* squid. Other vessels will target squid when they appear in large numbers. *Illex* squid is seldom targeted because the market is limited since the *Illex* squid spoils rapidly. There is a market for butterfish but no vessel is specialized in catching it.

The major species of fish caught in Stonington are flounder, summer flounder, squid, whiting, and some codfish during the winter months. Over the past five years (1988-1993), the fishermen have caught an increasing number of monkfish. The three large scallop boats have landed the majority of the monkfish.

In the past, summer flounder was the most important species caught by fishermen in Stonington. However, squid is increasing in importance as a result of the summer flounder quotas. During the summer of 1993, one boat attempted to specialize in dogfish but he discontinued this.

Freeport, NY

According to NMFS weighout data (Tables NY-FP1, 2), Freeport and neighboring Point Lookout (included in the Freeport port code) are almost entirely dependent on otter trawl landings (over 89% poundage, 87% value), and the major species are loligo squid and silver hake, with smaller amounts of scup, weakfish, bluefish, butterfish, summer flounder, other flounders, Atlantic mackerel. Gill-nets are used for bluefish, angler, and other species, and there are small handline, pot, pound-net and bay shellfisheries associated with these ports.

Table NY-FP1: Landings by Gear, Freeport, NY, 1998

GEAR TYPE, Freeport, NY	Lbs. %	Value %
Common seine, haul seine	0.3%	0.1%
Gill net, sink, other	7.0%	6.1%
Handline, other	2.5%	3.8%
Pot/trap, lobster, insh nk	0.6%	2.8%
Pot/trap, lobster, offsh nk	0.0%	0.0%
Pots + traps, blue crab	0.0%	0.0%
Pots + traps, conch	0.0%	0.0%
Pots + traps, fish	0.1%	0.1%
Pound net, fish	0.2%	0.2%
Rakes, other	0.2%	0.0%
Tongs & grabs, clam	0.0%	0.0%
Trawl, otter, bottom, fish	89.3%	86.8%

Total landings, rounded 1998: 1,865,800 lbs
Total value, rounded 1998: $1,504,800 dollars
Note: 0.0 = >0.0% but <0.06%

Table NY-FP2: Landings by Major Species, Freeport, NY, 1998

Bluefish	4.6%	2.1%
Butterfish	2.8%	2.6%
Flounder, summer	2.8%	7.9%
Flounder, yellowtail	4.0%	2.3%
Hake, silver	27.4%	16.2%
Mackerel, atlantic	2.5%	0.8%
Scup	4.4%	8.8%
Squid (loligo)	37.3%	39.3%
Weakfish, squeteague	2.7%	2.8%
Lobster	0.6%	2.8%
Sea bass, black	0.8%	1.9%

Number of species: 62

Other species of MAFMC interest by percentage total value 1998: Tilefish (0.1), and Illex squid (0.0). Surf clams are also landed here but are reported as "Other New York."

Other Nassau County

Other Nassau County landings came to about 595,000 pounds, worth about 4 million dollars, in 1998. Over 93% of the landings were of hard clams (quahogs), soft clams, and oysters, taken in the rich "Oyster Bays" of this county. Gill nets, handlines, and lobster pots were also used for striped bass and other species.

Greenport and Mattituck, N.Y.

Although Greenport and Mattituck are very dissimilar ports, we combine landings information from them to protect confidentiality.

Otter trawl landings are by far the most important, over 95%, and the classic Mid-Atlantic complement of species is found, led by silver hake and loligo squid, but including butterfish, summer and winter flounder, scup, striped bass, angler, and other species. There is also pound-net fishing, haul-seining, gill-netting, handlining, pelagic longlining, lobster and conch pot fishing, and raking for clams and dredging for bay scallops. Tables NY-GP1, 2 provide weighout data for Greenport combined with nearby Mattituck.

Over 90% of the weighout landings attributed to Mattituck came from otter trawl fishing, and the full complement of Mid-Atlantic species were major landings (=>2% value in 1998: bluefish (25%), butterfish (12%), summer flounder (14.5%), scup (4.4%), dogfish 3.1%), lobster and striped bass were also significant, among the 37 species landed. Total landings in 1998 were less than 275,000 pounds. But recall that "Other New York" includes lobster and other landings which probably came from places like Mattituck.

Table NY-GP1: Landings by Gear Type, Mattituck and Greenport, NY, 1998

GEAR TYPE	LBS %	VALUE %
Common seine, haul seine	0.0%	0.0%
Gill net, sink	1.5%	1.4%
Handline	1.1%	2.9%
Longline, pelagic	0.0%	0.1%
Pots + traps, conch	0.0%	0.0%
Pound net, fish	1.8%	3.0%
Trawl, otter, bottom, fish	95.6%	92.5%

Total landings, rounded 1998: 7,831,400 lbs
Total value, rounded 1998: $4,140,500 dollars
Note: Not including "Other New York" landings; here as elsewhere "0.0%" means more than 0 but less than 0.05%

Table NY-GP2: Landings by Major Species, Mattituck and Greenport, NY, 1998

MAJOR SPECIES >2%	LBS %	VALUE %
Bluefish	4.2%	3.1%
Butterfish	1.6%	1.9%
Flounder, summer	1.1%	5.1%
Flounder, winter	2.9%	1.2%
Hake, Red	2.3%	1.5%
Hake, silver	63.3%	46.1%
Scup	0.8%	2.6%
Squid (loligo)	21.6%	27.2%
Bass, striped	0.6%	3.0%

Number of species: 62

Other species of MAFMC interest by percentage value 1998: Atlantic Mackerel (0.1), Black Sea Bass (0.9), dogfish, other (0.1), Dogfish, Smooth (0.0), Tilefish (0.3), and Illex Squid (0.0).

"Other Suffolk" and Amagansett, NY

The NMFS data are collected for the port of Amagansett and well as unspecified "Other Suffolk" fishing. "Other Suffolk" probably includes landings from the fishermen at Orient/Orient Point, Shelter and Fisher Islands, Southold, Cutchogue, and many other smaller places in Suffolk County on both the north and the south forks of eastern Long Island including Mount Sinai.

Bay clamming (for hard clams, or quahogs) is the major fishery, representing over 71% of the area's value in 1998. Lobstering is next, 14% of the value. Other important shellfisheries are for oysters, soft clams, horseshoe crabs, blue crabs, and green crabs. Harvesting bay scallops is an important fishery for all east end ports, but landings vary widely from one year to the next. There is tremendous diversity in gears used, bespeaking the mixed bay, sound, and ocean nature of these fisheries. They include handlines, longlines, harpoons, seines, otter trawls, gillnets, pound nets, pots for fish, eels, conch, crabs, and lobster, fyke-nets, cast nets, diving gear, crab and oyster dredges, shovels, rakes, tongs, patent tongs, and "by hand".

Montauk, NY

Montauk, the largest fishing port in New York, is situated near the eastern tip of the South Fork of Long Island. Otter-trawls and longlines are the principal gear-types, in terms of pounds landed and value (Table NY-M1). Loligo squid and silver hake are the two most important fin-fish caught in 1998, but tilefish also stand out, and swordfish and tuna landings are important as well. Montauk is the leading tilefish port in the U.S., but this fishery has declined greatly. For the past two years (1998-1999) some of the Montauk-based tilefish boats have been unloading their catches in Rhode Island. Nonetheless, tilefish accounted for 21% of the value of landings in this port in 1998 (Table NY-M2). The number of species landed at Montauk is staggering: 90. The methods used to harvest fish and shellfish are diverse, including pound nets or fish weirs, box traps, haul seines, and spears, along with the more usual pots, lines, and trawl nets.

Table NY-M1: Landings by Gear Type, Montauk, NY, 1998

GEAR TYPE	LBS %	VALUE %
Box trap	0.0%	0.0%
Common seine, haul seine	0.0%	0.0%
Gill net, sink	1.2%	1.3%
Handline, other	3.0%	6.6%
Longline, bottom	11.4%	20.9%
Longline, pelagic	3.1%	8.7%
Pot/trap, lobster, insh nk	0.4%	1.3%
Pot/trap, lobster, offsh nk	0.1%	0.4%
Pots + traps, conch	0.0%	0.0%
Pots + traps, fish	0.1%	0.3%
Pound net, fish	0.6%	0.6%
Spears	0.0%	0.0%
Trawl, otter, bottom, fish	80.1%	59.9%

Total landings, rounded 1998: 12,035,700 lbs
Total value, rounded 12,108,800 dollars; 0.0% = <0.06 % rounded

Table NY-M2: Landings by Major Species, Montauk, NY, 1998

MAJOR SPECIES >2%	LBS %	VALUE %
Bass, striped		5.2%
Bluefish	2.1%	0.8%
Butterfish	3.2%	2.0%
Dogfish, nk	2.4%	0.4%
Flounder, summer	2.8%	6.9%
Flounder, winter	3.8%	5.1%
Hake, red	3.2%	1.1%
Hake, silver	31.2%	15.7%
Scup	1.8%	3.6%
Squid (loligo)	24.2%	19.8%
Swordfish	1.0%	3.4%
Tilefish	11.5%	21.2%

Number of species: 90

Other species of MAFMC interest by percentage 1998 value: Atlantic Mackerel (0.3), Black Sea Bass (1.3), Dogfish, NK (0.0), Smooth Dogfish (0.0), and Illex squid (0.0).

Shinnecock/Hampton Bays, NY

Shinnecock/Hampton Bays is second only to Montauk as a commercial fishing center in New York. The offshore fishing industry in this part of Long Island is concentrated to the west of Shinnecock Inlet, on a barrier island that is just to the south of Hampton Bays. "Shinnecock," as it is known, is part of the town of Southampton. There is a large county-owned dock that is run by the town, where most commercial boats tie-up. The pack-out facilities and their associated docks are on private land, including two private unloading docks and one belonging to the Shinnecock Fishermen's Cooperative. The rest of the land to the east and west of the inlet is a county park. The NMFS codes for this fishery are for Shinnecock and Hampton Bays. We have combined them for this analysis because both refer to the same place (bluefin tuna and other large pelagic landings are collected using the Shinnecock port code, the rest using Hampton Bays).

This is primarily a dragger fishing port, otter trawl landings making up 84% of the poundage and 74% of the value in 1998 (Tables NY-HB1,2). Silver hake (whiting) and Loligo squid made up over 70% of these landings; 66 other species were landed by draggers, including bluefish, butterfish, red hake, and summer flounder. Gill-nets are second in importance, accounting for 12% of the value of landings in 1998. They too had diverse landings, totalling 39 species, led by bluefish (31% of lbs.), angler (28%), and skates (23%).

"Table NY-HB1: Landings by Gear, Hampton Bays and Shinnecock, N.Y., 1998

GEAR TYPE:	LBS. %	VALUE %
Longline, Bottom	2.9	7.3
Handline	0.1	0.4
Longline, Pelagic	0.3	1.1
Otter Trawl, Bottom	84.3	74.2
Seines, Common and Haul	0.1	0.1
Gillnet, Sink	10.8	11.8
Pound Net, Fish	1.0	1.3
Pots/Traps, Fish	0.1	0.1
Pots/Traps, Eel	0.0	0.0
Pots/Traps, Conch	0.0	0.0
Pots/Traps, Lobster, Offshore	0.0	0.0
Pots/Traps, Lobster, Inshore	0.1	0.3
Shovels	0.0	0.1
By Hand	0.0	0.0
Rakes	0.0	0.0
Pots/Traps, Crab	0.0	0.0
Fyke-Net, Fish	0.0	0.0
Unknown	0.4	3.3

Total Landings by Weight, 1998: 13,143,401 lbs.
Total Landings by Value, 1998: $9,676,293

Table NY-HB2: Landings by Major Species, Shinnecock/Hampton Bays, NY, 1998

MAJOR SPECIES (>2%)	LBS. %	VALUE %
Angler	3.8	8.3
Bluefish	5.2	3.0
Winter Flounder	1.1	2.2
Summer Flounder	2.1	6.8
Yellowtail Flounder	0.9	2.0
Scup	1.5	3.4
Weakfish	2.5	2.1
Dogfish, NK	7.3	1.5
Skates	3.2	1.4
Tilefish	3.0	7.6
Silver Hake	37.5	23.1
Quahog	0.3	2.9
Loligo Squid	22.9	26.9

Total Number: 93

Other species of MAFMC interest, by percentage value, 1998: Butterfish (1.6), Atlantic Mackerel (0.3), Black Sea Bass (0.9), Smooth Dogfish (0.0), Spiny Dogfish (0.0), and Illex Squid (0.0).

Brooklyn

Commercial fish landings in New York City's boroughs have declined markedly over the years. Today landings in Brooklyn were reported in 1998 as less than 30,000 pounds, from otter-trawls (77%), sink gill nets (16%) and handlines. The principal species, out of 17 landed, were butterfish, bluefish, weakfish, and loligo squid. Sports fishing at Sheepshead Bay and other sites, have become more important than commercial fishing.

Columbia, Duchess, Queens, Greene, Rockland, Ulster, Westchester Counties

NMFS has "other" categories for counties where marine and estuarine fishes are landed. Those for Nassau and Suffolk are treated separately above. We lumped the others together; they largely represent estuarine and riverine fisheries. Most of these fisheries are the riverine ones for American shad (85% of pounds, 94% of value). Small amounts of menhaden, blue back herring, winter flounder, weakfish, scup and other species (totalling 10) were reported. The key gear types were drift and sink gill nets, both used for shad. Other gear types, with minor catches, were otter trawls, fyke nets, handlines, and fish pots/traps. The catches in 1998 were very small, totaling less than 200,000 lbs. or $230,000.

Belford, NJ

The fishing port of Belford is on a tidal creek leading out to Raritan Bay and the New York Bays.

Its fishery is oriented both to the bay and to the Atlantic Ocean, which is reached by going out around Sandy Hook, a few miles from Belford. Belford and neighboring Port Monmouth were once a large industrial fishing and processing center for menhaden, but the menhaden factory closed in 1982. Menhaden are still caught with small purse-seine boats and pound-nets, primarily for the bait market, and in 1998 they accounted for over 2/3rd of the landings in Belford (Table NJ-B1) Today Belford's fisheries are small-scale and owner-operated; most of the finfish are handled through a fishermen's cooperative, which sells wholesale but also runs a small retail store and restaurant. Lobsters are sold in other ways, including through a local lobster pound. Otter trawl finfishing is the most important activity, accounting for 50% of the landed value in 1998 (Table NJ-B1). It is a multi-species fishery: 42 species were landed in 1998. Major species caught by otter trawlers landing in Belford, by landed value, were summer flounder, Loligo squid, silver hake, winter flounder, spiny dogfish and skates. Lobster pot fishing is third only to purse seining and dragging; it accounted for 17% of landed value in 1998.

In recent years surf clam and ocean quahog vessels have been offloading at Belford, but in 1998 they accounted for less than 4% of the landed value (in contrast to 1992, when ocean quahogs accounted for over 30% of landed value). Crab dredging, in Raritan Bay, is of equal value. The last of New Jersey's pound-nets are in Raritan and Sandy Hook Bays; they accounted for 3.9% of Belford's total landed value in 1998. Some of that was from menhaden but 27 other species were also landed from the pound-nets, notably bluefish, weakfish, summer flounder, and butterfish; small amounts of tuna, skates, shad, tautog. Other fishing techniques used include crab and fish pots, handlining, and diving.

Table NJ-B1: Landings by Gear Type, Belford, NJ, 1998

GEAR TYPE, BELFORD, NJ	Lbs. %	Value %
Diving Gear	0.0	0.0
Dredge, SCOQ	2.7	3.8
Dredge, Crab	2.3	6.1
Hand Line	0.0	0.1
Pots/Traps, Lobster, Offshore	2.0	17.1
Pots/Traps, Blue Crab	0.0	0.0
Pots/Traps, Fish	0.0	0.2
Pound Nets	3.8	3.9
Purse Seine, Menhaden	65.1	18.6
Trawl, Otter, Bottom, Fish	23.9	50.1
Unknown	0.0	0.1

Note: “0.0" means more than 0 but less than 0.05. The figures for landings from which these percentages are derived are not given because they are confidential.

Other Monmouth County Ports

Highlands (at the mouth of two large tidal rivers coming out into Sandy Hook Bay with access to the Atlantic Ocean) and Neptune (in combination with neighboring municipalities which surround the tidal basin known as Shark River) are primarily small lobstering ports, sequestered within summer resort communities. Data for these ports are confidential. Highlands is also the site of bay clam depuration plants, which serve baymen who clam under state permits in Raritan and Sandy Hook Bays and the Navesink River. A small amount of handlining for finfish and potting for rock crab supplements lobstering. Atlantic Highlands is a center for recreational charter and party boat fishing.

Crabbing constitutes most of the landings for the rest of Monmouth County. The winter dredge fishery for blue crabs in Raritan Bay and its tributaries is significant. Clamming is also important. It takes place in the Sandy Hook and Raritan Bays and tidal rivers and is largely dependent on a "depuration" process, located in Highlands, as well as some "relaying" of clams to cleaner waters in south Jersey. Crabbers and clammers, like those involved in other fisheries, live in and around Belford, Highlands, and various municipalities along the shore of Raritan Bay.

Point Pleasant, NJ

The commercial fisheries of Point Pleasant are third in New Jersey to those of the Cape May-Wildwood area and Atlantic City (Table NJ-1). The weigh-out data include some bayman fisheries (i.e. "by hand" and crab dredge gears), but this is primarily an ocean fishing port, with a long history involving ocean pound-nets and fisheries focusing on the offshore 'canyons' of the region. The fishing port is actually Point Pleasant Beach, a borough within the larger town of Point Pleasant. Like so many ports of the Mid-Atlantic region, it is inlet-dependent. Ocean-going fishers must pass through the often dangerous Manasquan Inlet, a challenge shared with the recreational fishing community including the party and charter boat businesses of Point Pleasant and neighboring Brielle. This is a highly developed coastal region. Currently there is a wholesale finfish packing dock at Point Pleasant, a fishermen's cooperative. Another dock is primarily used for offloading surf clams and ocean quahogs although finfish may be handled there as well.

The fisheries are very diverse, the classic situation in the Mid-Atlantic. Two stand out in terms of volume and value: otter trawls and gillnetting, the latter particularly important for spiny dogfish as well as bluefish, weakfish, and other species (Table NJ-PP1). But sea scallop dredging is very important, as are surf clamming/ocean quahogging and offshore lobstering. Landings by major species for Point Pleasant are confidential but one can generalize that the most valuable species, in 1998, was angler or monkfish, which was partly incident to the scallop fishery but also caught by specialized gill-netters both local and migrating from other ports in the northeast and mid-Atlantic. Sea scallops were next in terms of ex-vessel value in 1998, followed by Loligo squid, a major focus of the local dragger fishery in the last decade, summer flounder, also a traditional fishery of the area but sharply cut back by regulations; lobster; spiny dogfish (like monkfish, caught by gill-netters as well as other fishers), and silver hake, or whiting. Whiting was one of the mainstays of this fishery from the 1970s through the 1980s; its availability and abundance have since declined. In terms of pounds landed, menhaden (purse-seined) and surf clams and ocean quahogs were the leading species in 1998, having come to replace the traditional otter trawl finfish fishery in importance over the past decade. Table NJ-PP1 gives landings by gear type.

Table NJ-PP1: Landings by Gear Type, Point Pleasant, NJ, 1998

GEAR TYPE, POINT PLEASANT, NJ:	Lbs. %	Value %
By Hand	0.0	0.0
	0.0	0.0
Dredge, Sea Scallop	1.2	10.4
Dredge, SCOQ	51.4	49.9
Gill Net, Drift	1.0	0.7
Gill Net, Sink	11.0	13.5
Hand Line	0.1	0.1
Longline, Pelagic	0.1	0.2
Pots/Traps, Lobster Offshore	0.6	3.5
Pots/Traps, Fish	0.0	0.0
Purse Seine, Menhaden	20.9	3.7
Trawl, Otter, Bottom, Fish	13.6	17.7
Troll Line	0.0	0.0
Troll Line, Tuna	0.0	0.0
Unknown	0.2	0.3

Total Landings, rounded, 1998: 31,916,900 lbs.
Total Value, rounded, 1998: $16,715,400 dollars

Point Pleasant Beach, NJ

The town of Point Pleasant (pop. 18,177, 1990) is located at the mouth of the Manasquan Inlet at the northern border of Ocean County. The town's economy is geared toward the summer tourist and recreational business. However, it is more than a "beach town", and has a large resident population. It is close to a larger township, called Brick or Bricktown (pop. 66,473, 1990), and across the Manasquan River from Manasquan (5,369, 1990) and Brielle (4,406). The fisheries are concentrated in an area known as Point Pleasant Beach, along a sandy strip which includes restaurants, a fisherman's supply store, small marinas, charter and party boat docks, and two commercial fishing docks.

One of the Cape May seafood businesses has two fishing properties in Point Pleasant, one of which is now used for offloading and trucking surf clams and ocean quahogs. (Each of these docks had been used for finfish until about 10 years ago). From 6 to 10 boats land clams here, according to company personnel interviewed in Cape May. There are 15 crew at the docks and about 50 on the boats. There is also a new (2000) seafood processing plant, initially shucking surf clams. One existed here two decades ago, part of the early surf clam industry.

A fishermen's cooperative owns two other properties, one for storing and working on gear and some dockage, the other including the coop's offices, gear storage, ice-making, packing house, and a retail store. The cooperative mostly depends on its fourteen or so members, who have older, wooden-hulled vessels, 45-65' in length. They are geared for bottom otter trawling in a mixed-species, diversified fishery. The vessels usually have a two or three man crew, including the captain, who are paid shares of the profits. They are all hired locally. Although there are families with several generations in the fisheries, in recent years crew members are not often related to the captain or owner. Some members of this cooperative and some crew members have been ethnic minorities (Spanish, Portuguese, Chinese, and others). A few women have crewed on these boats. The boats are all owner-operated. They tend to fish in areas of Hudson Canyon called "the Mudhole" or "the Gully." The Mudhole is closer and has a dredged channel, but poor landings, especially of silver hake ("whiting") have forced most to move north into the Gully, where silver hake seem to be more plentiful. The average trip to the Mudhole is one to three days, but for the Gully can last a week.

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

Summer flounder has long been a mainstay of this fishery, especially in the Mudhole in September and October, as well as other times in New Jersey and New York waters. Because of sharp quota restrictions, it is now a derby-like fishery. It is marketed in the fresh fish markets of New York and Philadelphia, in local restaurants and fish stores, and in the coop's own retail store.

At one time a few trawlers targeted scup (also called porgies), partially because doing so took pressure off a supply-burdened whiting market. (There was also a significant offshore summer flounder fishery in the winter months, for a few boats). Today no vessels target scup but may encounter large schools in the winter. Marketing is similar. Spiny dogfish have emerged as a very important fishery for the draggers and even more so for a gill-net fleet, both local and visiting, which has grown in recent years. Gill-netters have used "runaround" nets for species such as bluefish, Spanish mackerel, little tuna, scup, and weakfish, although this gear did not appear in the 1998 NMFS data. They use drift and sink nets for dogfish, angler, bluefish, weakfish, and other species. Angler, or monkfish, are particularly important. In 1998 local fishermen using sink gill nets caught almost 17 million pounds of monkfish as well as over 8 million pounds of spiny dogfish.

Barnegat Light (Long Beach Island), NJ

The fishing port of Long Beach Island is mostly located in the small bayside municipality of Barnegat Light, on this long, densely-developed barrier island on the central New Jersey coast. The commercial fishery has been undergoing a transition from over 20 years of specializing in offshore, deep-water and distant-water longlining. That tradition remains in the importance of bottom and pelagic longline gear (18% of total landed value) and of species such as tilefish, swordfish, and tunas (including big eye, yellowtail, blackfin, and skipjack in 1998) (Table NJ-LBI). (Handlines are also used for big eye tuna as well as for bluefish and other species; troll lines for yellowfin tuna). However, the physical perils of the inlet has kept this a relatively small-boat longliner fleet, and natural and regulatory changes in the species sought have forced people to look for alternatives. An alternative developed over the past decade is sea scalloping and the attendant by-catch of angler. Another is for expansion of the species sought with bottom and pelagic longlines, including sharks and dogfish among others. In 1998 the pelagic longline gear of Long Beach Island caught fully 23 different species, and bottom gear caught 17 species.

Whether transitional adaptation or old stand-by, the gill-net fisheries of Long Beach Island are the most substantial, representing 76% of poundage and 45% of landed value in 1998 (Table NJ-LBI1). The number of species involved is equally impressive: 61 for the drift gill-nets, including mackerel, dogfish, flounders, tunas, weakfish, shad, sharks; 23 for the sink gill-nets. In contrast, otter trawl dragging is minor and only 10 species were landed. Spiny dogfish are a recent focus, representing over one-third of the total landings in 1998.

Table NJ-LBI1: Landings by Gear Type, Long Beach Island, NJ, 1998

GEAR TYPE: LONG BEACH ISLAND, NJ	LBS. (%)	VALUE (%)
Dredge, Sea Scallop	5.7	28.6
Gill Net, Drift	64.0	34.9
Gill Net, sink	11.8	9.8
Handline	0.1	0.1
Longline, Bottom	7.0	6.1
Longline, Pelagic	11.2	19.9
Rakes	0.0	0.2
Otter Trawl	0.2	0.3
Troll Line, Tuna	0.0	0.0
Unknown	0.0	0.0

Total Landings, rounded, 1998: 10,032,800 lbs.
Total Value, rounded, 1998: $10,194,400 dollars

Other Ocean County, NJ

Ocean County, New Jersey, covers a large region, ranging from Point Pleasant Beach in the north to Long Beach Island and beyond to the south. The "Other Ocean" category encompasses the bayman fisheries in this region, which is made up of barrier islands and a large complex known as Barnegat Bay. It also includes some offshore fisheries from places other than Long Beach Island and Point Pleasant. The bayman fisheries are, as always, for blue crabs and for hard clams (quahogs). Pots are the major way blue crabs are caught; clams are caught with rakes, tongs and "By hand". Fyke nets are minor, for flounders and eels (they are increasingly restricted by regulation). NMFS 1998 weighout data on substantial longline and drift gill-net fisheries and on angler, scallop, tilefish, and bluefin tuna refer to offshore fisheries comparable to and probably associated with those of Long Beach Island.

Atlantic City and Other Atlantic County, N.J.

Atlantic City is better known for casino gambling and its boardwalk than for its status as a fishing port. The fishing port is on the backbay side of the city and is almost entirely given over to surf clam and ocean quahog dredge fishing (Table NJ-AC1). Atlantic City has long been a favored port for this fishery because of ready access to dense beds of clams off the central coast of New Jersey. Ocean quahogging has moved to more northern ports, especially New Bedford, Massachusetts, in recent years; it represented only 11% of the value of Atlantic City's landings in 1998. Other fisheries in Atlantic City are minor. Gears include sink gill-nets, and handlines, and bluefish, black sea bass, weakfish, jonah crab, lobster, and conch predominate.

Table NJ-AC1: Landings by Gear Type, Atlantic City, NJ, 1998

GEAR TYPE: ATLANTIC CITY, NJ	LBS. (%)	VALUE (%)
Dredge, SCOQ	99.9	99.7
Gill Net, Sink	0.0	0.0
Handline	0.0	0.0
Pots & Traps, Conch	0.0	0.0
Pots & Traps, Fish	0.1	0.2

Total Landings, rounded, 1998: 37,338,500 lbs.
Total Value, rounded, 1998: $17,867,000 dollars

Atlantic County, like the other coastal New Jersey counties, has numerous small-scale bay and estuary fisheries as well. By far the most important for this county is the hard clam (quahog) fishery (34% of the landings, 70% of the value for "other Atlantic" in 1998), using rakes, tongs, and "by hand" techniques such as treading. Some of this takes place through clam aquaculture. The other significant species is the blue crab, harvested with pots and dredges (50.5% landings, 25% value). Haul seines, fyke nets, gill nets, handlines, eel pots, and turtle traps are also used for white perch, menhaden, American shad, and many other bay and tidal river species.

Cape May, NJ

Cape May is New Jersey's largest commercial fishing port in terms of landings and value. When combined with neighboring Wildwood (the fishing port is often referred to as "Cape May/Wildwood"), its landings exceeded 93 million lbs., worth over $29 million in 1998.

Draggers, or vessels using bottom otter trawls, account for 69% of Cape May's landings and 70% of its value (Table NJ-CM1). Most are used for a wide variety of finfish species (56). Some are also used for scallops; Cape May has a long history of combined or alternating fin-fishing and scalloping. Squid is very important: In 1998 17% of Cape May's landed value came from Illex squid and another 22% from Loligo squid (Table NJ-CM2). Much of the squid is processed locally as is Atlantic mackerel, caught with draggers and midwater pair trawls. Summer flounder has been a major species but regulations have severely reduced catches (4% landed value in 1998). Scup is another dragger-caught species of historic importance in Cape May; in 1998 it represented 6% of landed value. Cape May is also the home of one of the very few vessels allowed to use purse seines for bluefin tuna in U.S. waters; this vessel lands its catch in Gloucester, MA. The only purse seine landings in Cape May in 1998 were for menhaden, using smaller vessels. Fishing for large pelagics is also done with longlines and troll lines.

Although sea scallop management measures have reduced opportunities for many Cape May fishermen, scalloping remains important. In addition to scalloping with otter trawls, scallop dredges are used, accounting for 15% of the total value of Cape May's landings in 1998. Angler (monkfish) are caught with scallop dredges as well as gill-nets, otter trawls, and scallop otter trawls (1.8% of landed value). Dogfish catches are now relatively small (0.3% of total landings in 1998).

Table NJ-CM1: Landings by Gear Type, Cape May, NJ, 1998

GEAR TYPE: CAPE MAY, NJ	LBS. (%)	VALUE (%)
Handline	0.0	0.0
Longline, Pelagic	0.0	0.3
Otter Trawl, Fish	68.9	61.9
Otter Trawl, Scallop	0.5	7.7
Troll Line, Tuna	0.0	0.0
Gill Net, Sink	0.2	0.5
Gill Net, Drift	0.1	0.1
Purse Seine, Other	0.0	0.0
Purse Seine, Menhaden	23.9	6.7
Dredge, Scallop	0.9	15.4
Menhaden Trawl	3.4	0.6
Pots & Traps, fish	0.1	0.7
Pots & Traps, Conch	0.1	0.4
Pots & Traps, Lobster Offshore	0.2	2.6
Dredge, Crab	0.1	0.3
Dredge, SCOQ	1.4	2.9
Unknown	0.0	0.0

Total Landings, rounded, 1998: 87,244,700 lbs.
Total Value, rounded, 1998: $25,757,200 dollars

Table NJ-CM2: Landings by Major Species, Cape May, NJ, 1998

MAJOR SPECIES: CAPE MAY, NJ	LBS. (%)	VALUE (%)
Atlantic Herring	2.9	1.0
Summer Flounder	0.9	3.9
Lobster	0.2	2.5
Atlantic Mackerel	20.9	8.2
Menhaden	24.1	6.8
Sea Scallop	1.1	21.9
Scup	1.7	6.1
Squid, Illex	34.1	16.9
Squid, Loligo	8.3	22.0
Surf Clam	1.4	2.9
Black Sea Bass	0.4	2.2

Number of Species: 69

Other species of MAFMC interest, by percentage of total value, 1998: Bluefish (0.2), Butterfish (0.5), Smooth dogfish (0.0), Spiny dogfish (0.1), Tilefish (0.0).

Wildwood, NJ

The fishing port of Wildwood is connected to a very popular tourist beach community. Resident and migratory draggers and clam boats are found in Wildwood. The largest landings come from surf clams and ocean quahogs, both harvested offshore with hydraulic dredges. A processing factory is in Wildwood. The otter trawl fleet accounts for 7% of Wildwood's landings, bringing in summer flounder, Loligo squid, butterfish, Atlantic croaker, black sea bass, weakfish, and other species (Table NJ-WW1). Wildwood also has a small pot fishery, including offshore lobster, conch, and fish pots (6% of value). The fish pots are used mainly for black sea bass. Gill-netting is done for weakfish, black sea bass, and other species. Wildwood also had some pelagic longline landings in 1998, notably swordfish and yellowfin tuna. Other species of Mid-Atlantic Fishery Management Council interest landed in 1998, in small quantities (less than 2% landed value) were bluefish, butterfish, Atlantic mackerel, scup, and dogfish.

Table NJ-WW1: Landings by Gear Type, Wildwood, NJ, 1998

GEAR TYPE: WILDWOOD, NJ	LBS. (%)	VALUE (%)
Crab Dredge	0.4	0.5
Surf Clam/Ocean Quahog Dredge	86.5	79.0
Gill Net, Drift	1.9	0.8
Gill Net, Sink	0.5	0.4
Handline	0.1	0.1
Longline, Pelagic	0.9	3.9
Pots & Traps, Offshore Lobster	0.8	1.7
Pots & Traps, Conch	0.5	2.0
Pots & Traps, Fish	1.1	2.8
Otter Trawl	7.2	8.6
Unknown	0.0	0.1

Total Landings, rounded, 1998: 6,193,40
Total Value, rounded, 1998: $3,492,900 dollars

Sea Isle City, NJ

Sea Isle City is north of Wildwood, one of the small fishing ports of the coast that is dependent on a dynamic and often problematic inlet for access to the sea. The fishery here is small. In 1998 fewer than 750,000 pounds, and $1.2 million dollars, were reported in the weighout data. There is a small offshore longliner fishery for tunas (mostly big eye, albacore and yellowfin) and swordfish. Otter trawl fishing includes spiny dogfish, skates, angler, and fluke but only 4% of the landed value. More significant are pot fisheries for offshore lobster (6% of value), conch (12%), and fish (12%, mostly black sea bass). Gill-netting represents 12% of the value, particularly for angler (monkfish). We did not visit Sea Isle City for this report but can report that it is primarily a summer beach town.

Other Cape May County

In the creeks and bays along the Atlantic coast of Cape May and around the cape to the Delaware Bay side are numerous small fisheries, coded as "other Cape May." These are the classic baymen or watermen fisheries, based on crustaceans and shellfish: blue crabs and hard clams dominate (66% and 23.5% of landed value, respectively). Horseshoe crabs are also harvested (12% of the 1998 poundage although only 1.6% of the value). There is a small gill-net fishery for species such as weakfish, American shad, and numerous other estuarine and anadromous species. Very small amounts of bluefish, butterfish, and summer flounder were landed in 1998. This fishery is very similar to and intertwined with the "Other Cumberland County" fishery discussed below.

Table NJ-OCM1: Landings by Gear Type, Other Cape May, 1998

GEAR TYPE: OTHER CAPE MAY, NJ	LBS. (%)	VALUE (%)
By Hand	17.9	23.6
By Hand, Oyster	0.1	0.8
Dredge, Crab	1.1	0.7
Gill Net, Drift	2.6	0.6
Gill Net, sink	0.0	0.0
Handline	0.5	0.5
Longline, Pelagic	0.3	0.3
Pots & Traps, Crab	74.8	65.3
Pots & Traps, Eel	2.2	4.0
Pots & Traps, Fish	0.0	0.0
Rakes	0.4	1.5

Total Landings, rounded, 1998: 1,190,800 lbs.
Total Value, rounded, 1998: $3,492,900 dollars

"Other Cumberland,"NJ

The two big fisheries for this region, the center of New Jersey's Delaware Bay fisheries, are for oysters and blue crabs (Tables NJ-CC1, CC2). 1998 was one of the few years in the past decade when oysters were harvested, due to problems with oyster diseases (there is no harvest in 2000 due to the disease ‘dermo’). Oysters were taken with dredges, and represented 48% of the landed value. Blue crabs are caught with dredges and pots, and represented 46% of the value in 1998. Both horseshoe crabs and menhaden are also taken in large quantities (4.8% and 11.6% of poundage, respectively), and are the focus of controversy in this area due to their alleged roles for migratory birds and as bait for other fishes.

Table NJ-CC1: Landings by Gear Type, Cumberland County, NJ, 1998

Cumberland County Landings by Gear Type	Percent Lbs.	Percent Value
Handline	0.9	0.6
Gill-net, Sink	2.6	0.9
Gill-net, Drift	5.3	1.4
Pots/Traps, Eels	0.8	1.3
By Hand	11.6	1.4
Dredge, Oyster	15.8	48.0
Dredge, Crab	2.4	1.5
Pots/Traps, Blue Crab	60.6	45.0

Total Landings, rounded, 1998: 4,444,900 lbs.
Total Value, rounded, 1998: $5,573,300

Table NJ-OCM2: Landings by Major Species, Pounds and Value, Other Cumberland County, NJ, 1998

Cumberland County, Major Species, 1998	Percent Lbs.	Percent Value
Menhaden	4.6	0.5
Weakfish	2.6	1.5
Blue Crab	62.9	46.4
Horseshoe Crab	11.6	1.4
Oysters	15.8	48

Total Species: 19, including MAFMC-managed Bluefish (0.0% value, 1998), Butterfish (0.0), and Summer Flounder (0.0).

Other New Jersey

Surprisingly, some commercial fishing is reported from the heavily urbanized, industrialized areas of northeastern New Jersey. There is a substantial amount of squid, both *Illex* and *Loligo*, as well as some summer flounder landed in (and trucked into) heavily urbanized Essex County, the site of a packing and processing company. Crab pot fishing is found with small landings in urbanized Bergen and Middlesex Counties. At the other side of the state, commercial fishing extends upbay and upriver from Cumberland County, into rural Salem and Hunterdon counties. Hunterdon is the site of one of the last of the river shad seine fisheries (and an annual shad festival). Salem is the home of small-scale waterman fisheries which involve gill-netting for shad, weakfish and other species, harvesting eels and snapper turtles.

Ocean City, MD (West Ocean City)

Ocean City, on the Atlantic Coast, is the only major port in Maryland engaged in the inshore and EEZ ocean fisheries. It accounts for 18.1% of the pounds landed and only 9.5% of the value landed in 1998 (Table MD1).

The major commercial fishing gears used for landings in Ocean City in 1998 (Table MD-OC1) were:
--gill-netting, heavily dependent on angler and spiny dogfish, but engaged in a very diversified fishery;
--surf clam and ocean quahogging, with small by-catches of angler and scallops;
--bottom dragging with otter trawls, a highly diversified fishery, with strong foci on summer flounder and loligo squid, but also landing 48 other species.

In terms of value, other gear types also emerge as important, namely fish traps and pelagic longlining. Traps are also used for lobster and conch.

Table MD-OC1: Landings by Gear Type, Ocean City, MD 1998

GEAR TYPE: OCEAN CITY, MD	*Lbs. %*	*Value %*
By hand	0.0	0.0
Dredge, SCOQ	56.3	55.8
Gill net, sink	28.1	13.7
Handline	0.0	0.0
Harpoon	0.0	0.0
Longline, pelagic	2.1	11.1
Pots, Lobster Offshore	0.1	0.7
Pots/Traps, Conch	0.9	1.4
Pots/Traps, Fish	2.9	7.4
Otter Trawl, Bottom, Fish	9.5	9.9
Unknown	0.0	0

Total Landings, rounded, 1998: 11,073,123 lbs. (of state total)
Total Value, rounded, 1998: $6,356,802 (of state total)

The major species caught commercially in Ocean City (Table MD-OC2), ranked by 1998 landed value, are:

--surf clams and ocean quahogs
--black sea bass caught mostly with fish traps but also gillnets and draggers;
--angler, caught primarily with sink gillnets but also by the draggers and the clam boats;
--spiny dogfish, caught primarily by the gillnet fleet and also by draggers.
--summer flounder, mostly a dragger fishery

--swordfish, among the species caught with pelagic longlines from this port (tunas are also caught, and big eye and yellowfin tuna each represented over 2% of the total landed value in 1998).

Other species of significance (using the criterion of at least 2% of poundage or value) are:

-- Atlantic croaker and Atlantic mackerel, each caught by draggers and gill-netters
-- striped bass, also caught by draggers and gill-netters
-- lobster, an offshore pot fishery.

Table MD-OC2: Major Species, Landed, Ocean City, MD, 1998

Major Species: Ocean City, MD	Lbs (%)	Value (%)
Dogfish, Spiny	21.6	5.6
Angler	3.8	6.0
Clam, Surf	**	**
Quahog, Ocean	**	**
Sea Bass, Black	2.8	7.1
Flounder, Summer	1.6	5.0
Swordfish	0.7	4.5
Tuna, Big Eye	0.5	2.7
Tuna, Yellowfin	0.5	2.3

Total Species Landed: 69

Note: ** indicates confidential data because fewer than 3 federally permitted dealers involved. Other species landed of MAFMC relevance (by % value): Bluefish (0.3%), Butterfish (**), Atlantic Mackerel (0.5%), Scup (**), Tilefish (**), Loligo Squid (0.8%), Illex Squid (**).

Chesapeake Bay

Virtually all of the other fishing activity in Maryland centers on the Chesapeake Bay and its tributaries. It is based in numerous small and dispersed landing areas, and focuses on the classic bay fisheries with blue crabs and oysters taking the lead (Table MD-OM1). This is the home of the Chesapeake Bay "watermen." For all ports in Maryland excluding Ocean City, blue crabs represented 71.5% of the value and oysters 12.6% of the value. The only other sizeable fishery in 1998 was for striped bass (5.9% of the value), thanks to the recovery of that species after a long moratorium. True to the tradition of watermen and baymen in the Mid-Atlantic, the diversity of species caught is extremely high: 57 species, ranging from terrapin and snapper turtles, crappies, carp, bullheads, and alewives, to name a few of the brackish water and anadromous species, to soft clams, horseshoe crabs, eels, lobsters, sturgeons, sunfishes, and sharks.

Table MD-OM1: Major Species, Other Maryland Ports, 1998

MAJOR SPECIES (>2%): MARYLAND OTHER THAN OCEAN CITY	Lbs (%)	Value (%)
Bass, Striped	5.6	5.9
Crabs, Blue	61.6	71.5
Croaker, Atlantic	2.4	0.7
Menhaden	8.9	0.7
Oysters	4.9	12.6
Gizzard Shad	3.5	0.9
White Perch	2.9	1.5
Soft Clam	0.4	2.1
Catfish	4.7	1.6

Total Species Landed: 57
Total Landings, 1998: 50,094,300 lbs.
Total Value, 1998: $60,832,500

Species Relevant to MAFMC according to value in 1998: Bluefish (0.1%), Butterfish (0.0%), Summer Flounder (0.2%), Atlantic Mackerel (0.0%), Scup (0.0%), Black Sea Bass (0.0%, Smooth Dogfish (0.0%), Spiny Dogfish (0.0%).

Virginia Beach, VA/ Lynnhaven

Most of the commercial fishing activity in Virginia Beach occurs in the Lynhaven section, along Long Creek, which empties into Lynhaven Bay and eventually Chesapeake Bay.Two active federally permitted dealers in this port also operate as packing houses for two out-or-town dealers. In the past, there also was significant activity at Rudee Inlet on the Atlantic side of the city, but now there are only 3 or 4 commercial boats that work out of there.

The commercial fishery at Virginia Beach/Lynhaven is inlet-dependent and pressured by competition for waterfront from tourist-related development and recreational boaters and fishers. The major gear type used as reported to the NMFS is the sink gill-net, used to catch a large number of species including bluefish, striped bass, Atlantic croaker, summer flounder, shad, dogfish, weakfish and spot (Table VA-VB1). Drift and stake gill nets are also used, the latter for spiny dogfish and bluefish among other species. This is also a center of pot fishing, for blue crabs, eels, conchs (whelks) and fish. The fish catches were mainly black sea bass and tautog. Handlines accounted for 9% of the landed value in 1998, mostly from black sea bass and summer flounder catches, but also striped bass, tautog, tilefish, tunas, and others. Pound nets accounted for 3.3% of the value in 1998; species included striped bass, bluefish, butterfish, Atlantic croaker, summer flounder, Spanish mackerel, spot, and weakfish.

Table VA-VB1: Landings by Gear Type, Virginia Beach/Lynhaven, 1998

GEAR TYPE: VIRGINIA BEACH/LYNHAVEN	LBS. (%)	VALUE (%)
By Hand	0.0	0.0
Common Seine, Haul Seine	0.7	0.7
Dredge, conch	0.3	0.9
Dredge, Crab	0.8	1.0
Gill Net, Drift	1.3	1.0
Gill Net, Sink	70.1	43.3
Gill Net, Stake	0.2	0.1
Handline	2.0	9.2
Pots & Traps, Blue Crab	12.9	18.3
Pots & Traps, Conch	3.7	14.1
Pots & Traps, Eel	0.1	0.2
Pots & Traps, Fish	2.8	7.8
Pound Net	5.1	3.3
Tongs & Grabs, Clam, Patent	0.0	0.0

Total Landings, rounded, 1998: 7,812,000 lbs.
Total Value, rounded, 1998: $4,272,800 dollars

Note: "0.0" means some activity but less than .06%

By species blue crab represented the highest value (19%). Next was black sea bass, which comprised 16% of 1998 landed value, mostly from handlining and fish pots (Table VA-VB2). Gillnetting for dogfish is another very important fishery. Atlantic croaker and striped bass are significant catches from the gill-net, handline, and pound-net fisheries, as is spot. Channeled whelk, caught in conch pots, made up 11% of value. The total number of species, though, is as always in this region very large: 65.

Table VA-VB22: Landings by Major Species, Virginia Beach/Lynhaven, 1998

MAJOR SPECIES: VIRGINIA BEACH/LYNHAVEN	LBS. (%)	VALUE (%)
Striped Bass	4.4	11.0
Blue Crab	13.7	19.1
Atlantic Croaker	**	**
Spiny Dogfish	**	**
Black Sea Bass	4.2	15.6
Spot	14.1	8.8
Channeled Whelk	2.8	11.2
Conch	1.4	5.3
Other Fish, Industrial	2.2	0.3

Number of Species: 65

Note: ** indicates confidential data due to small number of businesses involved.
Other species of MAFMC interest by percentage value, 1998: Bluefish (0.7), Butterfish (0.7), Summer Flounder (0.3), Atlantic Mackerel (**), Scup (**), Dogfish, Other (0.3), Dogfish, Smooth (**), Tilefish (**), Loligo Squid (**).

Newport News, VA

Sea scalloping is the principal fishery of Newport News, accounting for 72% of landed value in 1998. Scallopers use both dredges and bottom otter trawls (Table VA-NN1). Another fishery is finfish dragging (8.2% of value, 24.5% of landings) for a large variety of species. Summer flounder, angler, and black sea bass are landed in significant quantities (Table VA-NN2). Small scale inshore and bay fisheries are part of the waterman complex. They include clamming (hard clams or quahogs) and oystering using dredges, patent tongs, tongs and rakes; drift and sink gill-netting; pot-fishing and dredging for crabs (blue crabs were 28% of landings, 7% of value) and oysters; pot fishing for conch and eels and seining.

Table VA-NN1: Landings by Gear Type, Newport News, VA, 1998

GEAR TYPES, NEWPORT NEWS	LBS. (%)	VALUE (%)
Common Seine, Haul Seine	0.0	0.0
Dredge, Clam	0.0	0.0
Dredge, Crab	1.4	0.4
Dredge, Oyster	0.0	0.0
Dredge, Sea Scallop	32.9	59.7
Gill Net, Drift	0.0	0.0
Gill Net, Sink	1.0	0.3
Handline	0.0	0.0
Pots/Traps, Blue Crab	26.4	7.1
Pots/Traps, Conch	0.0	0.0
Pots/Traps, Eel	0.1	0.0
Tongs/Grabs, Oyster	0.5	0.6
Tongs/Grabs, Clam	2.4	6.0
Otter Trawl, Bottom, Fish	26.4	10.3
Otter Trawl, Bottom, Other	0.0	0.0
Otter Trawl, Bottom, Scallop	8.7	15.5

Total Landings, rounded, 1998: 5,742,500 lbs.
Total Value, rounded, 1998: $15,945,700 dollars

Table VA-NN2: Landings by Major Species, Newport News, VA, 1998

MAJOR SPECIES: NEWPORT NEWS, VA	LBS. (%)	VALUE (%)
Crab, Blue	27.7	7.3
Flounder, Summer	19.8	8.6
Quahog	2.4	6.1
Scallop, Sea	34.4	72.1
Sea Bass, Black	2.4	0.9
Angler	7.0	3.0

Number of Species: 59

Other species of MAFMC interest, by percentage value 1998: Bluefish (0.2), Butterfish (0.0), Scup (0.0), Smooth Dogfish (0.0), Tilefish (0.0), Loligo Squid (0.4).

Norfolk, VA

The commercial fishery of Norfolk, VA today is actually typical of the more rural waterman communities. Only a few fish houses are left to buy from local fishers; other docks and wholesalers have closed down, and one wholesaler has changed to a retail store and restaurant. The fishery is a small inshore and bay fishery. Principal gears used are crab pots (55% of value), crab dredges (10%), clam patent tongs and rakes (4%), handlines (10%) and sink gill-nets (12%). Other gears are haul seines, conch dredges, and eel and fish pots. Striped bass (10% of value) are caught with gill-nets, handlines and seines, as are Atlantic croaker (4% of value) and other estuarine and anadromous species. The small black sea bass fishery here (2.2% of value) is carried out with handlines, as is the summer flounder fishery (2.1%). Blue crabs make up two-thirds of the value of Norfolk's catch (64%); hard clams or quahogs account for 4%, and conch 4% as well.

Hampton and Seaford, VA

For purposes of discussing fishery landings and preserving confidentiality, we have combined weighout data for Hampton (within the Metropolitan Statistical Area depicted above) and Seaford (within York County, census and employment data for which are offered below). Gear-type data (Table VA-H1) show that sea-scalloping with dredges is the single-most important fishery by value; otter-trawl dragging for finfish is highest for poundage. Some draggers are also used for scalloping. Gill-netting, crab potting and dredging, seining, and tonging for clams are other techniques used in these two ports (Seaford is almost entirely devoted to scalloping, but scalloping is also important in Hampton).

Like Newport News, Hampton and Seaford are important sea scalloping ports near the mouth of Chesapeake Bay. Scallops accounted for 69% of landed value in 1998. In Hampton, a significant portion of the scallops are caught with otter trawls rather than scallop dredges. The sea scallop fleet of Seaford relies entirely on dredges and accounts for virtually all of the landings and landed value there. Besides scallops these dredge-equipped vessels caught large amounts of angler as well as a small amount of summer flounder.

Finfish dragging is also important in Hampton. Species diversity is extremely high. The otter trawl fleet of Hampton takes Illex and Loligo squid, black sea bass (a substantial amount is also caught with handlines); Atlantic mackerel; Atlantic croaker (a large portion was caught by haul seines as well as pound nets and sink gill nets); and angler (although most was landed by scallop dredges and scallop otter trawls). A small amount of pelagic longlining is also done from Hampton, for black tip, mako shortfin and thresher sharks and tuna (big eye, yellowfin, albacore)

The inshore and bay fisheries of Hampton include the pound-net and seine fisheries for Atlantic croaker, gill-netting and handlining, blue crabs, (caught with dredges, pots, and scrapes) and hard clams or quahogs (harvested with patent tongs and crabs). We have combined the weighout data for Hampton and Seaford to preserve the confidentiality of data for fisheries with few businesses involved. Species diversity in the landings at Hampton and Seaford is extremely high, 79 in 1998 (Table VA-H2). Fourteen had either poundage or value at or above 2% in 1998, led by sea scallops, summer flounder, Illex squid, Atlantic croaker, blue crab, and angler.

Table VA-H1: Landings by Gear Type, Hampton and Seaford, VA, 1998

GEAR TYPE: HAMPTON & SEAFORD	LBS (%)	VALUE (%)
Common Seine, Haul Seine	4.6	0.7
Dredge, Crab	1.6	0.8
Dredge, Scallop, Sea	16.6	57.2
Gill Net, Drift	0.7	0.2
Gill Net, Sink	8.2	2.1
Handline	0.3	0.2
Longline, Pelagic	0.1	0.1
Pots & Traps, Blue Crab	9.2	3.9
Pots & Traps, conch	0.0	0.0
Pots & Traps, Eel	0.0	0.0
Pots & Traps, fish	0.0	0.0
Scrapes	0.0	0.0
Tongs & Grabs, Clam, Patent	0.7	3.4
Otter Trawl, Bottom, Fish	53.5	16.5
Otter Trawl, Bottom, Scallop	4.4	14.7
Otter Trawl, Bottom, Shrimp	0.0	0.0
Pound Nets	0.0	0.0

Total Landings, rounded, 1998: 9,089,500 lbs.
Total Value, rounded, 1998: $13,311,000 dollars

Table VA-H2: Major Species Landed, Hampton and Seaford, VA, 1998

MAJOR SPECIES: HAMPTON & SEAFORD	LBS (%)	VALUE (%)
Angler	3.6	3.1
Crab, Blue	10.8	4.7
Croaker, Atlantic	13.2	2.1
Flounder, Summer	11.1	9.4
Mackerel, Atlantic	**	**
Scallop, Sea	17.3	68.8
Sea Bass, Black	2.9	2.6
Squid, Illex	**	**
Squid, Loligo	3.2	0.9
Other Fish, Industrial	2.1	0.1
Striped Bass	4.8	1.1
Herring, NK	**	**
Herring, Atlantic	**	**
Quahog	1.3	4.2

Number of Species: 79

Note: ** indicates confidential data due to small number of businesses involved.

Other species of MAFMC interest, by percentage value, 1998: Bluefish (0.4), Butterfish (0.1), Scup (0.1), Spiny Dogfish (0.0), Tilefish (0.0).

Northampton County, VA

Northampton County is at the southernmost tip of the Delmarva peninsula. Among its fishing ports are Oyster, inside the barrier islands of the Atlantic coast, and Cape Charles, at the entrance to the Chesapeake Bay, but most of the landings come from smaller sites coded as "Other Northampton" in NMFS weighout data. The fisheries are inshore and estuarine, dominated by blue crabs, Atlantic croaker, hard clams, and horseshoe crabs (Table VA-N2). Weakfish/squeteague and striped bass are among the 45 other species landed commercially in this area of Virginia.

Reflecting the importance of blue-crabs, the most important single gear-type is the blue crab pot (Table VA-N1). Pots are also used for conch, eel, and fish (the 1998 catches of the fish pots were Atlantic croaker and northern puffer, the latter a most unusual specialty). Dredges are used for hard clams, conch, horseshoe crabs, and blue crabs. Scrapes are used for crabs and eels; clams are harvested with patent tongs and "by hand."

Pound-nets are also important, both for crab and for fish. The fish pound nets catch Atlantic croakers, striped bass, summer flounder, weakfish and others, totaling 32 species. Otter trawl and "unknown" constitute the next largest gear types, totaling 8% of value; both were almost entirely horseshoe crab harvests in 1998. Gill-nets are used for a large variety of species; drift gill nets for 30 species, including striped bass, Atlantic croaker, and spot; sink gill nets for 25 species, including American shad and weakfish. The NMFS dealer weighout data used for landings do not completely reflect the active, inshore fishery of Virginia, which is recorded by the State of Virginia. On the other hand, they do indicate the variety of techniques and fisheries.

Table VA-N1: Landings by Gear Type, Northampton County, VA, 1998

GEAR TYPE: NORTHAMPTON CO., VA	LBS (%)	VALUE (%)
By Hand	0.3	2.3
By Hand, Oyster	0.0	0.0
Common, Haul Seine	0.0	0.0
Dredge, Clam	0.3	3.4
Dredge, Conch	0.1	0.3
Dredge, Crab	6.4	7.9
Dredge, Other	0.3	0.1
Gill Net, Drift	6.1	4.9
Gill Net, Sink	4.7	4.4
Gill Net, Stake	0.1	0.1
Handline	0.2	0.4
Pots & Traps, Blue Crab	28.7	33.6
Pots & Traps, Conch	0.4	1.6
Pots & Traps, Eel	0.0	0.0
Pots & Traps, Fish	0.1	0.2
Pound Net, Crabs	0.2	0.6
Pound Net, Fish	24.0	14.7
Scrapes	0.0	0.1
Tongs & Grabs, Clam, Patent	0.0	0.3
Otter Trawl, Bottom, Fish	16.7	13.9
“Unknown” (Horseshoe Crab)	11.4	11.1

Total Landings, rounded, 1998: 8,468,400 lbs.
Total Value, rounded, 1998: $5,001,400 dollars

Note: "0.0" indicates some activity but less than 0.06%

Table VA-N2: Landings by Major Species, Northampton County, VA, 1998

MAJOR SPECIES: NORTHAMPTON CO., VA	LBS. (%)	VALUE (%)
Bass, Striped	1.3	3.1
Crab, Blue	34.9	41.2
Crab, Horseshoe	28.2	25.2
Croaker, Atlantic	21.4	13.1
Quahog	0.5	2.9
Spot	2.4	1.4
Conch	0.8	2.9
Clams, Bloodarc	0.2	2.9
Weakfish	5.1	2.5

Number of Species: 49

Other species of MAFMC interest, by percentage value 1998: Bluefish (0.6), Butterfi sh (0.1).

Accomack County and Chincoteague, VA

The visiting otter trawl fishery accounts for almost half of Chincoteague's 1998 landed value; summer flounder predominates in this fishery and is the leading species for landed value (39%). Like other Mid-Atlantic otter trawl fleets, this one is highly diverse, landing 19 species in 1998, led by summer flounder, black sea bass, and Loligo squid. There is a small drift gill-net fishery for striped bass, Atlantic croaker and other species and a large sink gill-net fishery (27% of Chincoteague's value), mainly for angler, but also spiny dogfish, Atlantic mackerel, and other species. Angler was almost as valuable as fluke in 1998. Some handlining and longlining for tunas and sharks takes place, and in1998 16% of the value came from fish pots, mainly black sea bass. Less than 5% of Chincoteague's fishing activity, in terms of value, came from clamming, crabbing and other estuarine and bay fisheries, which otherwise predominate in the Virginia and Maryland region.

Table VA-AC1 shows 1998 landings and value, broken down by percentage for gear type and major species, combining Chincoteague's landings with those of the many small waterman fisheries of Accomack County, as well as the port of Wachapreague. Seventy-two species were landed in 1998, primarily blue crabs. Crabs are caught with dredges, pots, scrapes, and trot-lines. There is also oystering and hard-clamming. Angler and summer flounder, mainly from Chincoteague's gill-net and otter trawl fisheries, account for 2.2% and 3.8% of the county's total value. Striped bass, Atlantic croaker, and conch are other important species.

The major gear types are crab pots (52.2% of value) and conch and fish pots (4.9%); crab scrapes and dredges. Also important are gillnets (19.8% of value); otter trawls; and "by hand" referring to treading, hand rakes, and other techniques used to harvest hard clams, oysters and horseshoe crabs.

Table VA-CH1: Landings by Gear Type, Accomack County, VA, 1998

GEAR TYPE: CHINCOTEAGUE & OTHER ACCOMACK CO, VA	LBS. %	VALUE %
By Hand	0.5	2.4
By Hand, Oyster	0.0	0.0
Dredge, clam	0.1	0.5
Gill Net, Drift	15.0	7.9
Gill Net, Sink	19.5	11.8
Gill Net, Stake	0.1	0.1
Handline	0.0	0.1
Longline Pelagic	0.0	0.0
Pots & Traps, Blue Crab	45.9	52.2
Pots & Traps, Conch	1.5	3.1
Pots & Traps, Fish	1.2	1.8
Rakes, Other	0.0	0.1
Trawl, Otter, Bottom, Fish	3.3	4.4
Cast Nets	0.1	0.1
Seines	0.7	0.3
Dredge, Conch	1.9	1.5
Dredge, Crab	4.4	4.3
Dredge, Oyster	0.1	0.3
Pots & Traps, Eel	0.0	0.0
Pound Net, Crab	0.1	0.3
Pound Net, Fish	3.2	0.8
Scrapes	2.1	7.3
Tongs & Grabs, Patent	0.1	0.7
Trot Line	0.1	0.1

Total Landings, rounded, 1998: 11,077,100 lbs.
Total Value, rounded, 1998: $8,485,000 dollars

Table VA-AC2: Landings by Major Species, Accomack County, VA, 1998

MAJOR SPECIES: ACCOMACK CO, VA	LBS. (%)	VALUE(-%)
Crab, Blue	52.2	63.9
Flounder, Summer	2.4	3.8
Angler	**	**
Bass, Striped	1.5	2.7
Croaker, Atlantic	**	**
Dogfish, Spiny	**	**
Quahog	0.6	3.4
Horseshoe Crab	2.5	1.5
Conch	1.6	3.3
Menhaden	2.8	0.3

Spot	8.2	4.1

Number of Species: 72

Note: ** indicates confidential data due to the small number of businesses involved
Other Species of MAFMC interest, by percentage value, 1998: Bluefish (0.5), Butterfish (0.1), Atlantic Mackerel (0.1), Scup (0.0), Black Sea Bass (1.7), Tilefish (**), Loligo Squid (**).

Carteret County, NC (includes fishing centers of Morehead City, Beaufort, Bettie, Harker's Island, Davis, Stacy, Sea Level, Atlantic, Cedar Island)

Carteret County has the largest fishery in terms of poundage and second largest in terms of value in North Carolina (Table NC1). Total 1998 landings were over 80 million lbs, but value was little more than 21 million lbs., largely due to the low value of species such as menhaden and thread herring caught by purse-seining. Other important fisheries were crab-potting, shrimp trawling, fluke trawling, hard-clamming, and the use of pound-nets, sink gill nets, longlines, and other gears for a large variety of finfishes (the total number of species landed was 69) (Tables NC-CC1, 2).

Table NC-CC1: Landings by Gear Type, Carteret County, North Carolina, 1998

GEAR TYPE	LBS. %	VALUE %
Beach seine	0.0%	0.0%
By hand	0.1%	2.0%
Cast net	0.1%	0.0%
Channel net	0.1%	0.5%
Clam dredge (hydraulic)	0.0%	0.7%
Clam trawl, kicking	0.1%	2.2%
Common seine	0.0%	0.0%
Crab pot	6.0%	13.4%
Crab trawl	0.6%	1.4%
Fish pot	0.0%	0.2%
Flounder trawl	2.4%	9.1%
Flynet	0.6%	0.7%
Gigs	0.0%	0.1%
Gill net (drift)	0.1%	0.1%
Gill net (runaround)	0.5%	1.1%
Gill net set (float)	0.4%	1.1%
Gill net set (sink)	3.7%	5.4%
Haul seine	1.7%	2.9%
Longline bottom	0.0%	0.1%
Longline surface	0.1%	0.9%
Other (including conf.)	78.7%	22.8%
Oyster dredge	0.0%	0.1%
Peeler pot	0.0%	0.1%
Pound net	1.0%	5.5%
Purse seine	0.0%	0.0%
Rakes bull	0.0%	0.5%
Rakes hand	0.2%	3.8%
Rod-n-reel	0.8%	5.0%
Scallop dredge (bay)	0.1%	1.1%
Scallop dredge (sea)	0.0%	0.0%
Scallop scoop	0.0%	0.0%
Scallop trawl	0.0%	0.0%
Shrimp trawl	2.4%	16.7%
Skimmer trawl	0.1%	1.1%
Swipe net	0.0%	0.0%
Tongs, hand	0.0%	0.8%
Trolling	0.1%	0.4%

Total landings, rounded, 1998: 80,417,400 lbs.
Total value, rounded, 1998: 21,332,100 dollars

Table NC-CC2: Landings by Major Species, Carteret County, NC, 1998

MAJOR SPECIES >2%	LBS. %	VALUE %
Unclassified shrimp	1.9%	16.7%
Crabs, blue, hard	7.1%	15.4%
Croaker, atlantic	2.7%	3.0%
Flounders, fluke	2.0%	14.0%
Other (including conf.)	78.7%	22.8%
Spot	1.5%	2.4%
Weakfish (seatrout, grey)	1.6%	2.8%
Clam, hard (meats)	0.4%	9.2%
Groupers	0.2%	1.9%

Number of species: 69

Pamlico County, NC

Pamlico County (pop. 11,372, 1990) had impressive total landings in 1998 of over 10 million pounds, worth over 9 million dollars. Important fishing centers include Bayboro, Vandemere, Hobucken and Oriental. Fishing takes place in the sounds and tidal rivers as well as coastal marine waters. Crab-potting, shrimp trawling, and flounder trawling are the major fisheries. Blue crabs accounted for 62% of the value in 1998, shrimp 13%, and fluke 19%. Fluke were caught mainly in trawls ("flounder trawls") but also in crab pots, crab trawls, drift or runaround gill-nets, set gill nets (float and sink), haul seines, pound nets, shrimp trawls, and swipe nets. Like other Mid-Atlantic areas, this is a very diversified fishing region, 46 species being landed by 19 different techniques or gears (Tables NC-PC1, 2).

Table NC-PC1: Landings by Gear Type, Pamlico County, NC, 1998

GEAR TYPE	LBS. %	VALUE %
By hand	0.0%	0.0%
Crab pot	72.0%	57.2%
Crab trawl	7.3%	5.5%
Eel pot	0.0%	0.0%
Flounder trawl	8.5%	16.6%
Flynet	0.0%	0.0%
Gill net (drift)	0.0%	0.0%
Gill net (runaround)	2.7%	1.7%
Gill net set (float)	2.5%	3.2%
Gill net set (sink)	0.5%	0.4%
Haul seine	0.0%	0.0%
Other (including conf.)	1.1%	1.4%
Oyster dredge	0.1%	0.3%
Peeler pot	0.0%	0.0%
Pound net	0.0%	0.0%
Rod-n-reel	0.0%	0.0%
Scallop trawl	0.0%	0.3%
Shrimp trawl	5.3%	13.5%
Swipe net	0.0%	0.0%

Total landings, 1998, rounded: 10,502,300 lbs.
Total value, 1998, rounded: 9,271,800dollars

Table NC-PC2: Landings by Major Species, Pamlico County, NC, 1998

MAJOR SPECIES >2%	LBS. %	VALUE %
Unclassified shrimp	4.9%	13.1%
Crabs, blue, hard	78.5%	60.1%
Flounders, fluke	9.4%	19.3%
Mullets	3.0%	1.6%
Crabs, blue, peeler	0.9%	2.1%

Number of species: 46

Beaufort County, NC

Beaufort County (pop. 42,283, 1990) is an important fishing county, accounting for over 10 million lbs. and 8 million dollars in 1998 (Tables NC-BC1,2). Bellhaven is the principal fishing port. Blue crabs, caught with pots, trawls, trotlines, and other methods, comprise almost all of the landings and value. Fluke made up over 3% of the value. Shrimp is also important although not shown below because of confidentiality.

Table NC-BC1: Landings by Gear-Type, Beaufort County, NC, 1998

GEAR TYPE	LBS. %	VALUE %
Crab pot	85.6%	82.9%
Crab trawl	10.0%	10.0%
Eel pot	0.1%	0.2%
Fish pot	0.0%	0.0%
Flounder trawl	0.0%	0.0%
Fyke net	0.0%	0.0%
Gigs	0.0%	0.0%
Gill net (runaround)	0.0%	0.0%
Gill net set (float)	1.4%	1.1%
Gill net set (sink)	1.2%	1.9%
Other (including conf.)	1.5%	3.7%
Oyster dredge	0.0%	0.0%
Peeler pot	0.0%	0.0%
Pound net	0.0%	0.0%
Rod-n-reel	0.0%	0.0%
Shrimp trawl	0.1%	0.1%
Trolling	0.0%	0.0%
Trotline	0.0%	0.0%

Total landings, rounded, 1998: 10,147,000 lbs.
Total value, rounded,1998: 8,035,100 dollars

Table NC-BC2: Landings by Major Species, Beaufort County, NC, 1998

MAJOR SPECIES >2%	LBS. %	VALUE %
Crabs, blue, hard	94.4%	89.8%
Flounders, fluke	1.4%	3.1%
Other (including conf.)	1.5%	3.7%

Number of species: 38

Hyde County, NC

Hyde County (pop. 5,411 in 1990) although small in population (reportedly there is only one traffic light in the county) is the third largest fishing county of North Carolina, with total landings over 16 million lbs. and value over 10 million dollars in 1998 (Tables NC-HC1,2). Fishing centers include Swan Quarter, Engelhard and Ocracoke. Blue crabs and fluke are the two most important species in terms of value; dogfish, and Atlantic croaker are also significant, and 56 other species are caught. Gears used are the full array of estuarine and inshore techniques, particularly crab pots and trawls, sink and float set gill nets, shrimp trawls, pound nets, and flounder trawls.

Table NC-HC1: Landings by Gear Type, Hyde County, NC, 1998

GEAR TYPE	LBS. %	VALUE %
By hand	0.0%	0.0%
Cast net	0.0%	0.0%
Crab pot	63.0%	58.4%
Crab trawl	4.4%	3.8%
Fish pot	0.0%	0.0%
Flounders trawl	1.9%	5.0%
Fly net	0.3%	0.6%
Gill net (runaround)	0.4%	0.3%
Gill net set (float)	2.2%	2.9%
Gill net set (sink)	17.8%	12.5%
Haul seine	0.0%	0.0%
Longline bottom	0.0%	0.0%
Longline shark	0.0%	0.0%
Other (including conf.)	5.7%	3.2%
Oyster dredge	0.1%	0.9%
Peeler pot	0.0%	0.0%
Pound net	1.5%	3.6%
Rakes bull	0.0%	0.0%
Rakes hand	0.0%	0.0%
Rod-n-reel	0.0%	0.0%
Shrimp trawl	2.5%	8.5%
Swipe net	0.0%	0.0%
Tongs, hand	0.0%	0.0%
Trolling	0.2%	0.4%

Total landings, rounded, 1998: 16,079,800 lbs.
Total value, rounded,1998: 10,921,600 dollars

Table NC-HC2: Landings by Major Species, Hyde County, NC, 1998

MAJOR SPECIES >2%	LBS. %	VALUE %
Unclassified shrimp	2.3%	8.2%
Crabs, blue, hard	66.2%	58.5%
Croaker, Atlantic	8.3%	4.1%
Flounder, fluke	5.9%	16.0%
Other (including conf.)	5.7%	3.2%
Sharks, dogfish	3.8%	0.8%

Number of species: 62

Dare County, NC

Dare County (pop. 22,746, 1990) saw over 36.6 million pounds and 23.5 million dollars from fish and shellfish (and turtle) landings in 1998, the second highest county in the state in terms of pounds and first in terms of dollars (Tables NC-DC1,2). Fishing centers include Wanchese, Hatteras, and Mann's Harbor. Fluke (15%) was second to crabs (40%) in terms of value, but a much wider range of products were significant than in other North Carolina counties, because of the importance of ocean as well as estuarine fisheries. These included bluefish, dogfish, squid, weakfish, anglerfish, king mackerel, sharks, and tuna. The fisheries range from estuarine fisheries (crab-pots, pound-nets, turtle pots, fyke nets, etc.) to offshore longlining.

Table NC-DC1: Landings by Gear Type, Dare County, NC, 1998

GEAR TYPE	LBS. %	VALUE %
Beach seine	1.5%	1.3%
By hand	0.0%	0.0%
Cast net	0.1%	0.0%
Crab pot	30.6%	33.0%
Crab trawl	0.6%	0.5%
Eel pot	0.0%	0.1%
Fish pot	0.1%	0.2%
Flounder trawl	3.3%	7.5%
Flynet	13.2%	7.7%
Fyke net	0.0%	0.0%
Gigs	0.0%	0.0%
Gill net (runaround)	1.0%	1.0%
Gill net set (float)	0.7%	0.8%
Gill net set (sink)	36.4%	22.5%
Haul seine	0.7%	0.5%
Longline bottom	0.0%	0.0%
Longline shark	1.5%	0.8%
Longline surface	2.7%	5.8%
Other (including conf.)	0.6%	0.4%
Oyster dredge	0.0%	0.0%
Peeler pot	1.1%	5.6%
Pound net	2.1%	3.4%
Rakes bull	0.0%	0.0%
Rakes hand	0.0%	0.0%
Rod-n-reel	0.6%	1.4%
Shrimp trawl	0.4%	1.2%
Trolling	2.8%	6.1%
Turtle pot	0.0%	0.0%

Total landings, rounded, 1998: 36,625,800 lbs.
Total value, rounded, 1998: 23,511,500 dollars

Table NC-DC2: Landings by Major Species, Dare County, NC, 1998

MAJOR SPECIES >2%	LBS. %	VALUE %
Anglerfish (goosefish)	1.8%	1.9%
Bluefish	6.4%	2.6%
Crabs, blue, hard	30.1%	27.8%
Croaker, atlantic	18.9%	9.4%
Flounders, fluke	5.2%	15.0%
Mackerel, king	2.0%	4.7%
Sharks	2.7%	1.4%
Sharks, dogfish	10.9%	2.3%
Squid	2.4%	2.0%
Tuna	2.6%	5.2%
Weakfish (seatrout, grey)	4.7%	3.9%
Crabs, blue peeler	0.7%	2.2%
Crabs, blue, soft	1.6%	9.2%

Number of species: 69

Other North Carolina Counties:

Commercial fishing is important in many other North Carolina counties as well. Following are profiles of counties for which landings were reported in 1998, in rough geographical order, from southwest to northeast. Counties where landings were very small in 1998 are signified by full indentations and italics. Population figures for 1997 are from Diaby (1999:35), based on the July 1997 estimate from the Office of State Planning, Office of the Governor. Estimates of fishing income were derived from various sources described in Diaby (1999: 35).

Brunswick, Pender, and related Inland Counties

Brunswick County (pop. 65,200, 1997), at the southwestern end of the coast, has a diversified estuarine and inshore fishery, which yielded almost 3 million lbs and over 4.8 million dollars in 1998 (Tables NC-BC1,2). Shrimp trawls and rod-n-reel account for most of the landings by value; shellfish techniques ("by hand, bull rakes, hand rakes, hand tongs"), crab pots, trolling, and other techniques are also found. The major species by value was shrimp (48%); it was followed by a fairly even representation of porgies, snappers, groupers, hard clams, oysters, spot, triggerfish, and swordfish. In 1990 89 white men and 36 black men, plus 12 white women, claimed the occupation of fisher, and 23 white men were captains and other officers on the census. According to Diaby (1999: 35), there were 688 ETS issued in 1997, and the average fishing income that year was $11,572, comapred with an average annual wage per worker of $23,860.

Pender County (pop. 37,208, 1997), up the Cape Fear River from Wilmington, is the site of estuarine and ocean fisheries, amounting to about $770,000 worth, for 535,000 lbs. in 1998. 19 gear types were used that year, ranging from shrimp trawls and four different kinds of gill-nets to a variety of shell-fishing techniques and small scale nets (butterfly net, cast net, channel net). Shrimp, clams, crabs, and oysters were major. Fluke made up 2.1% of value and porgies 3.2% of value. Other ocean fishes are king mackerel, spot, snappers, and groupers. In 1990 66 white males declared fishing as their occupation. Diaby (1999: 35) reports 239 ETS issued in 1997, with average fishing income of $8,599 compared with an average annual wage of $19,329.

Bladen County, up the Cape Fear River, was the site of a gill-net fishery, plus a little oystering, haul-seining and crab potting in 1998. Species caught included crabs, spot, shad, croaker, and other bay and estuarine species. The 1990 census showed 8 black men as fishers. Robeson County, far inland up the same river, had a few landings in 1998 as well.

Columbus County, between Brunswick and Bladen Counties and on the Cape Fear River, had a small fishery, mainly oysters but also small amounts of spot, shad, fluke, bluefish, and crabs. It was valued at less than $70,000 in 1998. Techniques include crab pots, gill nets, gigs, and "by hand." The 1990 census showed no fishers as occupational types.

Refer to the sections on description of fishing activities (section 7), economic characteristics of the fishery (section 8), and the fishery impact statement (section 9.2.6) of Amendment 5 to the Atlantic mackerel squid and butterfish FMP.

5.6. Cost Analysis

Refer to the section on Regulatory Impact Analysis.

5.7. Competitive Effects Analysis

There are no large businesses involved in the industry, therefore, there are no disproportional small versus large business effects. There are no disproportional costs of compliance among the affected small entities.

5.8. Identification of Overlapping Regulations

The final action does not create regulations that conflict with any state regulations or other federal laws.

6. PAPER WORK REDUCTION ACT OF 1995

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

The Council is not proposing measures under this regulatory action that will involve increased paper work and consideration under this Act.

7. IMPACTS OF THE PLAN RELATIVE TO FEDERALISM

The proposed 2002 specifications do not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under Executive Order 12612.

8.0 Literature Cited

Anderson, E.D. 1985. Status of the northwest Atlantic mackerel stock - 1984. NMFS. NEFC. Woods Hole Lab. Ref. Doc. No. 85-03.

Anderson, E.D. and A.J. Paciorkowski. 1978. A review of the Northwest Atlantic mackerel fishery. ICES Symposium on the Biological Basis of Pelagic Fish Stock Management. No. 11, 63p.

Bigelow, H.B., and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. Fishery Bulletin, U.S. 53:417-423

Buck E. 1995. Summary of fisheries and aquaculture issues. Electronic summary. Congressional Research Service. The Library of Congress. Washington DC. August 4, 1995.

Christensen, D.J., W.J. Clifford, P.G. Scarlett, R.W. Smith, and D. Zachea. 1979. A survey of the 1978 spring recreational fishery for the Atlantic mackerel, *Scomber scombrus*, in the Middle Atlantic region. NMFS Sandy Hook Lab Report No. 78-43. 22 p.

Dawe, E.G., P.C. Beck, H.J. Drew, and G.H. Winters. 1981. Long-distance migration of a short-finned squid, Illex illecebrosus. J. Northw. Atl. Fish. Sci. 2: 75-76.

Dawe, E.G., R.K. O'Dor, P.H. Odense, and G.V. Hurley. 1985. Validation and application of an ageing technique for short-finned squid (Illex illecebrosus). J. Northw. Atl. Fish. Sci. 6:107-116.

Dawe, E.G. and P.C. Beck. 1992. Population structure, growth, and sexual maturation of short-finned squid (Illex illecebrosus). ICES CM 1993/K:33.

Food and Agriculture Organization of the United Nations (FAO). 1982. Fishery statistics. Catches and landings. Vol. 54. Rome, Italy. 393 p.

FAO. 1992. Fishery statistics. Catches and landings. Vol. 74. Rome, Italy. 677 p.

FAO. 1992a. Fishery statistics. Commodities. Vol. 75. Rome, Italy. 435 p.

FAO. 1994. Globefish European Fish Price Report. No. 12/94. Rome, Italy. December 15, 1994.

FAO. 1994a. Globefish Highlights. No. 4/94. Rome, Italy. December 15, 1994.

FAO. 1994b. Globefish European Fish Price Report. No. 12/94. Rome, Italy. December 15, 1994.

FAO. 1995. Globefish European Fish Price Report. No. 1/95. Rome, Italy. January 15,1995.

FAO. 1995a. Globefish European Fish Price Report. No. 5/95. Rome, Italy. May 15, 1995.

FAO. 1995b. Globefish Highlights. No. 2/95. Rome, Italy. June 15, 1995.

FAO. 1995c. Globefish Highlights. No. 1/95. Rome, Italy. March 15, 1995.

FAO. 1995d. Globefish European Fish Price Report. No. 7/95. Rome, Italy. July 15, 1995.

FAO. 1995e. Infofish International. “Alternative Asian markets for cephalopods.” No. 1/95. January/February. Kuala Lumpur, Malaysia. 68 p.

FAO. 1995f. Infofish International. “Fishing methods for cephalopods in Malaysia.” No. 1/95. January/February. Kuala Lumpur, Malaysia. 68 p.

FAO. 2000. Fishery statistics. Capture Production. Vol. 86/1. Rome, Italy. 713 p.

Fishing News (FN). 1995. Prices set to rise: world market update. April 14, 1995. No. 4239.

FN. 1995a. Klondykers limited. April 14, 1995. No. 4239.

FN. 1995b. Mackerel price pelagic boost. May 5, 1995. No. 4242.

FN. 1995c. Mackerel success boosts Ullapool. May 26, 1995. No. 4245.

FN. 1995d. More north sea cod: Agreement on 1995 TACs in EU/Norway talks. March 3, 1995. No. 4233.

Fishing News International (FNI). 1995. Why Norwegian coast guard is getting tougher. January 1995, Vol. 34:1.

FNI. 1995a. UK looks at squid stocks. March 1995, Vol. 34:3.

FNI. 1995b. Peru squid fishery boom: experts forecast catch rise to half-a-million tonnes. March 1995, Vol. 34:3.

FNI. 1995c. Action needed on *Illex* squid: Falklanders look to UN for answers. July 1995, Vol. 34:7.

FNI. 1995d. Korean fleet works to catch limit. July 1995, Vol. 34:7.

FNI. 1995e. We must sustain stocks-fisheries director. July 1995, Vol. 34:7.

Gregoire, F. 1996. Mackerel in the Northwest Atlantic. Stock Status Report 96/24. Dept. of Fisheries and Oceans, Quebec Canada. 15p.

Infofish Trade News (ITN). 1994. Infofish Fact Sheet. Republic of Korea: liberalization of fish imports, 1995-1997. No. 20/94. Kuala Lumpur, Malaysia. November 1, 1994.

ITN. 1994a. Infofish Fact Sheet. Summary of EC schedule for reduction in tariffs for fish and fish products under the Uruguay round. Infofish fact sheet. No. 11/94. Kuala Lumpur, Malaysia. June 16, 1994.

ITN. 1994b. Infofish Fact Sheet. Summary of EC schedule for reduction in tariffs for fish and fish products under the Uruguay round. No. 12/94. Kuala Lumpur, Malaysia. July 1, 1994.

ITN. 1994c. Frozen cephalopods, molluscs and froglegs: India. No. 20/94. Kuala Lumpur, Malaysia. November 1, 1994.

ITN. 1994d. Frozen cephalopods, molluscs and froglegs: Peru. No. 19/94. Kuala Lumpur, Malaysia. October 17, 1994.

ITN. 1995. Strong importing nation. No. 8/95. Kuala Lumpur, Malaysia. May 2, 1995.

ITN. 1995a. Kansai market recovering. No. 8/95. Kuala Lumpur, Malaysia. May 2, 1995.

ITN. 1995b. Frozen mackerel imports from Norway up. No. 1/95. Kuala Lumpur, Malaysia. January 17, 1995.

ITN. 1995c. Cold storage holdings. No. 13/95. Kuala Lumpur, Malaysia. July 15, 1995.

ITN. 1995d. Canned fish and shellfish: mackerel. No. 6/95. Kuala Lumpur, Malaysia. April 3, 1995.

ITN. 1995e. GATT tariff reductions take effect. No. 2/95. Kuala Lumpur, Malaysia. February 3, 1995.

ITN. 1995f. Frozen cephalopods, molluscs and froglegs: Peru. No. 1/95. Kuala Lumpur, Malaysia. January 17, 1995.

ITN. 1995g. Frozen cephalopods, molluscs and froglegs: Peru. No. 9/95. Kuala Lumpur, Malaysia. May 16, 1995.

ITN. 1995h. Cold storage holdings. No.13/95. Kuala Lumpur, Malaysia. July 15, 1995.

Jackson G.D. and J.H. Choat. 1992. Growth in tropical cephalopods: an analysis based on statolith microstructure. Can. J. Fish. Aquat. Sci. 49:218-228.

Jereb, P., S. Ragonese, S. von Boletzky [*Eds.*]. 1991. Squid age determination using statoliths. Proceedings of the International Workshop held at the Institutio di Technilogica della Pesce e del Pescato (ITPP-CNR), Mazara del Vallo, Italy, 9-14 October 1989. N.T.R.-I.T.P.P. Special Publication,, Vol. 1, 127 p.

Lange, A.M.T. 1984. An assessment of the long-finned squid resource off the northeastern United States - Autumn 1984. NMFS, NEFC, Woods Hole Lab. Ref. Doc.84-37. 24 p.

Lange, A.M.T. and M.P. Sissenwine. 1980. Biological considerations relevant to the management of Squid, *Loligo pealei* and *Illex illecebrosus* of the Northwest Atlantic. Mar. Fish. Rev. 42(7-8): 23-38.

Lux, F.E. and W.D. Handwork and W.J. Rathjen. 1974. The potential for an offshore squid fishery in New England. Mar. Fish. Rev. 36(12): 24-27.

Macy, W.K. III. 1992. Preliminary age determination of the squid, *Loligo pealei*, using digital imaging. ICES CM 1992/K:, 9 p.

Mesnil, B. 1977. Growth and life cycle of squid, *Loligo pealei* and *Illex illecebrosus,* from the Northwest Atlantic. NAFO Research Document 76/VI/65.

Murawski S.A. and G.T. Waring. 1979. A population assessment of butterfish, *Peprilus triacanthus*, in the Northwest Atlantic Ocean. Tran. Am. Fish. Soc. 108(5): 427-439.

NMFS. 1994. Report of 17th NEFSC Stock Assessment Workshop. NEFSC, Woods Hole Lab. Ref. Doc. 94-03.

NMFS. 1996. Draft Report of the 20th Northeast Regional Stock Assessment Workshop, Northeast Fishery Science Center. Woods Hole, MA.

NMFS. 1996. Report of the 21th Northeast Regional Stock Assessment Workshop, Northeast Fishery Science Center. Woods Hole, MA. June 1996.

NMFS. 1998. Guidelines for Regulatory Analysis of Fishery Management Actions. Office of Sustainable Fisheries, National Marine Fisheries Service, Silver Spring, Maryland 20910. Revised April 15, 1998.

NMFS. 1999. Report of the 29th Northeast Regional Stock Assessment Workshop, Northeast Fishery Science Center. Woods Hole, MA. June 1999.

Okutani, T. 1977. Stock assessment of cephalopod resources fished by Japan. FAO Fish. Tech. paper No. 173. 62 p.

Overholtz, W.J. 1989. Density-dependent growth in the Northwest Atlantic stock of Atlantic mackerel (*Scomber scombrus*). J. Northw. Atl. Fish. Sci. (9):115-121.

Overholtz, W.J., R.S. Armstrong, D.G. Mountain, and M. Terceiro. 1991. Factors influencing spring distribution, availability, and recreational catch of Atlantic mackerel (*Scomber scombrus*) in the Middle Atlantic and southern New England regions. NOAA Tech. Memo. NMFS-FNEC-85. 13 p.

Pentilla, J.A. and E.D. Anderson. 1976. Mackerel age-length keys from the 1973-76 bottom trawl surveys in SA 5-6. Int. Comm. Northw. Atlantic Fish., Res. Doc. 76/XII/148, Ser. No. 4044.

Peterson, A. 1994. Personal communication. NMFS. Woods Hole, MA.

Ross, Robert. 1994. Personal communication. NMFS, Gloucester, MA. July 1994.

Ross, Robert. 1995. Personal communication. NMFS, Gloucester, MA. August 1995.

Seafish Industry Authority. 1994. Key Indicators. Spring 1994. Edinburgh, Scotland.

Serchuck F.M. and W.J. Rathjen. 1974. Aspects of the distribution and abundance of the long-finned squid, *Loligo pealei*, between Cape Hatteras and Georges Bank. Mar. Fish. Rev., 36(1): 10-17.

Sette, O.E. 1950. Biology of the Atlantic mackerel *Scomber scombrus* of North America. Part 2. Migrations and habits. U.S. Fish. Bull. 50(38): 251-358.

Summers, W.C. 1968. The growth and size distribution of the current year class *Loligo pealei*. Biol. Bull. 137(1): 366-377.

Summers, W.C. 1983. *Loligo pealei*, pp 115-142. In: Cephalopod Life Cycles, Vol. I. Academic Press, London.

United States Department of Commerce (USDC). 1990. Fisheries of the United States, 1989. Current Fishery Statistics No. 8900. NOAA. NMFS. 111 p.

USDC. 1994. Fisheries of the United States, 1993. Current Fishery Statistics No. 9300. NOAA. NMFS. 121 p.

USDC. 1994a. Imports and exports of fishery products annual summery, 1994. Current Fishery Statistics No. 9402. NOAA. NMFS. 23 p.

United States International Trade Commission (USITC). 1993. Mackerel: Competitiveness of the U.S. Industry in Domestic and Foreign Markets. Investigation No. 332-333. Washington, DC.

Waring, G. 1975. A preliminary analysis of the status of the butterfish in ICNAF subarea 5 and statistical area 6. International Commission for the Northwest Atlantic Fisheries. Res. Doc. 74/74, Dartmouth, Canada.

9.0 Tables (*Note: Tables 1-8 are imbedded in the text*)

Table 9. Frequency distribution of Atlantic mackerel vessel permit holders in 2000 by home port state.

ST	Frequency	Percent	Cumulative Frequency	Cumulative Percent
AL	1	0.0	1	0.0
CT	31	1.5	32	1.5
DE	14	0.7	46	2.2
FL	8	0.4	54	2.6
GA	1	0.0	55	2.7
MA	904	43.7	959	46.3
MD	20	1.0	979	47.3
ME	222	10.7	1201	58.0
NC	77	3.7	1278	61.7
NH	71	3.4	1349	65.2
NJ	194	9.4	1543	74.5
NY	253	12.2	1796	86.8
PA	18	0.9	1814	87.6
RI	127	6.1	1941	93.8
SC	2	0.1	1943	93.9
TX	1	0.0	1944	93.9
VA	119	5.7	2063	99.7
VT	1	0.0	2064	99.7
WA	2	0.1	2066	99.8
WV	4	0.2	2070	100.0

Frequency Missing = 28

Table 10. Frequency distribution of Atlantic mackerel, squid and butterfish dealers permit holders in 2000 by state.

STATE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
CT	6	1.7	6	1.7
DE	2	0.6	8	2.2
FL	7	2.0	15	4.2
HI	1	0.3	16	4.5
LA	1	0.3	17	4.7
MA	105	29.3	122	34.1
MD	6	1.7	128	35.8
ME	30	8.4	158	44.1
NC	28	7.8	186	52.0
NH	8	2.2	194	54.2
NJ	26	7.3	220	61.5
NY	71	19.8	291	81.3
PA	2	0.6	293	81.8
PR	1	0.3	294	82.1
RI	40	11.2	334	93.3
SC	2	0.6	336	93.9
VA	22	6.1	358	100.0

Table 11. Frequency distribution of Atlantic mackerel, squid and butterfish dealer permit holders who bought Atlantic mackerel in 2000 by state.

STATE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
HI	1	1.0	1	1.0
MA	27	26.7	28	27.7
MD	3	3.0	31	30.7
ME	2	2.0	33	32.7
NC	9	8.9	42	41.6
NH	2	2.0	44	43.6
NJ	7	6.9	51	50.5
NY	25	24.8	76	75.2
RI	21	20.8	97	96.0
VA	4	4.0	101	100.0

Table 12. Total landings and value of Atlantic mackerel, *Loligo*, *Illex*, and butterfish during 2000.

	Landings (pounds)	Value ($)	Vessels (number)	Trips (number)
Mackerel	12,450,595	2,019,060	520	2,911
Loligo	37,393,311	24,085,049	497	8,145
Illex	19,866,591	3,705,708	66	322
Butterfish	3,161,120	1,471,626	520	7,263

Source: Unpublished NMFS Dealer reports.

Table 13. Total landings of Atlantic mackerel, *Loligo*, *Illex*, and butterfish during 2000 by permit category.

	Permit Categories							
	Loligo/Butterfish Moratorium		Squid/Butterfish Incidental Catch		Atlantic Mackerel		*Illex* Squid Moratorium	
	Landings (pounds)	Vessels (number)	Landings (pounds)	Vessels (number)	Landings (pounds)	Vessels (number)	Landings (pounds)	Vessels (number)
Mackerel	11,202,177	197	11,633,771	231	11,202,177	352	11,202,177	38
Loligo	34,779,833	307	7,313,854	208	29,728,519	326	14,772,258	68
Illex	19,695,588	25	3,183	36	19,696,701	50	19,693,801	18
Butterfish	2,552,390	261	811,792	232	2,380,684	342	1,085,013	56

Source: Unpublished NMFS Dealer reports.

Table 14. Atlantic mackerel landings by port in 2000.

Port	Pounds	Percent (%)
Cape May, NJ	9,421,736	75.67
North Kingstown, RI	1,649,486	13.25
Chatham, MA	305,401	2.45
Point Judith, RI	184,429	1.48
Gloucester, MA	108,733	0.87
Little Compton RI	81,054	0.65
New Bedford, MA	47,438	0.38

Source: Unpublished NMFS Dealer Reports (for ports landing >1% of total Atlantic mackerel landings)

Table 15. Value of landings all species landed and Atlantic mackerel by port in 2000 (for ports where mackerel comprised >1% of total value of all species) .

	Number of vessels	Value All species ($)	Mackerel value ($)	Percent (%)
North Kingstown, RI	2	8,522,877	367,594	4.3
Cape May, NJ	22	23,936,235	1,110,079	4.6
Virginia Beach, VA	2	4,4520797	49,353	1.1

Table 16. Home port state of vessels with *Loligo*/butterfish moratorium permits in 2000.

ST	Frequency	Percent	Cumulative Frequency	Cumulative Percent
CT	8	2.0	8	2.0
DE	3	0.8	11	2.8
FL	1	0.3	12	3.1
MA	110	28.0	122	31.0
MD	3	0.8	125	31.8
ME	4	1.0	129	32.8
NC	24	6.1	153	38.9
NH	1	0.3	154	39.2
NJ	57	14.5	211	53.7
NY	93	23.7	304	77.4
PA	6	1.5	310	78.9
RI	66	16.8	376	95.7
VA	17	4.3	393	100.0

Frequency Missing = 2

Table 17. Frequency distribution of dealers which bought *Loligo* in 2000 by state.

STATE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
CT	1	0.8	1	0.8
MA	28	21.1	29	21.8
MD	3	2.3	32	24.1
ME	2	1.5	34	25.6
NC	17	12.8	51	38.3
NJ	9	6.8	60	45.1
NY	38	28.6	98	73.7
RI	27	20.3	125	94.0
VA	8	6.0	133	100.0

Table 18. *Loligo* squid landings (pounds and value) by port in 2000.

Port	Pounds	Percent (%)
Point Judith, RI	**10,685,677**	**28.6**
Cape May, NJ	**3,953,750**	**10.6**
Montauk, NY	**4,371,102**	**11.7**
Hampton Bay, NY	**5,982,249**	**16.0**
North Kingstown, RI	**2,649,930**	**7.1**
New Bedford, MA	**1,363,828**	**3.6**
Newport, RI	**1,829,480**	**4.9**
Point Pleasant, NJ	**775,926**	**2.1**
Greenport, NY	**696,436**	**1.8**
Other Barnstable, MA	**606,637**	**1.6**
Stonington, CT	**821,176**	**1.9**
Freeport, NY	**983,473**	**2.6**

Source: Unpublished NMFS Dealer Reports (for ports landing >1% of total *Loligo* landings)

Table 19. Value of landings all species landed and *Loligo* by port in 2000 (for ports where *Loligo* comprised >10% of total value of all species) .

Port	Number of Vessels	Value All Species ($)	Loligo Value ($)	Percent (%) of Total
Newport, RI	**46**	**8,296,017**	**1,044,851**	**12.61**
Other Dukes, MA	**14**	**1,378,959**	**150,335**	**10.90**
Greenport, NY	**13**	**2,120,257**	**461,338**	**21.75**
Point Judith, RI	**101**	**41,399,853**	**7,630,909**	**18.43**
Montauk, NY	**53**	**12,689,215**	**2,778,590**	**21.89**
Hampton Bay, NY	**68**	**8,988,986**	**3,755,037**	**41.77**
Freeport, NY	**21**	**1,496,110**	**675,233**	**45.13**
North Kingstown, RI	**9**	**8,522,877**	**1,987,244**	**23.31**
Falmouth, MA	**13**	**498,191**	**947957**	**19.03**

Table 20. Home port state of vessels with *Illex* moratorium permits in 2000.

ST	Frequency	Percent	Cumulative Frequency	Cumulative Percent
CT	2	2.6	2	2.6
DE	1	1.3	3	3.9
FL	1	1.3	4	5.2
MA	12	15.6	16	20.8
NC	7	9.1	23	29.9
NH	1	1.3	24	31.2
NJ	25	32.5	49	63.6
NY	9	11.7	58	75.3
PA	3	3.9	61	79.2
RI	9	11.7	70	90.9
VA	7	9.1	77	100.0

Table 21. Frequency distribution of dealers which bought *Illex* in 2000 by state.

STATE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MA	3	13.0	3	13.0
ME	1	4.3	4	17.4
NC	7	30.4	11	47.8
NH	2	8.7	13	56.5
NJ	3	13.0	16	69.6
NY	2	8.7	18	78.3
RI	5	21.7	23	100.0

Table 22. *Illex* squid landings by port in 2000.

Port	Pounds	Percent (%)
Cape May, NJ	8,315,896	41.86
North Kingstown, RI	10,481,098	52.76
Hampton, VA	364,528	1.83

Source: Unpublished NMFS Dealer Reports (for ports which landed >1% of *Illex* landed in 2000).

Table 23. Value of landings all species landed and *Illex* by port in 2000 (for ports where *Illex* comprised >1% of total value of all species) .

Port	Number of Vessels	Value All Species ($)	Illex Value ($)	% of Total
North Kingstown, RI	3	8,522,877	2,077,703	24.37
Cape May, NJ	10	23,936,235	1,403,624	5.56

Table 24. Frequency distribution of dealers which bought butterfish in 2000 by state.

STATE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
CT	1	0.8	1	0.8
HI	1	0.8	2	1.6
MA	20	15.9	22	17.5
MD	3	2.4	25	19.8
ME	1	0.8	26	20.6
NC	21	16.7	47	37.3
NH	3	2.4	50	39.7
NJ	9	7.1	59	46.8
NY	33	26.2	92	73.0
RI	27	21.4	119	94.4
VA	7	5.6	126	100.0

Table 25. Landings of butterfish by port in 2000.

Port	Pounds	Percent (%)
Point Judith, RI	910,793	28.81
North Kingstown, RI	237,637	7.52
Cape May, NJ	344,487	10.9
Hampton Bay, NY	148,943	4.71
Montauk, NY	244.798	7.74
Greenport, NY	384,252	12.16
New Bedford, MA	34,436	1.09
Newport, RI	111,084	3.51
Ocean City, MD	32,306	1.02
New London, CT	50,765	1.61
Stonington, CT	91,416	2.89

Table 26. Home port state of vessels with squid/butterfish incidental catch permits in 2000.

ST	Frequency	Percent	Cumulative Frequency	Cumulative Percent
AK	1	0.1	1	0.1
AL	1	0.1	2	0.1
CT	23	1.4	25	1.5
DE	13	0.8	38	2.3
FL	7	0.4	45	2.7
GA	1	0.1	46	2.7
MA	765	45.6	811	48.3
MD	13	0.8	824	49.1
ME	151	9.0	975	58.1
NC	96	5.7	1071	63.8
NH	46	2.7	1117	66.5
NJ	158	9.4	1275	75.9
NY	182	10.8	1457	86.8
PA	9	0.5	1466	87.3
RI	97	5.8	1563	93.1
SC	1	0.1	1564	93.2
TX	1	0.1	1565	93.2
VA	108	6.4	1673	99.6
WA	2	0.1	1675	99.8
WV	4	0.2	1679	100.0

Frequency Missing = 25

Table 27. Home port state of vessels with Atlantic mackerel, squid and butterfish part/charter permits in 2000.

ST	Frequency	Percent	Cumulative Frequency	Cumulative Percent
CT	14	2.5	14	2.5
DE	12	2.2	26	4.7
FL	6	1.1	32	5.8
MA	121	21.8	153	27.5
MD	5	0.9	158	28.4
ME	28	5.0	186	33.5
NC	7	1.3	193	34.7
NH	24	4.3	217	39.0
NJ	116	20.9	333	59.9
NY	127	22.8	460	82.7
PA	23	4.1	483	86.9
RI	36	6.5	519	93.3
RO	1	0.2	520	93.5
VA	35	6.3	555	99.8
WA	1	0.2	556	100.0

Frequency Missing = 5

Table 28. Summary of impacts of proposed and alternative specifications for 2002for Atlantic mackerel, Loligo and Illex squid and butterfish.

Species	Option	Total No. Vessels	Total Revenue Change ($ millions)	Revenue Change/ vessel ($)	No. vessels w/revenue reduced by > 5%	No. vessels w/revenue reduced by < 5%
Loligo	Proposed	497	+0.055	+111	0	497
Loligo	Alt. 1	497	-5.66	-11,386	132	365
Loligo	Alt. 2	497	-7.73	-15,558	170	327
Illex	Proposed	66	0	0	0	66
Illex	Alt. 1	66	0	0	0	66
Illex	Alt. 2	66	0	0	0	66
butterfish	Proposed	520	0	0	0	520
butterfish	Alt. 1	520	0	0	0	520
butterfish	Alt. 2	520	0	0	0	520
A. mackerel	Proposed	520	0	0	0	520
A. mackerel	Alt. 1	520	0	0	0	520
A. mackerel	Alt. 2	520	0	0	0	520
A. mackerel	Alt. 3	520	0	0	0	520

Table 29. Comparison of the size distribution of all vessels which landed *Loligo* in 2000 and those expected to have total gross revenues reduced by >5% as a result of the alternative 1 quota (13,000 mt) for *Loligo* in 2002.

	Vessels that landed *Loligo* in 2000		Affected Vessels[1]	
length (ft)	# vessels	% vessels	# vessels	% vessels
25 - 49	112	23.1	33	25.2
50 - 74	233	48.3	60	45.8
75 - 99	128	26.5	33	25.2
100 - 124	10	2.1	5	3.8
total	483	100	131	100

ton class	# vessels	% vessels	# vessels	% vessels
1	4	0.8	0	0.9
2	159	32.9	44	33.6
3	240	49.7	61	46.6
4	80	16.6	26	19.8
total	483	100	131	100

[1] Vessels with revenues reduced by >5%
[2] TC 1= <5 GRT; TC 2= 5 - 50 GRT; TC 3= 51 - 150- GRT; TC 4= >150 GRT
Source: unpublished NMFS permit file data.

Table 30. Distribution of vessels by home port state which landed *Loligo* in 2000 v. those affected by the alternative 1 quota of 13,000 mt and alternative 2 quota of 11,700 mt for *Loligo* in 2002.

	All vessels landing *Loligo in 2000*		Alternative 1 Quota (13,000 mt)		Alternative 2 Quota (11,700 mt)	
Home Port State	# vessels	% vessels	# vessels	% vessels	# vessels	% vessels
MA	123	23.5	37	28.2	49	29.2
MD	5	1.0	0	0.0	0	0.0
NC	68	14.1	0	0.0	0	0.0
NJ	58	12.0	11	8.4	16	19.5
NY	101	20.9	54	41.2	58	34.5
PA	6	1.2	1	0.8	2	1.2
RI	82	17.0	24	18.3	38	22.6
VA	25	5.2	0	0.0	0	0.0
other	15	3.1	4	3.1	5	3.1
Total	483	100.0	131	100.0	168	100.0

Source: unpublished NMFS permit file data.

Table 31. Distribution of vessels by principal port landing state which landed *Loligo* in 2000 v. those vessels affected by the alternative 1 quota of 13,000 mt and alternative 2 quota of 11,700 mt for *Loligo* in 2002.

	All vessels landing *Loligo* in 2000		Alternative 1 Quota (13,000 mt)		Alternative 2 Quota (11,700 mt)	
Principal Port State	# vessels	% vessels	# vessels	% vessels	# vessels	% vessels
CT	5	1.0	4	3.1	4	2.4
MA	109	22.6	31	23.7	42	25.0
MD	6	1.2	0	0.0	1	0.6
ME	6	1.2	1	0.8	1	0.6
NC	64	13.3	0	0.0	18	0.0
NJ	68	14.1	13	9.9	53	10.7
NY	92	19.0	50	38.2	47	31.5
RI	102	21.1	31	23.7	2	28.0
VA	30	6.2	1	0.8	0	1.2
Total	483	100	131	100.0	168	100.0

Source: unpublished NMFS permit file data.

Table 32. Distribution of vessels by vessel owner's state which landed *Loligo* in 2000 v. those vessels affected by the alternative 1 quota of 13,000 mt and the alternative 2 quota of 11,700 mt for *Loligo* in 2002.

	All vessels landing *Loligo* in 2000		Alternative 1 Quota (13,000 mt)		Alternative 2 Quota (11,700 mt)	
Owner's State	# vessels	% vessels	# vessels	%vessels	# vessels	% vessels
CT	5	0.6	2	1.5	2	1.2
DE	2	0.4	1	0.8	1	0.6
MA	103	21.3	30	22.9	39	23.2
MD	6	1.2	0	0.0	0	0.0
ME	5	1.0	0	0.0	0	0.0
NC	71	14.7	0	0.0	0	0.0
NJ	67	13.9	13	9.9	20	11.9
NY	94	19.5	50	38.2	54	32.1
RI	101	20.9	34	26.0	49	29.2
VA	27	5.6	1	0.8	2	1.2
Other	1	0.2	0	0.0	1	0.6
Total	483	100	131	100.0	168	100.0

Source: unpublished NMFS permit file data.

Table 33. Comparisons of the size distribution of all vessels which landed *Loligo* in 2000 and those expected to have total gross revenues reduced by >5% as a result of the alternative 2 quota (11,700 mt) for *Loligo* in 2002.

	Vessels that landed *Loligo* in 2000		Affected Vessels[1]	
length (ft)	# vessels	% vessels	# vessels	% vessels
25 - 49	112	23.1	41	24.4
50 - 74	233	48.3	80	47.6
75 - 99	128	26.5	42	25.0
100 - 124	10	2.1	5	2.9
total	483	100	168	100

ton class	# vessels	% vessels	# vessels	% vessels
1	4	0.8	0	0.0
2	59	32.9	57	33.9
3	240	49.7	78	46.4
4	80	16.6	33	19.6
total	483	100	168	100

[1] Vessels with revenues reduced by >5%
[2] TC 1= <5GRT; TC 2= 5 - 50 GRT; TC 3= 51 - 150 GRT; TC 4= >150 GRT
Source: unpublished NMFS permit file data.

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT FOR THE 2002 CATCH SPECIFICATIONS FOR ATLANTIC MACKEREL, SQUID, AND BUTTERFISH

September 2001

**Prepared by the National Marine Fisheries Service,
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18 October 2001

1.0 Introduction

The Mid-Atlantic Fishery Management Council (Council) approved its 2002 recommendations for annual specifications at its June 2001 meeting and submitted them to the Regional Administrator, Northeast Region, National Marine Fisheries Service (NMFS) (Regional Administrator). A document titled "Annual Quota Specifications for Atlantic Mackerel, *Loligo*, *Illex*, and Butterfish for 2002" was submitted to the Regional Administrator in August 2001. This document not only serves as a vehicle for the Council's formal submission of recommendations for specifications, but also contains analyses upon which the recommendations are based. An Environmental Assessment was also submitted to NMFS in response to a need for analyses of the impacts of the proposed 2002 specifications for the Atlantic mackerel, squid and butterfish (specifications) on the human environment pursuant to the National Environmental Policy Act (NEPA).

Framework 1 to the Atlantic Mackerel, Squid and Butterfish Fishery Management Plan (FMP), which was approved by NMFS on August 10, 2001, established a procedure through which research set-aside amounts would be specified annually as part of Council's quota setting process. The intent of the program is to support the collection of new information that will improve the management of the these fisheries. For each of the four species managed under the FMP, the Council recommended that up to 2 percent of the 2002 initial optimum yield (IOY) be set aside for scientific research purposes (Table 1).

Table 1. Proposed Research Quota Set-asides, in mt, for Atlantic Mackerel, Squid, and Butterfish for the Fishing Year January 1 through December 31, 2002.

Specifications	Squid Loligo	Squid Illex	Atlantic Mackerel	Butterfish
Research Set-aside	340	480	1,700	118
Remaining Quota	16,660	23,520	83,300	5,782
Total	17,000	24,000	85,000	5,900

A number of research projects have been submitted to NMFS that would require an exemption from some of the current or proposed regulations for these species. This Supplemental Environmental Assessment was prepared in response to the need for an analyses on the impacts of the research set-asides on the human environment pursuant to NEPA. This analysis also serves to help expedite the approval and implementation of these proposed research projects. Should the proposed research projects be approved, researchers could be permitted to fish for *Loligo* squid in the scup gear restricted areas (GRAs) and allowed to retain landings of *Loligo* squid in amounts greater than 2,500 pounds during a closure of the directed *Loligo* squid fishery.

2.0 ENVIRONMENTAL IMPACTS OF THE RESEARCH QUOTA SET-ASIDE

2.1 Biological Impacts

As noted in the above table, the amount of research quota set-aside relative to the overall annual quotas for Atlantic mackerel, squid, and butterfish is minimal. Therefore, given the limited scope and duration of the proposed research projects, it is unlikely that exemptions from the scup GRAs or the retention of *Loligo* squid landings in amounts greater than 2,500 pounds during a closure of the directed *Loligo* squid fishery, would have negative biological impacts. A more detailed description of each of the proposed exemptions is given below and additional descriptions of the stocks and their habitats can be found under sections 3.1 and 3.2 of the 2002 Annual Quota Specifications for Atlantic Mackerel, *Loligo*, *Illex*, and Butterfish. .

In an attempt to reduce scup bycatch and unwanted discards, regulations implementing scup GRAs were implemented in 2000 and 2001. Under these regulations, vessels fishing for non-exempt species, including *Loligo* squid, are required to fish using the scup minimum mesh size of 4 ½ in. Given the need to use small mesh sizes to retain *Loligo* squid (1 7/8 in. minimum mesh size), the *Loligo* squid fishery inside the scup GRAs was essentially eliminated. Several researchers have proposed projects that would test gear modifications in an attempt to allow unwanted scup bycatch to escape while retaining *Loligo* squid catches. To evaluate these gear modifications, researches have requested exemptions that would permit fishing for *Loligo* squid in the scup GRAs using mesh sizes less than 4 ½ in.

The harvesting of *Loligo* squid in the scup GRAs is not expected to have negative biological impacts on the *Loligo* squid fishery. As mentioned above, the amount of *Loligo* squid set-aside is minimal and is included in the overall *Loligo* squid quota. Therefore, the 2 percent set-aside, whether harvested through research projects or through the normal prosecution of the *Loligo* squid fishery, would have occurred. Further biological impacts from this exemption are related to the retention and discard of scup taken in the small mesh squid gear used in these experiments. These impacts will be evaluated in the Environmental Assessment for the 2002 annual scup specifications.

The annual *Loligo* squid quota is divided into quarterly quota periods (Table 2). Current regulations specify that after the quarterly quota is attained the directed *Loligo* squid fishery is closed and only an incidental catch amount of 2,500 lb per calender day may be retained. Some of the proposed research projects have requested an exemption from the 2,500 lb limit. This would allow research vessels to land *Loligo* squid in amounts greater than 2,500 lb per calender day during a quarterly closure of the directed *Loligo* squid fishery.

Table 2. *Loligo* Squid Quarterly Allocations.

Quarter		Percent	Metric Tons	Research Set-aside
I	(Jan-Mar)	33.23	5,649	N/A

II	(Apr-Jun)	17.61	2,994	N/A
III	(Jul-Sep)	17.30	2,941	N/A
IV	(Oct-Dec)	31.86	5,416	N/A
Total		100	17,000	340

The annual quota established for *Loligo* squid is the chief mechanism used to control fishing mortality. The research set-aside quota is deducted from the annual quota prior to the allocation of the quota into quarters. The proposed total allowable landings for the 2002 *Loligo* squid fishery is 17,000 mt, 2 percent (340 mt) of which may be used as research set-aside. The 2 percent set-aside is deducted from the overall *Loligo* squid quota prior to dividing the quota into quarterly allocations. Research quota harvested after a quarterly closure of the directed fishery will not count towards that quarter's quota, but instead will count towards the overall *Loligo* squid quota for the entire year. This will prevent total quota overages, and thus possible negative biological impacts, from occurring as the result of research quota harvested after the directed fishery has closed. As noted in the proposed scup GRA exemption, the amount of *Loligo* squid set-aside is minimal and the 2 percent set-aside, whether harvested through research projects or through the normal prosecution of the *Loligo* squid fishery, would have occurred. Therefore, the harvesting of *Loligo* squid after a closure of the directed fishery is not expected to have negative biological impacts on the *Loligo* squid fishery.

2.2 Economic and Social Impacts

As discussed in detail under section 2.1 above, researchers have requested exemptions from the minimum mesh restrictions in the scup GRAs and for the retention of *Loligo* squid landings in amounts greater than 2,500 pounds during a closure of the directed *Loligo* squid fishery. Because the amount of set-aside quota is limited, these exemptions are expected to have only minimal economic and social impacts. A detailed description of the fishing activities, economic environment, and participants in these fisheries can be found under section 3.3 of the 2002 Annual Quota Specifications for Atlantic Mackerel, *Loligo*, *Illex*, and Butterfish.

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

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

2.3 Endangered Species and Marine Mammals

There are numerous species which inhabit the management unit of this FMP that are afforded protection under the Endangered Species Act (ESA) of 1973 (i.e., for those designated as threatened or endangered) and/or the Marine Mammal Protection Act of 1972 (MMPA). Through the use of the research quota set-aside, the basic fishing operations for Atlantic mackerel, squid, and butterfish are expected to remain the same. Therefore, the overall impact to species afforded protection under the ESA and the MMPA are not expected to change. A complete description of these species and a discussion of the potential impacts the Atlantic mackerel, squid, and butterfish fisheries may have on them can be found in section 4.3 of the 2002 Annual Quota Specifications for Atlantic Mackerel, *Loligo*, *Illex*, and Butterfish.