AMENDMENT #1 TO

THE FISHERY MANAGEMENT PLAN

FOR THE

ATLANTIC MACKEREL, SQUID, AND BUTTERFISH FISHERIES

August 1983

Mid-Atlantic Fishery Management Council

in cooperation with the

National Marine Fisheries Service

New England Fishery Management Council

and the

South Atlantic Fishery Management Council

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Preface

The Council wishes to express its appreciation to Frank Grice and Sal Testaverde (NMFS Northeast Regional Office), to Pete Jensen, Don Leedy, and Paul Martensen (NMFS Washington), to Liz Casey and Joel MacDonald (Office of NOAA General Counsel), and to Emory Anderson (NEFC) for assistance in preparation and review of this Amendment.

Abbreviations and Definitions Used In This Document

Act - The Magnuson Fishery Conservation and Management Act of 1976, as amended, 16 U.S.C. 1801 et seq.
allocated portion - that portion of the TALFF actually distributed to foreign nations.
Allowable Biological Catch (ABC) - the maximum allowable catch of squid for a particular fishing year developed by reducing the maximum OY as necessary based on stock assessments.
Amendment - Amendment #1 to the Atlantic Mackerel, Squid, and Butterfish Plan (Plan).
Annual Fishing Level - a foreign fishing allocation set pursuant to Section 201(d)(3) of the Act.
Atlantic mackerel (mackerel) - the species Scomber scombrus.
butterfish - the species Peprilus triacanthus.
CFR - Code of Federal Regulations.
Council (MAFMC) - the Mid-Atlantic Fishery Management Council
Domestic Annual Harvest (DAH) - the capacity of US fishermen, both commercial and recreational, to harvest and their intent to use that capacity.
Domestic Annual Processing (DAP) - the capacity of US processors to process, including freezing, and their intent to use that capacity.
F - instantaneous rate of fishing mortality (The proportion of the population caught in a small period of time.). This mortality occurs in the presence of mortality from other causes and is usually given as averages for a year.
F0.1 - fishing mortality rate at which the additional catch produced by one additional unit of effort is only 0.1 of the catch produced by the same unit of effort in a new fishery.
FMP - fishery management plan.
fishing year - the 12 month period beginning 1 April.
GIFA - Governing International Fishery Agreement.
ICNAF - International Commission for the Northwest Atlantic Fisheries (replaced by NAFO).
Initial Optimum Yield (IOY) - the initial annual specification of squid amounts as determined by the Northeast Regional Director, in consultation with the Council, modifying the ABC on the basis of economic considerations.
joint venture - an arrangement through which US fishermen transfer their catch at sea to foreign vessels.
metric tons (mt) - 2204.6 pounds.
MSY- maximum sustainable yield.
NAFO - Northwest Atlantic Fisheries Organization.
NEFC - the Northeast Fisheries Center of the NMFS.
NMFS - the National Marine Fisheries Service of NOAA.
NOAA - the National Oceanic and Atmospheric Administration of the US Dept. of Commerce.
Non-Processed Fish (NPF) - the capacity of US fishermen to harvest fish which are not processed, which, in this Plan, is defined as equal to mackerel caught by marine recreational anglers.
OY - Optimum Yield.
Regional Director (RD) - the Regional Director, Northeast Region, NMFS.
SA - Subarea or Statistical Area.
SSC - the Scientific and Statistical Committee of the Council.
Secretary - the Secretary of Commerce, or his designee.
squid - the species Loligo pealei (Loligo or L. pealei) and Illex illecebrosus (Illex or I. illecebrosus).
Stock assessment - the NMFS yearly biological assessment of the status of the resources. This document provides the official estimates of stock size, spawning stock size, fishing mortalities, recruitment, and other parameters used in this Plan. The data from these assessments shall constitute the "best scientific information currently available" as required by the Act.
Total Allowable Level of Foreign Fishing (TALFF) - that portion of the Optimum Yield made available for foreign fishing.

II. SUMMARY

The Fishery Management Plan for the Atlantic Mackerel, Squid, and Butterfish fisheries modified by this Amendment was implemented by emergency interim regulations on 1 April 1983 for a period ending 31 March 1986.

The management unit is all Atlantic mackerel, (Scomber scombrus). squid (Loligo pealei and Illex illecebrosus) and butterfish (Peprilus triacanthus) under US jurisdiction, excluding the Gulf of Mexico and the Caribbean Sea.

The objectives of the Plan are:

1. Prevent the exploitation of these resources from exceeding those levels which reduce the probability of successful (i.e., the historic 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 Plan.

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.

Amendment

The Amendment changes the squid management regime to allow the Northeast Regional Director (RD), in consultation with the Mid-Atlantic Fishery Management Council (Council), to adjust OY at the beginning of the fishing year and throughout the year on the basis of specified guidance. The mackerel regime is changed to reflect the changed mackerel natural mortality rate (from 0.3 to 0.2).

The rigidity of past Optimum Yields (OY) and their components has prevented timely management responsiveness necessary to address a developing situation such as the squid fishery. An OY with the proposed flexibility is highly preferable to the relatively rigid current system. Experience has shown that rigidly established limits must be capable of being changed rapidly to meet unforeseen circumstances.

The squid fishery recently has experienced a dramatic increase in domestic fishing effort. Demand for domestic processed and joint venture amounts of squid has increased significantly during this fishing year. This measurably increased demand requires the the National Marine Fisheries Service (NMFS) to have greater flexibility for proper management, and for distributing available amounts of squid among the various components of the fishery, both domestic and foreign. The OY mechanism meets this need. It allows for adjustments to be made due to changes in seasonal availability of squid; changes in fishing patterns or practices of US fishermen fishing for more economically valuable species of fish; increases in TALFF to reward foreign nations providing markets for US exporters; joint venture operations and changes to approved joint ventures; or for other benefits. This mechanism both fosters the "fish and chips" policy and the Magnuson Act and establishes a mechanism to achieve maximum utilization of the OY for squid. The mechanism would work as follows:

Loligo Squid

The maximum OY for Loligo is 44,000 mt. The RD in consultation with the Council, shall determine annual specifications relating to Initial Optimum Yield (IOY). Domestic Annual Harvest (DAH), Domestic Annual Processing (DAP), Joint Venture Processing (JVP), and Total Allowable

Level of Foreign Fishing (TALFF). The RD shall review yearly the most recent biological data pertaining to the stock. If the RD determines that the stock cannot support a level of harvest equal to the maximum OY, he shall establish a lower Allowable Biological Catch (ABC) for the fishing year. This level represents essentially the modification of the maximum sustainable yield (MSY) to reflect changed biological circumstances. If the stock is able to support a harvest level equivalent to the maximum OY, the ABC shall be set at that level.

From the ABC, the RD, in consultation with the Council, shall determine the IOY for the fishing year. The IOY represents a modification of ABC, based on economic factors. It is intended to provide the greatest overall benefit to the nation by incorporating all relevant factors. The IOY is composed of an initial DAH and initial TALFF. The RD will project the DAH by reviewing the data concerning past domestic landings, projected amounts of Loligo necessary for domestic processing and for joint ventures during the fishing year, and other data pertinent for such a projection. The Joint Venture Processing (JVP) component of DAH shall be the portion of DAH which domestic processors either cannot or will not use. In assessing the level of IOY, the RD shall provide for a TALFF of at least a minimum bycatch of Loligo squid that would be harvested incidentally in other directed fisheries. This bycatch level shall be 1% of the allocated portion of the Illex, mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs (MAFMC, 1982b). In addition, this specification of IOY shall be based on the application of the following factors:

1. total world export potential by squid producing countries;

2. total world import demand by squid 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.

Proposed annual specifications of the ABC and IOY and its component amounts shall be published in the Federal Register and provide for a public comment period. At the close of the public comment period, a notice of final annual specifications with the reasons, therefore, shall be published in the Federal Register.

Any subsequent adjustments to the IOY shall be published in the Federal Register and may provide for a public comment period.

The IOY may be adjusted by the RD, in consultation with the Council, upward to the ABC at any time during the fishing year. An adjustment may be made to IOY to accommodate DAH needs, including when the the application of the above factors warrants an adjustment in TALFF. However, TALFF may not be adjusted to a quantity less than that already allocated to and accepted by foreign nations or less than that needed for bycatch.

Illex Squid

The maximum OY for Illex is 30.000 mt. The RD, in consultation with the Council, shall determine annual specifications relating to IOY, DAH, DAP, JVP, and TALFF. The RD shall review yearly

the most recent biological data pertaining to the stock. If the RD determines that the stock cannot support a level of harvest equal to the maximum OY, he shall establish a lower ABC for the fishing year. If the stock is able to support a harvest level equivalent to the maximum OY, the ABC shall be set at that level.

From the ABC, the RD, in consultation with the Council, shall determine the IOY for the fishing year. The IOY represents a modification of ABC, based on economic factors. It is intended to provide the greatest overall benefit to the nation by incorporating all relevant factors. The IOY is composed of an initial DAH and initial TALFF. The RD shall determine the IOY and any adjustments by the same procedures and factors set out above for Loligo, except that it shall provide for a minimum bycatch of Illex squid that would be harvested incidentally in other directed fisheries. This bycatch level shall be 10% of the allocated portion of the Loligo TALFF and 1% of the allocated portions of the mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs (MAFMC, 1982b).

Atlantic Mackerel

Based on the best scientific information available, the Amendment changes the spawning stock size above which a directed foreign fishery will be allowed. The specification of mackerel OY, DAH, DAP, and TALFF is based upon:

C = estimated mackerel catch in Canadian waters for the upcoming fishing year.
US = estimated US mackerel catch for the upcoming fishing year.
S = mackerel spawning stock biomass in the year after the upcoming fishing year.
Bycatch = 2% of allocated portion of the silver hake TALFF and 1% of the allocated portions of the Loligo, Illex, and red hake TALFFs (MAFMC, 1982b).
AC = acceptable catch in US waters for the upcoming fishing year.
T = total catch in all waters (US and Canadian) for the upcoming fishing year.

If S is less than or equal to 400.000 mt; use Case 1. If S is greater than 400,000 mt; use Case 2.

Case 1: OY is less than or equal to 30,000 mt.
AC is less than or equal to 30,000 mt.
DAH is less than or equal to 30,000 mt - Bycatch.
DAP is less than or equal to 30.000 mt - Bycatch.
TALFF = Bycatch.

Case 2: OY is less than or equal to AC
AC = T - C such that S is not less than or equal to 400,000 mt and that the fishing mortality associated with T does not exceed F0.1.
DAH is between 30,000 mt and AC - Bycatch.
DAP is between 30,000 mt and AC - Bycatch.
TALFF is AC - DAH, but may be no less than Bycatch. If AC - DAH is equal to or greater than 10,000 mt, $\frac{1}{2}$ is initially allocated to TALFF and $\frac{1}{2}$ is initially allocated to Reserve.

The 30,000 mt minimum DAH and DAP in Case 2 may only be reduced to the extent necessary to assure that AC is not exceeded and the foreign fishery receives the bycatch requirements. OY and TALFF must be adjusted to account for the minimum US allocation. It must be recognized that while such an adjustment at the beginning of a fishing year may result in an initial OY less than that which is biologically acceptable (i.e.. less than AC), if US landings during the year, including amounts authorized for joint ventures, increase above the initial estimates, DAH and OY may be increased by similar amounts up to the point where OY = AC. TALFF would not change from its value at the beginning of a year as a result of these adjustments to DAH and OY.

Butterfish

Butterfish MSY is 16,000 mt. OY is specified as whatever quantity of butterfish US fishermen harvest annually plus a bycatch TALFF equal to 6% of the allocated portion of the Loligo TALFF

and 1% of the allocated portions of the Illex, Atlantic mackerel, silver hake, and red hake TALFFs (MAFMC. 1982b), up to 16.000 mt. DAH would equal whatever quantity of butterfish US fishermen harvest, not to exceed 16,000 mt minus the TALFF. The Act provides that OY may differ from MSY for economic reasons. In this case, the reason for the difference is the development of the US fishery for export. The concept is simply that if foreign nations are not permitted to directly harvest butterfish, there will be a greater incentive to purchase the fish from US harvesters and processors. It is recognized that butterfish are a bycatch in other foreign fisheries and it is necessary, therefore. to provide a TALFF in keeping with those bycatch requirements. This specification is unchanged from the current Plan.

The precise specification of OY is:

OY is less than or equal to 16,000 mt.
DAH is less than or equal to 16.000 mt - bycatch.
DAP is less than or equal to 16,000 mt - bycatch.
TALFF = bycatch = 6% of the allocated portion of the Loligo TALFF and 1% of the allocated portions of the Illex, mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs.

Permit Requirements

Any owner or operator of a vessel desiring to take any Atlantic mackerel, squid, or butterfish within the FCZ, or transport or deliver for sale, any Atlantic mackerel, squid, and/or butterfish taken within the FCZ must obtain a permit for that purpose. Each foreign vessel engaged in or wishing to engage in harvesting the TALFF must obtain a permit from the Secretary of Commerce as specified in the Act. This section does not apply to recreational fishermen taking Atlantic mackerel, squid, or butterfish for their personal use, but it does apply to the owners of party and charter boats (Section XIII.A).

Reporting Requirements

NMFS has the responsibility to provide, on a timely basis, adequate commercial and recreational catch data to develop DAH for plan review and development and to implement the reallocation procedures of the Plan. At a minimum these data shall include amounts of fish landed. the capacity to process squid, Atlantic mackerel, and butterfish. and the amount of that capacity actually used. The Council does not require additional data to meet its planning needs. but NMFS should collect all data required by the Act. The Secretary may require further specific data relating to the harvesting of squid. Atlantic mackerel, and butterfish be submitted if necessary to manage or plan for management of the fishery (Section XIV.A).

Alternatives to the Amendment

In the development of the original Plan, earlier Amendments, and previous drafts of the implemented FMP, the Council considered many other alternatives. For any and all of the subject species, these included reversion to PMP management; different OY amounts, limited flexible OY, maximum flexibility and capacity amounts, including ranges for these amounts, the use of Reserves; different combinations of species for merger into one or more management plans, including species for which plans have not been prepared; and continuation of the current management measures with no change.

Because the more flexible squid OY adjustment mechanism intended by the Council was found not to be sufficiently supported in the merger amendment NMFS implemented a limited squid OY adjustment mechanism provided for by that amendment. This assured that the merger amendment would be in place by the beginning of the 1983 fishing year. 1 April 1983. Since then, the intent of the Council to have a more flexible squid OY adjustment mechanism has been more clearly articulated and supported with attendant documentation.

The Council considers the alternatives presented within this Amendment to be appropriate under current and foreseeable future circumstances. The Council will also consider modifications of the

alternatives as the result of public comments received after the completion of the public comment period.

The alternatives to the Amendment are:

1. Take no action at this time.

This would mean that the Plan would continue in effect until 31 March 1986, unless otherwise amended. The limited squid adjustment mechanism would remain intact. Atlantic mackerel specifications would continue to be based upon a natural mortality rate of 0.30, instead of the most recent scientifically determined rate of 0.20. This would not allow determination of OY on as current a basis as possible for squid and would violate National Standard #2 in the case of mackerel.

2. Prepare a Secretarial Amendment to Amend the Council Plan.

This would amend the Plan by adopting the more flexible squid adjustment mechanism contemplated by the Council. It would further provide for the best scientific information forming the basis of the Atlantic mackerel specifications. It would grant the RD, in consultation with the Council, the authority to adjust squid OYs based upon certain biological and economic information. It would allow the annual mackerel specifications to be based upon the most recent scientific assessment of natural mortality rate of 0.2. This alternative was considered because, if NMFS prepared the Secretarial Amendment, the Council staff would be able to work on other Plans. However, the alternative was rejected because of timing considerations.

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APPENDICES

IV. INTRODUCTION

IV.A. Development of the Plan

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

The Plans were revised, the revisions being identified as Mackerel Plan Supplement #1 and Squid Plan Supplement #1. These two Supplements, along with the original Butterfish Plan, were adopted for public hearings by the Council in July of 1978. Hearings on all three documents were held during September and October, 1978, and they were adopted in final form by the Council in November, 1978. The Butterfish Plan was submitted for NMFS approval in December, 1978. Mackerel Plan Supplement #1 and Squid Plan Supplement #1 were submitted for NMFS approval in January, 1979. NMFS approved Squid Plan Supplement #1 in June, 1979, and Mackerel Plan Supplement #1 in July, 1979. Both Plans were for fishing year 1979-80.

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

The Council adopted Amendments #1 to the Mackerel and Squid Plans for hearings in August, 1979. Hearings were held during October, 1979. The Amendments were adopted by the Council and submitted for NMFS approval in November, 1979. Both Amendments were approved by NMFS in March, 1980. This extended the Squid Plan for an indefinite time beyond the end of fishing year 1979-80 and extended the Mackerel Plan through fishing year 1980-81.

Butterfish Plan Amendment #1, extending the Plan through fishing year 1980-81, was adopted by the Council for hearings in December, 1979, with hearings held during January, 1980. During January, 1980, the Amendment was adopted in final form by the Council and submitted for NMFS approval. It was approved in March, 1980.

The Council began work on an amendment to merge the Mackerel, Squid, and Butterfish Plans in March, 1980, the document being identified as Amendment #2 to the Mackerel, Squid, and Butterfish Plan. The Amendment was adopted by the Council for public hearings in August, 1980. However, NMFS commented that there were significant problems with the Amendment that could not be resolved prior to the end of the fishing year (31 March 1981).

The Council then prepared separate Amendments #2 to the Mackerel and Butterfish Plans to extend those Plans through fishing year 1981-82. Since Amendment #1 to the Squid Plan extended that Plan indefinitely, there was no need to take this action for the Squid Plan. Those drafts were adopted for public hearing by the Council in October, 1980, with hearings held in November. The Amendments were adopted in final form by the Council and submitted for NMFS approval in November, 1980. Amendment #2 to the Mackerel Plan was approved by NMFS in January, 1981, and Amendment #2 to the Butterfish Plan was approved by NMFS in February, 1981.

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

In an effort to have the FMP in place by the beginning of the fishing year (1 April 1983) the Plan,

without the squid OY adjustment mechanism or a revised Atlantic mackerel mortality rate, was implemented by emergency interim regulations on 1 April 1983. By agreement of the Secretary of Commerce and the Council, the effective date of those emergency regulations was extended through 27 September 1983.

The management unit is all Atlantic mackerel, Loligo pealei, Illex illecebrosus, and butterfish under US jurisdiction, excluding the Gulf of Mexico and the Caribbean Sea.

IV.B. Problems Addressed by This Amendment

This Amendment is intended to address two problems: the need for administrative flexibility in the squid regime and a change in the best scientific evidence available on the Atlantic mackerel natural mortality rate.

1. Need for increased administrative flexibility in the squid regime.

This problem relates directly to the attainment of Objective 2. In the original Butterfish Plan, the Council and, by approval of the Plan, the Commerce Department, established the principle of using the specification of OY as a tool to help in the development of the US commercial fishery. The principle was based on the concept that foreign nations will not purchase fish from US harvesters or processors if they are allowed to harvest them directly. It has always been recognized that lower TALFFs will not automatically develop export markets for US caught fish. However, the higher TALFFs were felt to minimize opportunities for the US industry to develop export markets.

This concept was introduced into the squid regime with the current Plan. However, the Plan continued the Reserves for the squids, so that any difference between OY and DAH is divided initially $\frac{1}{2}$ to TALFF and $\frac{1}{2}$ to Reserve. The problem is that the automatic division of the difference into TALFF and Reserve and the time related review of US fishery performance can create problems because it is not flexible enough. With the current Plan, the squid OY and estimates of DAH are set annually (Section IV.D) and may be increased during the year, so those values are flexible in that they may be adjusted during the year to reflect the dynamic character of the fishery. The TALFF and Reserve provisions do not have this flexibility and, thus, present an impediment to the efficient operation of development efforts. The purpose of the Magnuson Act and this Plan is to develop the US fishery while recognizing that a significant part of such development, particularly in the short run, involves arrangements with foreign nations to purchase US harvested and processed fish, with incentives to the foreign nations provided by preferential allocations from TALFF. To do this effectively requires the ability to adjust OY and DAH during a year in response to changing economic conditions.

2. Change in the Atlantic mackerel natural mortality rate.

Atlantic mackerel management under the International Commission for the Northwest Atlantic Fisheries (ICNAF) and subsequently under the Magnuson Act was based on a natural mortality rate of 0.3. Recent analyses by the Northeast Fisheries Center (NEFC) resulted in a revision of that value to 0.2. The mackerel regime in the Plan is keyed directly to mackerel spawning stock size estimates. The spawning stock size estimates change as a result of the change to the natural mortality rate. It is, therefore, necessary to change the specifications of the mackerel regime to be consistent with the most recently accepted mackerel natural mortality rate.

The solution of this problem does not involve changing the policy that the mackerel regime is based on. It requires changing the regime so the policy is carried out based on the best available scientific information.

IV.C. Management Objectives

The objectives of the Plan are:

1. Prevent the exploitation of these resources from exceeding those levels which reduce 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 Plan.

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.

IV.D. Current Management Measures

Maximum annual OYs for Loligo and Illex are less than or equal to 44,000 mt (97 million lbs.) and less than or equal to 30,000 mt (66 million lbs.), respectively. DAH and DAP estimates are made annually. The differences between the initial OY and initial DAH, if any, initially are allocated $\frac{1}{2}$ to TALFF and $\frac{1}{2}$ to Reserve, except that the sum of the initial TALFF and Reserve may not exceed 37,000 mt (82 million lbs.) and 25,000 mt (55 million lbs.) for Loligo and Illex, respectively. That portion of the Reserve not needed for increases in the US harvest may be allocated to TALFF. DAH may also be increased during the year by increasing the OY from the initial value, so long as the maximum OY is not exceeded.

During August for Illex and during September for Loligo, the Regional Director projects the total amounts of squid that will be harvested by US fishermen during the entire fishing year. For Illex, monthly catches from April through July (exclusive of joint venture harvest) are multiplied by 2.9 to obtain a projected annual harvest. For Loligo, monthly catches from April through August (exclusive of joint venture harvest) are multiplied by 1.3 to obtain a projected annual harvest. Amounts authorized for joint ventures are added to these projections. If the projected amount of either species to be harvested by US fishermen, including joint ventures, exceeds the initial US harvest estimate, the Regional Director leaves the excess in the Reserve to allow the US fishery to continue without closure throughout the year. The remainders of the Reserves are then allocated to TALFF. After the initial allocation, the Regional Director may allocate any remaining portions of the Reserves to TALFF if he determines that the domestic harvest, including joint ventures, will not attain the projected level, if such allocation is consistent with the objectives of the Plan. The Regional Director is required to reexamine the multiplication factors (2.9 for Illex and 1.3 for Loligo) and revise them as necessary based on changes in US harvesting patterns.

The annual OY, US harvest estimate, and TALFF for Atlantic mackerel are set using a series of procedures that depend on the predicted spawning stock size. The capacity for mackerel in the US recreational fishery is the amount predicted by the equation

$$Y = (0.008)(X) - 1.15$$

where Y is the predicted recreational catch and X is the mackerel spawning stock size in the upcoming fishing year in thousands of metric tons.

If the spawning stock size would be less than or equal to 600,000 mt (1.3 billion lbs.) after the expected harvests in US and Canadian waters were taken, the mackerel TALFF may be no greater than 2% of the allocated portion of the silver hake TALFF plus 1% of the allocated portions of the red hake, Illex, and Loligo TALFFs. US harvest is whatever US fishermen catch up to 66 million lbs. (30,000 mt) minus the bycatch TALFF. OY equals the sum of the US harvest and TALFF, but may not exceed 66 million lbs.

If the spawning stock size would be larger than 600,000 mt after the full US and Canadian estimated harvests were taken, the OY equals that amount which, when taken in addition to the predicted Canadian catch, results in a spawning stock size of 600,000 mt the following year, but the total mackerel catch (all waters, all nations) may not result in a fishing mortality rate greater than 0.4, the best present estimate of F0.1. The TALFF equals the difference between OY and the

US allocation (which may be no less than 30,000 mt), but may not be less than 2% of the allocated portion of the silver hake TALFF plus 1% of the allocated portions of the red hake, Illex, and Loligo TALFFs. If the TALFF is greater than 10,000 mt, $\frac{1}{2}$ is allocated to the initial TALFF and $\frac{1}{2}$ is placed in Reserve.

If a Reserve is created, during October of each year, the Regional Director projects the total amount of mackerel that will be harvested by US fishermen during the entire year. If that amount exceeds the initial US harvest estimate, the Regional Director leaves the excess in the Reserve to allow the US fishery to continue without closure throughout the year. That part of the Reserve not needed to meet the projected US harvest may be allocated to TALFF.

The butterfish TALFF is 6% of the allocated portion of the Loligo TALFF plus 1% of the allocated portions of the Illex, mackerel (if a targeted foreign fishery is allowed), silver hake, and red hake TALFFs. OY equals the US harvest plus TALFF, but may not exceed 16,000 mt (35 million lbs.).

All vessels fishing commercially for Atlantic mackerel, squid, or butterfish, either directly or as a bycatch from other fisheries, must have permits. This provision also applies to all vessels for hire for fishing recreationally, directly or indirectly, for mackerel, squid, and/or butterfish. This does not apply to individual US fishermen catching mackerel, squid, or butterfish for their personal use.

NMFS is responsible for collecting harvesting and processing data for mackerel, squid, and butterfish.

Part 611 of Title 50, Code of Federal Regulations, regulates foreign fishing.

V. DESCRIPTION OF THE STOCKS

V.A. Species Or Groups Of Species And Their Distribution

Atlantic mackerel

Atlantic mackerel (Scomber scombrus) are distributed between Labrador and the Gulf of St. Lawrence (Parsons, 1970) to 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. The northern contingent overwinters at the edge of the continental shelf off Long Island and east, and the southern from Long Island southward.

The southern contingent begins its spring migration from waters off North Carolina and Virginia in April, and move steadily northward, reaching New Jersey and Long Island usually by 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.

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. However, 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 were in effect for Subareas 5 and 6 and for areas to the north from 1973-1977. Thus, Atlantic mackerel may be considered to consist of one stock for fishery management purposes.

Loligo pealei (long-finned squid)

Known by the common names of long-finned squid, winter squid, common squid, and bone squid, Loligo pealei is one of five Atlantic species of the genus Loligo of the squid family Loliginidae. Loligo pealei ranges over the continental shelf from Nova Scotia to the Gulf of Mexico. However, primary commercial concentrations occur from Corsair Canyon on Georges Bank to Cape Hatteras (Serchuk and Rathjen, 1974).

Seasonal differences in geographic and bathymetric distribution of long-finned squid are evident and appear to be related to bottom water temperatures. Concentrations are usually found in areas where these temperatures are above 46 degrees F. During winter, when water is coldest inshore, long-finned squid concentrate along the outer edge of the continental shelf in 46-54 degree F waters (Summers, 1967; Vovk, 1969). From late spring to early autumn the species disperses from the shelf edge into shallow coastal waters with heaviest concentrations usually occurring in the Cape Hatteras, New York Bight, and Nantucket Shoals areas. During summer, however, concentrations of Loligo may occur anywhere on the continental shelf. This dispersion is part of a spring inshore spawning migration which begins in the southern areas and as water temperatures rise, proceeds northward along the coast. By April or May, mature squid arrive in Massachusetts waters with smaller immature individuals arriving in May and June. During late spring and summer, long-finned squid may be found in harbors and estuaries, particularly in southern New England. In the fall, concentrations appear in the southern New England and Hudson Canyon area (ICNAF 5Zw and 6A) in water less than 360' deep (Rathjen, 1973; Serchuk and Rathjen, 1974; Tibbetts, 1975). Vovk (1969) also found large fall concentrations of long-finned squid in the area between Block Island and southern Georges Bank.

The NMFS spring bottom trawl surveys show primary concentrations of Loligo in depths of 360-600' and lesser concentrations in other depths surveyed (90-360' and 600-1,200'). Size distribution correlates with depth in both spring and fall survey data, with the largest individuals usually taken at the greatest depths (Serchuk and Rathjen, 1974). Other investigators (Summers, 1967; Mercer, 1969) have found similar correlations.

Loligo pealei usually spawn in shallow waters between Delaware and eastern Cape Cod. A six-month spawning season which extends through the warmer half of the year is indicated by the annual cycle of sexual maturation of Loligo. Mesnil (1976) proposed the concept of two crossed life cycles for Loligo pealei based on various size groups found during research surveys and inferences to similar life cycles for Loligo vulgaris and the cuttlefish Sepia officinalis in the northeast Atlantic. Briefly, this theory is as follows: squid hatching in early summer spawn approximately 14 months later during the following fall. These eggs hatch in late fall and mature about 20 months later in late spring - early summer. This cycle would then be repeated. However, much more study is necessary before this theory can be firmly established. It is believed that there is heavy mortality of both sexes after spawning, but this has not been conclusively established.

Squid age determination is not yet conclusive. Present data indicate that Loligo live for 14-24 months, although some males may reach 36 months of age. Individuals grow an average of 0.4-0.6" per month, reaching a dorsal mantle length of 6.25" and 7" at one year, and 10.5" and 12.5" at two years for females and males, respectively.

Illex illecebrosus (short-finned squid)

The summer or short-finned squid (Illex illecebrosus) is one of three species of Illex found in the northwest Atlantic. Its range extends from Greenland to Florida and it is relatively abundant between Nova Scotia and New Jersey. However, it is most abundant in summer in the Gulf of Maine and in the Newfoundland region (Mercer, 1965).

Details of the life history and biology of Illex are not well known. During the spring and summer, they migrate into coastal waters about 30-50' deep off Newfoundland and Nova Scotia and somewhat deeper in the New England area and may form large surface schools. This inshore movement may be in response to temperature and salinity preferences, and off Canada may be due to their pursuit of capeline (Mallotus villosus) which also move inshore at this time. In late fall

(October-December) short-finned squid move offshore in Subareas 5 and 6 and to the southeast and open ocean from Subareas 3 and 4 (Figure 1).

Unlike Loligo, Illex is not restricted to water above 46 degrees F (Merçer, 1973). The optimum temperature range of Illex is about 45-59 degrees F, although they were taken by Canadian research surveys on the Grand Banks at depths of 180-1,200' with bottom water temperatures of 33-46 degrees F (Squires, 1957). However, large concentrations of short-finned squid are usually found along the edge of the continental shelf where temperatures are greater than 41 degrees F (Tibbetts, 1975).

Spawning is usually assumed to take place in the deep waters of the continental slope from December through June with most individuals dying after spawning, but actual spawning grounds have not been documented. In fact, some short-finned squid have been taken on Georges Bank during the assumed winter spawning season.

Short-finned squid are usually shorter-lived than long-finned squid, reaching ages of 12-24 months (Lange, 1982). Maximum mantle length is approximately 9.5-13.75". Females grow larger than males, although males are heavier than females for any given length. Growth is rapid with an approximate doubling in mantle length between May and October and a resultant six- to eight-fold weight increase (Squires, 1967; Rathjen, 1973; Tibbetts, 1975).

Butterfish

Butterfish (Peprilus triacanthus) occur along the east coast of North America from Newfoundland to Florida (Hildebrand and Schroeder, 1928). This species has also been observed in deeper offshore waters off Cape Hatteras and Florida, and infrequently as far north as Prince Edward Island (Nichols and Breder, 1927; Murawski et al., 1978).

The seasonal distribution of butterfish is similar to that of scup (Stenotomus chrysops), Atlantic mackerel (Scomber scombrus), weakfish (Cynoscion regalis), and long-finned squid (Loligo pealei). Butterfish north of Cape Hatteras display definite migratory patterns in response to water temperatures. Horn (1970), Waring (1975), and Fritz (1965) concluded that summer movements of butterfish are both inshore and northward. Butterfish south of Cape Hatteras evidence no strong inshore-offshore migrations (Murawski et al., 1978).

Butterfish travel in small schools, usually near the surface when inshore during the warm months. Bigelow and Schroeder (1953) state that butterfish "seldom descend deeper than 15 to 30 fathoms during the summer," and the northern component of this stock spends winter and early spring offshore and near the bottom. Water temperature is probably the most significant factor affecting butterfish distribution. In winter in the Mid-Atlantic area, butterfish appear in water 660-690' deep, at the edge of the continental shelf (Horn, 1970; Bigelow and Schroeder, 1953). South of New York Bight, from New Jersey to the Chesapeake Bay, butterfish overwinter along the 600' contour (Heald, 1968). Butterfish appear off Rhode Island by the end of April, at Cape Cod by May, and arrive in the Gulf of Maine usually by June.

Meristic and morphometric studies by Caldwell (1961) and Horn (1970) concluded that depth isolated populations of butterfish exist in the Atlantic. Caldwell (1961) proposed one population south of Cape Hatteras to Florida, distributed to 70', and another group in all waters north of Cape Hatteras and deeper than 70' to the south. Horn (1970) examined specimens from both localities and concluded the two groups were distinct.

V.B. Abundance, Present Condition, and Probable Future Condition

Atlantic mackerel

Catch per tow from NEFC bottom trawl surveys (spring and autumn) and catch per day from the US commercial fishery continue to reflect an increasing trend in mackerel stock biomass (Anderson, 1982).

The 1974 year class was the predominant year class in the 1981 commercial catch and comprised 21% of the total catch in numbers. The 1980, 1978, and 1975 year classes accounted for 17%, 14%, and 13%, respectively. Mean weights at age have increased substantially since the mid 1970s (Anderson, 1982).

The 1975-81 year classes are all estimated to be below average in strength, with the 1980 year class appearing to be the strongest among these. The 1978 year class appears to be weaker than estimated in the 1981 assessment (Anderson, 1981). The 1982 year class appears to be above average in strength based on results from the 1982 NEFC autumn survey. However, the autumn age 0 indices by themselves are insufficient to reliably predict year-class size, and furthermore, the 1982 index was felt to be biased upwards because of an unusually early southern migration of mackerel which considerably increased their availability at the time of the autumn survey. The 1982 year class was, therefore, assumed to be equal to the median of the 1977-81 year classes (Anderson, 1982).

Total stock biomass increased from a low of 712 million lbs. in 1978 to a projected level of 1.2 billion lbs. in 1983. Spawning stock biomass improved from 635 million lbs. in 1980 to an estimated 1.0 billion lbs. in 1982 (Anderson, 1982).

Catch and stock biomass projections indicate that the catch in 1983 can be increased considerably above the level taken during 1978-82 (55-77 million lbs.) without incurring a decrease in spawning stock biomass from 1983 to 1984. A minimum spawning stock biomass of 794 million lbs. (using an M of 0.20) is suggested as an equivalent to the 1.3 billion lbs. constraint (using an M of 0.30) currently in the pending management regulations. The further constraint that fishing mortality should not exceed F0.1 would suggest a 1983 catch of about 229 million lbs. (Anderson, 1982).

Loligo pealei and Illex illecebrosus

The short life spans of these species (usually 2 years or less), the timing and location of the NEFC stock assessment surveys, the amount of time needed to interpret the survey data, and the amount of time needed to effect changes in Plan regulations make it very difficult to make timely adjustments to squid OYs to parallel changes in stock abundance. In addition, the relationship between stock size and recruitment is not known for either species. Therefore, even if timely assessment data were always available and could be acted on promptly, it would be difficult to justify such adjustments to the OYs, unless stock sizes increased or decreased dramatically.

The maximum Loligo and Illex OYs are based on MSY estimates, which were developed assuming (conservatively) a moderate to strong relationship between stock size and recruitment. The maximum OY for Illex has been set somewhat lower than the MSY estimate because the biological and fishery information is less complete than for Loligo, and because of uncertainties as to the discreteness of Illex stocks in the northwest Atlantic. The most recent NEFC assessment (Lange, 1982) indicated Illex abundance estimates in 1981 were the highest observed during the available time series (1968-1982) while substantial decreases in both survey and commercial abundance indices were observed in Canadian waters. The abundance estimate for Loligo in 1981 was 63% less than the record high in 1980 but equal to the 1968-1980 average (Lange, 1982). Although this decrease may indicate lower recruitment in 1982 than in recent years, recruitment should have remained above 1.5 billion individuals, which is the minimum assumed necessary to support an annual catch of 97 million lbs. (Lange and Sissenwine, 1980).

Butterfish

The NEFC autumn survey abundance and biomass indices for 1982 declined markedly from the levels of the previous several years, but remained slightly above the 1968-1981 (excluding the high values of the last several years) average. The 1982 year class is less abundant than the three apparently strong year classes in 1979-1981 (Waring and Anderson, 1982). The results of the NEFC autumn 1979 offshore trawl survey (Waring, 1980) indicated that the abundance of butterfish (based on catch-per-tow indices) was the highest ever observed. The survey also indicated that the butterfish recruitment index (age 0+ fish) was over 7 times greater in 1979 than in 1978 and was the highest ever observed.

The 1982 landings of butterfish off the US Atlantic coast totalled 19 million lbs. US landings (17.2 million lbs.) exceeded the previous historical high of 11.1 million lbs. caught in 1980. The distant-water-fleet landings of 1.8 million lbs. decreased slightly from the 2.1 million lbs. caught the year before. There is no evidence that the proposed maximum OY for butterfish (35 million lbs.) will adversely influence abundance or recruitment in the foreseeable future. Unless butterfish abundance is significantly affected by other factors, such as environmental fluctuations or other natural phenomena, the population should remain at a relatively high level during 1983-1985.

V.C. Estimates of Maximum Sustainable Yield

Atlantic mackerel

The MSY estimate (Anderson 1976b) used in the original Plan and in Amendments #1 and #2 was 463-507 million lbs. (210,000-230,000 mt). This estimate was refined by Anderson (1980). With a reduced natural mortality rate (M = 0.20 rather than 0.30) the estimated MSY is 335-401 million lbs. (Anderson, 1982).

F0.1 (the instantaneous fishing mortality rate at which the additional yield per recruit gained from an additional mortality unit is 10% of the gain per unit of mortality in a lightly exploited stock) has been estimated for Atlantic mackerel to be equal to 0.40, while Fmax (the fishing mortality rate at which yield per recruit is maximum) may be about 1.78 (Anderson, 1982). Simulated long-term equilibrium yields under conditions of constant recruitment at the median level observed during 1962-1981 and same mean weights at age and exploitation pattern as existed for the 1978-1981 period, yield values about 335 million lbs. (F = 0.4) and about 401 million lbs. (F = 1.2). Thus, the theoretical Atlantic mackerel yield per recruit curve (Ricker, 1975) is relatively flat-topped. In other words, a relatively large amount of fishing effort (the difference between F0.1 and Fmax) would be required in order to increase total catches by a relatively small amount (the difference between 335 and 401 million lbs.). This consideration is the primary reason why the practice of limiting catches to the F0.1 level was recommended under ICNAF regulation, and why this Amendment uses it in the determination of OY during years of high abundance. The effect of using M = 0.20 instead of M = 0.30 is to reduce the F0.1 and Fmax values by 30-35%, correspondingly decreasing the MSY.

Loligo

Recent minimum stock size estimates indicate between 1.0 billion and 4.6 billion Loligo in NAFO Subareas 5 and 6 during the fall of each year, most of which are new recruits. Sissenwine and Tibbetts (1977) estimated MSY at about 97 million lbs. (44,000 mt), based on the assumptions of a moderate stock-recruitment relationship and an annual recruitment of about 1.5 billion individuals. Based on a review of the latest stock assessment (Lange, 1982), there is no reason to change the MSY estimate at this time.

Illex

There are no reliable estimates of stock size nor certainty as to catches of Illex until recent years. The MSY of Illex has been estimated by Anderson (1976b) as 88 million lbs. Based on a review of the latest stock assessment (Lange, 1982), there is no reason to change the MSY estimate at this time.

Butterfish

A preliminary estimate of MSY is 47.7 million lbs. (Murawski and Waring, 1978). This estimate, however, presupposes certain mesh sizes are used in the fishery and an average level of annual recruitment to the stock, and these conditions may not be completely met in the future. Mesh sizes used by foreign and domestic vessels frequently vary from that which theoretically will produce MSY. In addition, the best scientific evidence available indicates that annual recruitment to this fishery is not constant and that the substantial variations in yearly recruitment which have been observed in the past will probably continue.

A realistic estimate of MSY, based on the present mix of gear in the fishery, may be between 33.1-41.9 million lbs. (15,000-19,000 mt). The best conservative estimate of MSY under current fishery conditions is approximately 35.3 million lbs. (16,000 mt). This is the MSY estimate used in the original Plan and in Amendments #1, #2, and #3. There is no reason to change the estimate at this time.

V.D. Ecological Relationships

Ecological (predator-prey) relationships were discussed in detail in each of the original Plans. The following is a summary discussion.

Atlantic mackerel

Predators - Mackerel have been identified in the stomachs of a number of different fish. They are preyed upon heavily by spiny dogfish, silver hake, white hake, weakfish, goosefish, and Atlantic cod. They also comprise part of the diet of swordfish, red hake, Atlantic bonito, bluefin tuna, blue shark, porbeagle, sea lamprey, shortfin mako, and thresher sharks (Langton and Bowman, 1977).

Prey - Mackerel prey most heavily on crustaceans such as copepods, krill, and shrimp. They also feed on squid, and less intensively on fish and ascidians (Langton and Bowman, 1977).

Loligo

Predators - Bluefish, sea ravens, spiny dogfish, and the Atlantic angel shark are known to be major predators of the longfin squid. The fourspot flounder, witch flounder, roughtail stingray, and white hake are also known to prey on Loligo. In many cases, squid remains in the stomach of fish are only identified as "squid" with no reference to the species. It is likely that some of these animals are Loligo and there are at least 42 other species of "squid"-eating fish in addition to those identified above (Langton and Bowman, 1977).

Prey - Loligo is known to feed on fish, possibly silver hake, mackerel, herring, and menhaden, among others, and also on squid and crustaceans. However it is difficult to identify the species of fish eaten or to quantify the diet because squid do not swallow their prey whole (Langton and Bowman, 1977).

Illex

Predators - 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" (Langton and Bowman, 1977).

Prey - Food habits of squid are difficult to quantify because the squid do not swallow their prey whole. They are known to prey on other squid, fish, and crustaceans such as krill (Langton and Bowman, 1977).

Butterfish

Predators - As is typical of a small, schooling, pelagic finfish, butterfish are subject to predation by a number of larger species. Haddock, silver hake, swordfish, bluefish, weakfish, goosefish, sand tiger, porbeagle, and red hake are several species which are known to consume butterfish specifically. The relative importance of butterfish, however, to the diet of any other species is unknown.

Prey - Young butterfish feed primarily on jellyfish (Horn, 1970), and ctenophores and salps (Haedrich, 1967). The diet of adult butterfish includes other small fish, squid, crustaceans, polychaetes, tunicates and chaetognaths (Bigelow and Schroeder, 1953; Leim and Scott, 1966; Nichols and Breder, 1927; Maurer and Bowman, 1975).

VI. DESCRIPTION OF HABITAT

VI.A. Description Of The Habitat

Climatic, physiographic, and hydrographic differences separate the ocean region from Cape Hatteras to the Gulf of Maine into two distinct areas: the Middle Atlantic -Southern New England Region and the New England Region, with the natural division occurring at Nantucket Shoals.

The Middle Atlantic - Southern New England Region is fairly uniform physically and is influenced by many large coastal rivers and the Chesapeake Bay, the largest estuary in the United States. Additional significant estuarine influences are Narragansett Bay, Long Island Sound, the Hudson River, Delaware Bay, and the nearly continuous band of estuaries behind the barrier beaches along southern Long Island, New Jersey, Delaware, Maryland, and Virginia. The southern edge of the region includes the estuarine complex of Currituck, Albemarle, and Pamlico Sounds behind the outer banks of Cape Hatteras.

At Cape Hatteras, the continental shelf (characterized by waters less than 650' deep) extends seaward approximately 20 miles, widens gradually to 70 miles off New Jersey and Rhode Island and then broadens to 120 miles off Cape Cod forming Georges Bank. The substrate of the shelf in this region is predominantly sand interspersed with large pockets of sand-gravel and sand-shell. Beyond 650', the substrate becomes a mixture of silt, silt-sand, and clay. As the continental slope turns into the Abyssal Plain (at depths greater than 6,500'), clay predominates over silt and becomes the major substrate.

Mineral resources of the area include large sand and gravel deposits, now being mined in some localities near shore. There are potentially recoverable offshore deposits of phosphate rock, titanium, monazite, zircon, and oil. Locally important concentrations of sulfur, salt, anhydrite, potash, and magnesium are known. It is also probable that manganese oxide nodules occur offshore. However, current technology is inadequate for economic recovery of most placer and hard rock deposits.

Water temperatures range from less than 35 degrees F in the New York Bight in February to approximately 80 degrees F off Cape Hatteras in August. The annual range of surface temperature at any location may be 25 degrees F in slope waters to greater than 35 degrees F near shore. During winter the vertical thermal gradient is minimized. In late April - early May, a thermocline develops although storm surges over Nantucket Shoals retard thermocline development there. The thermocline persists through the summer. Surface waters begin to cool in early autumn, weakening the thermocline so that by mid-November surface to bottom water temperature is nearly homogeneous.

The salinity cycle results from stream flow and the intrusion of slope water from offshore. The winter salinity maximum is reduced to a minimum in early summer by large volumes of runoff. Inward drifts of offshore saline water in autumn eventually counterbalance fresh water outflow and return the region's salinity distribution to the winter maximum. Water salinities near shore average 32 parts per thousand (ppt), increase to 34-35 ppt along the shelf edge, and exceed 36.5 ppt along the main lines of the Gulf Stream.

On the continental shelf, surface circulation is generally southwesterly during all seasons, although this may be interrupted by coastal indrafting and some reversal of flow at the northern and southern extremities of the area. Speeds of the drift are on the order of 5 knots per day. There may be a shoreward component to this drift during the warm half of the year and an offshore component during the cold half. This drift, fundamentally the result of temperature-salinity distribution, may be made final 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. Offshore, the Gulf stream flows northeasterly.

The New England region from Nantucket Shoals to the Gulf of Maine includes two of the worlds most productive fishing grounds: Georges Bank and Browns Bank. The Gulf of Maine, which is a deep cold water basin, is nearly sealed off from the open Atlantic by these two Banks. The outer

edges of Georges and Browns Banks fall off sharply into the continental shelf. Other major features include Vineyard and Nantucket Sounds, Cape Cod Bay, and Cashes Ledge and Stellwagen Bank within the Gulf of Maine.

Water temperatures range from 35-65 degrees F at the surface and over the banks, and 40-50 degrees F at 650' in the inner Gulf of Maine. Mean salinity values vary from about 32 to 34 ppt depending on depth and location. However, lower salinity values generally occur close to shore. In addition, both water temperatures and salinities within the Region, but especially along the southern boundary of Georges Bank and the deep basins of the inner Gulf of Maine, are influenced by intrusions of slope water.

Surface circulation within the Gulf of Maine is usually counterclockwise. Cold Nova Scotian waters enter through the Eastern Channel and move across Browns Bank while slope waters enter through the Northeast (Fundian) Channel. Gulf of Maine waters spill out over Georges Bank and through Great South Channel onto Nantucket Shoals. The anticyclonic eddy over Georges Bank that develops in spring breaks down into a westerly and southerly drift by autumn.

Gulf Stream meanders and warm core eddies, two oceanographic phenomena which normally remain in deep offshore water, can profoundly effect environmental conditions on the fishing grounds off the northeast United States when either one moves close along the continental slope. The warm core eddies seen off the New England coast mostly form in the slope water region southeast of Georges Bank by detaching from meanders of the Gulf Stream. Rotation is in a clockwise direction at speeds varying from 0.6 to 1.8 knots.

Environmental effects and their possible influence on fishery resources resulting from meanders and eddies have been identified by Chamberlin (1977) and are:

1. Warming of the upper continental slope and outer shelf by direct contact of a meander or eddy. This may influence the timing of seasonal migrations of fish as well as the timing and location of spawning.

2. Injection of warm saline water into the colder less saline waters of the shelf by turbulent mixing at the inshore boundary of a meander or eddy. This may have influences on the fishery resource similar to that of direct warming, and also cause mortality of fish eggs and larvae on the shelf when the colder water in which they live is warmed beyond their tolerance by the mixing-in of warm slope water.

3. Entrainment of shelf water off the shelf, an effect frequently seen in satellite imagery. Mortality of Georges Bank fish larvae is known to occur, presumably because of temperature elevation when shelf water in which they occur is carried into the slope water. The most profound effects of entrainment on the fishing grounds may be changes in circulation and in water mass properties resulting from the replacement of the waters lost from the shelf.

4. Upwelling along the continental slope, which may result in nutrient enrichment near the surface and increased primary biological productivity.

The annual cycle of the plankton community of the region is typical of the temperate zone. During the winter, phytoplankton (plant plankton) and zooplankton (animal plankton) populations are low. Nutrients are available, but production is suppressed by low levels of solar radiation and low temperatures. As spring approaches and the level of solar radiation increases, an enormous diatom bloom occurs. As the bloom progresses, concentrations of inorganic nutrients decrease.

As water temperatures increase during late spring and summer, phytoplankton and zooplankton become increasingly abundant because of the more rapid development of early life stages, the spawning of fish and benthos, and the abundant food supply.

During summer, zooplankton reaches maximum abundance while phytoplankton declines to a level near the winter minimum. Dinoflagellates and other forms apparently better suited than diatoms to warm, nutrient-poor waters become more abundant during summer. Bacteria in the sediment

actively regenerate nutrients, but because of vertical temperature and salinity gradients, the water column is stable and nutrients are not returned to the euphotic zone (where solar radiation and nutrients are "fixed" into organic matter). On Georges Bank, nutrients regenerated by sedimentary bacteria are immediately available to phytoplankton because of mixing (Cohen, 1975).

During autumn, as water temperatures decrease, the water column becomes unstable due to mixing and nutrients are recycled to the euphotic zone. This stimulates another phytoplankton bloom which is limited by decreasing levels of solar radiation. Phytoplankton and zooplankton levels then decline to their winter minimum while nutrient levels increase to their winter maximum.

Anomalous conditions within the generalized annual cycles are probably common. The stability of the water column which affects nutrient availability may be disrupted by severe storms. Anomalies in temperature may disturb the timing between the annual cycles of interacting species.

VI.B. Habitat Areas Of Particular Concern

During the summer and early autumn of 1976, oxygen concentrations at bottom were severely depleted and widespread mortalities of benthic organisms occurred in a section of the New York Bight off New Jersey. This near-anoxic (and in places anoxic) region of oxygen levels less than 2 parts per million (ppm) was located approximately 4 miles off New Jersey and covered an area about 100 miles long and 40 miles wide during the most critical phases of the depletion (Sharp, 1976). Normal oxygen levels in this region are generally greater than 4 ppm.

Investigations indicate this depletion was probably induced by a combination of meteorological and circulatory conditions in conjunction with a large-scale algal bloom (predominantly Ceratium tripos). Lack of normal seasonal turbulence occasioned by relatively few storms, unusual wind patterns, and above-average surface water temperatures probably all contributed to depletion of the oxygen content of waters beneath the thermocline (Sharp, 1976). It is not known to what degree the routine dumping of sewage sludge and dredge spoils contributed to the depletion, but it is reasonable to assume that any effect would have been detrimental (Atkinson, 1976).

The species affected by the anoxia of most commercial importance were surf clams, red hake, lobster, and crabs. Finfish were observed to be driven to inshore areas to escape the anoxia, or were trapped in water with concomitant high levels of hydrogen sulfide (Steimle, 1976). Freeman and Turner (1977) pointed out that "...it is difficult to measure with any precision the extent of damage to highly mobile organisms, especially the fishes. Sublethal effects can also occur. Among the observed effects of the anoxic water on fishes were behavioral changes involving vertical distribution and migratory routes which in turn may affect feeding and spawning habits."

Reduction in oxygen levels in New York Bight below normal levels has been observed several times in recent history (Atkinson, 1976) although not to levels as low as those observed in summer 1976. The relative contribution of any of the above mentioned factors to the anoxia cannot yet and may never fully be assessed. However, it is important to note that each of these conditions, by itself, was not a unique, previously unobserved phenomenon.

Dumping also needs to be considered in terms of habitat. Trace metals, suspended solids, and organic wastes are introduced into the marine environment at 6 sites in the New York Bight (Environmental Protection Agency, 1979). Each area is designated for a specific type of material so that it can be monitored more effectively. The Environmental Protection Agency (EPA) monitors areas to determine the extent to which the marine environment has been affected by released material. EPA has established impact categories in its Ocean Dumping Regulations which specify impacts detected by site monitoring which dictate modifications in the use of disposal sites.

VI.C. Habitat Protection Programs

No special habitat protection programs exist in the habitat of the species that is the subject of this Plan. Sampling for pollution is carried out by both NMFS and EPA.

Habitat protection programs are administered by a variety of Federal agencies including the Bureau of Land Management of the Interior Department, the Coast Guard, EPA, and NMFS. The NMFS Northeast Region Habitat Protection Branch actively reviews applications for permits to discharge or dump pollutants, to dredge, to place fill material, to place structures, and to operate structures in aquatic environments where such activities may affect resources for which NMFS bears responsibility. The Fish and Wildlife Service does similar reviews for resources for which it bears responsibility. Coastal zone management is discussed in Section XV.D.

VII. FISHERY MANAGEMENT JURISDICTION, LAWS, AND POLICIES

VII.A. Management Institutions

The US Department of Commerce, acting through the Mid-Atlantic, New England, and South Atlantic Fishery Management Councils, pursuant to the Act, has authority to manage the stocks under US jurisdiction.

VII.B. Treaties And International Agreements

Foreign fishing for mackerel, squid, and butterfish is regulated by the Act pursuant to which Governing International Fishery Agreements (GIFA) are negotiated with foreign nations for fishing within the FCZ.

VII.C. Federal Laws, Regulations, And Policies

The only known Federal law that regulates the mackerel, squid, or butterfish fisheries is the Act.

No Indian treaty rights are known to exist relative to these species.

VII.D. State Laws, Regulations, And Policies

Several States have minimum size limits for the commercial sale or possession of mackerel: Massachusetts, 6"; Connecticut, 7"; New York, 7"; and New Jersey, 7".

All of the east coast states mandate a permit or license for the commercial harvest and sale of finfish. The criteria for defining "commercial" harvest and sale, however, vary among the states. It is impossible to gauge the degree to which such requirement may affect domestic harvests, since fees for such permits and the enforcement of the applicable regulations also vary among the states.

All of the states have various regulations which prohibit or restrict the use of various kinds of commercial (and sometimes recreational) fishing gear within certain portions of state waters during all or parts of the year. For example, New Jersey prohibits all trawling within 2 miles of shore. Maryland prohibits the use of otter and beam trawls within 1 mile of shore. Delaware prohibits fishing with trawls, dragnets, and dredges operated by any power vessel within 3 miles of shore. Virginia prohibits fishing with trawl nets or 'similar devices' within the 3 mile limit of the Virginia Atlantic shoreline (with limited exceptions). In addition, several states restrict and/or regulate commercial harvesting within their jurisdiction by non-residents. Such regulations may or may not inhibit the magnitude of the commercial and recreational harvests of these species. It is probable, however, that these kinds of restrictions, particularly on trawling, serve to maintain or increase the proportion of the commercial catch which is harvested from the FCZ. This should support the effectiveness of the management measures in this Plan, since it would be difficult in many states for individuals to circumvent the regulations accompanying the Plan by transferring their harvests of these species to the territorial sea.

Several states also have mesh size specifications which may affect the magnitude of and/or the sizes of the fish in the catch.

VII.E. Local And Other Applicable Laws, Regulations, And Policies

No local or other laws, regulations, or policies are known to exist relative to these fisheries.

VIII. DESCRIPTION OF FISHING ACTIVITIES

VIII.A. US Commercial Fishery

Reported US Loligo landings during 1982 were 36% more than the previous (1979) high (12.7 vs. 9.4 million lbs.; Table 1). Reported US Illex landings during 1982 (10.7 million lbs.) were 348% more than the previous high (1979, 2.4 million lbs.; Table 1). Reported US landings of butterfish were also at an all time high, and in fact, nearly 50% greater than the prior (1980) high. Commercial US landings of Atlantic mackerel (7.5 million lbs.) were the highest since 1970 (Table 1).

Much of the growth in landings came from the FCZ, especially for butterfish. In 1982, 77% of the mackerel catch came from the FCZ, although the division between the FCZ and territorial sea is highly variable. For squid, the catch has varied between 40-60% territorial sea versus 60-40% FCZ, although in 1982 it was 70% FCZ. For butterfish, the FCZ share has been generally increasing, to a 1982 high of 92% (Table 2).

Nearly three quarters of the Atlantic mackerel landed between 1971 and 1980 were captured in trawls (1.7 million lbs. average) or pound nets and floating traps (1.4 million lbs. average, Tables 3 and 4). Massachusetts and New Jersey have consistently been the two States with the greatest annual mackerel landings during the past decade with most of the mackerel landed in Massachusetts by pound nets and floating traps while New Jersey mackerel was caught mostly by trawls (Table 4). Eighty-three percent (4.9 or 5.9 million lbs., Table 3) of the US landed squid were caught in trawls. Massachusetts, Rhode Island, and New York all landed over 10 million lbs. of squid between 1971 and 1980 (Table 5). Almost 90% (47 of 52 million lbs.) of the butterfish landed by US commercial fishermen were caught in trawls (Table 3). More than half the butterfish caught between 1971 and 1980 were caught by Rhode Island trawlers (Table 6).

However, recent interest by foreign nations in US harvested Atlantic mackerel and squid have increased dramatically (Section X.A).

US commercial landings of these species very widely by month (Figure 2). Commercial landings of Atlantic mackerel usually are concentrated in the spring, those of squid in late spring-summer, and those of butterfish in the autumn. In 1978, about 80% of the commercially caught mackerel, about 70% of the squid, and about 40% of the butterfish were taken in what is now the first six months of the fishing year for the Plan (1 April - 30 September).

The dramatic growth in squid landings during the spring and summer of 1979 was due mainly to a large inshore fishery in Massachusetts. Reported Massachusetts commercial landings of squid in May that year were over 3 million lbs. (worth over $1.3 million ex-vessel) and were landed primarily in Chatham and New Bedford. The squid landings in New Bedford that month brought over $500,000 at the dock, about 20% of the total ex-vessel value from all finfish and squid. This fishery was possible only because of the beginning development in 1979 of a US squid export fishery. The rapid shift of fishing effort to squid and the proportional increase in economic importance of the species are similar to what occurred in Rhode Island in 1978 in response to foreign demand for butterfish (Figure 2). Foreign demand for US caught mackerel has not changed significantly in recent years. The increase in mackerel landings in 1980, 1981, and 1982 was probably due more to increased availability of good market quality fish to commercial fishermen than to shifts in either the domestic or foreign market.

VIII.B. US Recreational Fishery

Although it is known that recreational marine anglers occasionally take squid and butterfish, no estimates of these catches have resulted from any of the national or regional angler surveys. Any sport catch of these species is likely to be negligible, although significant portions of the commercial catch may be used as bait in recreational fisheries for other species. The following discussion is directed at the Atlantic mackerel sport fishery.

The National Salt-Water Angling Surveys (Clark, 1962; Deuel and Clark, 1968; Deuel, 1973) and the survey of the Northeast Region (Maine - Virginia) in 1974 (Deuel, NMFS, pers. comm.) produced

estimates of recreational mackerel catches which showed nearly a 7 fold difference in catch between 1960 and 1970 (Table 7). Catch in 1970 (71 million lbs.) was over 4 times the average (16 million) total catch reported during 1960, 1965, and 1974.

NMFS performed small scale, limited area, limited season surveys of the recreational mackerel fishery in 1976, 1977, and 1978 (Christensen et al., 1976, 1979; Anderson, 1980). These studies produced coastwide estimates of mackerel catches of about 9.3 million lbs. in 1976, 1.2 million lbs. in 1977, and 14.5 million lbs. in 1978.

No distinctions were made in any of the above surveys as to the definition of "catch", i.e., it must be assumed that the figures cited above represent estimates of all mackerel taken, regardless of whether they were landed, released alive, or discarded dead.

In 1979, marine anglers caught approximately 4 million mackerel, 54% in New England and 46% in the Mid-Atlantic (Table 8). If the average weight of all fish caught was equal to the average weight of the fish landed (Table 8), the total weight caught in 1979 was 4.2 million lbs. for the New England, 3.1 million lbs. for the Mid-Atlantic, and 7.3 million lbs. total. If the average weights of the released and discarded mackerel were less than the average weight of the retained fish, these estimates are too high. There is, however, no way at present to adjust the above figures to account for such possibilities.

In 1979, Atlantic mackerel was the sixth most frequent recreationally caught species in the New England area (Table 9), comprising over 5% of the total regional catch. Mackerel did not make the top 10 caught species in either the Mid-Atlantic or South Atlantic regions (Table 9). Over the entire US East Coast during 1979, mackerel was the eleventh most frequently caught species in numbers and eighth most caught species in terms of weight (US Dept. Comm., 1980a).

Relationship Between Stock Abundance and Recreational Mackerel Catch

NMFS, in the Mackerel Preliminary Fishery Management Plan (PMP), and subsequently the Council, in its Plan, based their estimates of US recreational capacity for mackerel on the assumption that the sport catch is directly proportional to species abundance.

After a survey of the Mid-Atlantic fishery in 1975-76, Christensen et al. (1976) concluded: "A variety of factors affect angler harvest of mackerel including population size, availability of more desirable species, and weather conditions during the relatively brief Middle Atlantic fishing season... Therefore, it does not necessarily follow that the recreational catch is directly proportional to mackerel stock size. Nonetheless, it is believed that angler catches follow general trends set by other indicators of stock size... Indicators included in this comparison are biomass estimates, US research vessel autumn and spring bottom trawl survey indices (Anderson et al., 1976), and the international catch per standard US day fished. The trends in recreational mackerel catch exhibit a similar pattern... Length frequency data from this survey indicate that recreational fishermen primarily harvest the larger size mackerel which are part of the spawning stock. The estimated spawning stock biomass follows a similar trend..." Comparison of subsequent angler survey data and stock estimates (e.g., Anderson, 1980) supports these conclusions. Given the absence of more precise predictive relationships, the assumption that the size of the mackerel sport catch will depend on the size of the spawning stock, within limits, is reasonable given the current data on both mackerel stock abundance and recreational fishing activity for the species.

The Plan provides that the capacity for mackerel in the US recreational fishery is the amount predicted by the equation:

$$Y = (0.008)(X) - (115)$$

where Y is the predicted recreational catch and X is the mackerel spawning stock size in the upcoming fishing year, in metric tons. Since this equation was developed using spawning stock estimates based on a natural mortality rate of 0.3, it was necessary to repeat the analysis that developed the equation to derive an equation using spawning stock estimates based on a natural mortality rate of 0.2. The analysis is discussed in detail in a revised version of Background Paper

#1 (MAFMC, 1982a). The resulting equation is:

$Y = (0.01)(X) + (180)$ with X and Y in metric tons or

$Y = (22{,}046)(X) + (396{,}828)$ with X and Y in lbs.

VIII.C. Foreign Fishery

The reported foreign catch of the squids, Atlantic mackerel, and butterfish from 1965 through 1982 have varied widely (Table 1). The 1982 Loligo catch was about 35 million lbs., up from the 1981 catch of 20 million lbs., but well below the peak 80 million lbs. caught in 1973. The foreign Illex catch during calendar 1982 was about 29 million lbs., up from about 17 million lbs. in 1981, but down from the 54 million lbs. peak of 1976 (Table 1). The final squid TALFFs (on a fishing year basis) have been about 81 million lbs. for Loligo and 50-55 million lbs. for Illex for 1980-81 through 1982-83 (Table 10). However, during that period, the total final TALFF was generally not allocated to foreign nations, with the actual catch between 60% and 70% of the allocation (Table 11). The share of the TALFF caught is considerably lower, ranging from 34% (Loligo in 1982-83) to 75% (Illex in 1980-81; Table 11).

Foreign Atlantic mackerel landings in the FCZ in calendar 1982 were 14.6 million lbs. (including a Polish research cruise of 9.6 million lbs.). The 1979 landings, 139,000 lbs., were the lowest during the period from 1965 and were negligible relative to the foreign peak of 850 million lbs. in 1972. Final Atlantic mackerel TALFFs were 2.6 million lbs. in 1978, 1979, and 1979-80, 22 million lbs. in 1980-81 and 1981-82, and 19.8 million lbs. in 1982-83 (Table 10). Allocations have been generally close to the final TALFF, but the actual catch has generally been below both the TALFF and allocation (only 13% of the TALFF and 14% of the allocation in 1982-83; Table 11).

The foreign butterfish catch in the FCZ was 1.8 million lbs. in calendar 1982, down from a 1973 peak of about 70 million lbs. (Table 1). The TALFF throughout the period has been 8.8 million lbs., except for 3.1 million lbs. in 1981-82 when the Council certified an annual fishing level (Table 10). The catch has been well below these TALFFs; 31% in 1979-80, 28% in 1980-81, 36% in 1981-82, and 20% in 1982-83 (Table 11).

Incidental catch relationships among the foreign fisheries for the squids, mackerel, butterfish, and the hakes are important relative to management of these species. These relationships were discussed in the original Plans and have been analyzed under both ICNAF and Act management (MAFMC, 1982b).

Loligo/Butterfish: Roughly 5,000 lbs. of butterfish are caught with every 100,000 lbs. of Loligo (MAFMC, 1982b). This estimate was developed using designated foreign fishing reports (NMFS, NEREIS reports) from January through mid June 1978-1982. Only data from countries (Italy, Japan, Mexico, and Spain) with relatively large allocations and catches of Loligo in 1978-1982 were used. This estimate is actually fairly inflated and the fishery could be much 'cleaner' if harvesting methods used by Spain and Mexico (where butterfish bycatch were 1.9 and 2.0%, respectively) were employed by all. The assumption that all butterfish was taken as a bycatch overestimates the incidental catch rate, since some of the butterfish was taken either as a bycatch in fisheries for species other than Loligo or by effort aimed directly at butterfish (e.g., probably a large fraction of the Japanese catch).

Mackerel/Silver Hake: It is difficult to estimate the magnitude of the true bycatch of the foreign hake fisheries because no real directed foreign fishing has existed since 1979. Only the USSR had significant allocations and catches of silver and red hake during 1979. Designated Foreign Official Reports (NMFS, NEREIS) for 1978 and 1979, ICNAF data for 1977 and 1978, and Foreign Fishery Observer Program reports during 1977-79 all indicate a mackerel bycatch of about 1,000 lbs. per 100,000 lbs. of targeted hake (MAFMC, 1982b).

Other Species: In addition to the two bycatch relationships discussed above, small, irregular, but not infrequent bycatch of all the subject species may result from foreign effort aimed at any one species (for instance, mackerel in the Loligo fishery). All evidence indicates that this bycatch is

small but also that such bycatch cannot be fully eliminated.

IX. DESCRIPTION OF ECONOMIC CHARACTERISTICS OF THE FISHERY

IX.A. Domestic Harvesting Sector

Commercial Fishery

During the decade since 1971, the commercial ex-vessel value of the Atlantic mackerel catch reached a low of $265,000 in 1971 and a high of $1,085,000 in 1982 (Table 12). Using the wholesale price index to adjust for inflation, the real value of mackerel in terms of 1967 dollars peaked in 1966 at $468,900 and reached a low of $232,700 in 1971. The 1982 value of commercial landings in inflation adjusted dollars was $361,000. (It must be noted that deflation by the wholesale price index may be misleading since fishery products are a very small sector of the economy while the wholesale price index covers all sectors of the economy. Its use is just to indicate that while nominal prices have increased over the long term, some of this increase may have been due to inflationary causes occurring outside the fishery.)

The US squid fishery has traditionally been incidental in nature. The main reason for little domestic interest in squid harvesting has been lack of a substantial US market; thus, prices remained low until recent years.

Squid landings (Loligo and Illex) have risen from 2.6 million lbs. in 1965 to a peak of 23.5 million lbs. in 1982 (Table 1). The dramatic increase in squid landings since 1978 is largely due to increases in exports. Squid prices have also increased in nominal terms since 1971, from $.13/lb. to a 1981 level of $.35/lb. (Table 13). Adjusted for inflation, however, the real price of squid has fallen from a 1978 peak of $.19/lb. to $.06/lb. in 1982.

Butterfish has been an important component of the foodfish fisheries of this region since at least the 1930s. The lowest total ex-vessel value in recent years was in 1972 at $404,000 (Table 12). Value of landings peaked in 1982 at $5,618,000, due largely to the expansion of an export market that began in 1978. Adjusted for inflation (1967 dollars), these values are $339,000 for 1972 and $1,873,000 for 1982.

The Plan requires that US vessels in the squid, butterfish, and mackerel fisheries have permits. As of October 1982, the number (Table 14) of commercial squid permits has increased to 892 permits, party/charter boat permits were 46, and incidental commercial squid permits increased to 185. Similarly, commercial mackerel permits increased to 1,068, party/charter boat permits increased to 247, and incidental commercial mackerel permits increased to 274.

For vessels with commercial squid permits, the average hold capacity is 62,838 lbs., with a range up to 800,000 lbs. Average crew size is approximately 4, with a range from 1 to 17 (Table 15).

Vessels with permits for the commercial mackerel fishery have an average hold capacity of 52,839 lbs., with a range up to 800,000 lbs. Average crew size is approximately 4, with a range from 1 to 17 (Table 15).

As of October 1982, there were 553 commercial vessels (Table 14) permitted in the butterfish fishery with an average hold size of 78,382 lbs. (ranging up to 800,000 lbs.) and an average crew size of approximately 5 (range from 1-17). These statistics also show 17 butterfish party/charter boats and 158 incidental commercial permits issued for 1982.

It is not possible to develop meaningful vessel performance indicators based on fishing vessel records since such records are not required by this Plan. Such information is necessary to develop harvesting capacity estimates. However, using the average hold capacity for the permitted vessels it seems reasonable to conclude that the fleet would have the physical capacity to harvest Illex, Loligo, mackerel, and butterfish at the maximum sustainable yield levels without extensive amounts of effort, if adequate markets existed. Given the average hold capacity of the permitted squid vessels (62,838 lbs.) and the number of vessels (892), the total capacity of the fleet is 56

million lbs. per trip. Using the same procedures for the permitted mackerel and butterfish vessels, the capacity is 56 million lbs. and 43 million lbs. per trip, respectively.

Recreational Fishery

The marine recreational fishing industry is important in the New England and Mid-Atlantic areas (Centaur Management Consultants, Inc., 1977), with 1975 sales estimated at a minimum of $634 million.

No data are available on the specific value of the recreational fisheries for the species that are included in this Plan. However, as noted above, there are 247 party/charter boats with permits in the mackerel fishery, 46 in the squid fishery, and 17 in the butterfish fishery.

IX.B. Domestic Processing Sector

Since mackerel, squid, and butterfish have small markets in comparison with groundfish and other major fisheries of the Atlantic coast, processing sector and export information is generally unavailable. The following discussion is based on the most recent data available.

It is estimated that approximately 10 plants process mackerel in the northeast, although mackerel constitutes only a small percentage of the total volume processed. Similarly, a limited number of firms process mackerel in the Mid-Atlantic area. Processing for domestic consumption primarily involves filleting and canning. A substantial portion of the catch is also sold for bait. In 1963, 1965 and 1975, the value of processed mackerel from New England was $5,000, $21,000 and $75,000, respectively.

A total of 29 processing firms reportedly participate in the squid fishery. Of the total, eleven are located in Massachusetts, eight in Rhode Island, seven in Virginia, and one each in Maine, New York and New Jersey. All of these firms handle other fish products in addition to their seasonal squid supply.

New England dominates production of frozen squid on the Atlantic coast (Table 16). Canned squid has reportedly been produced by New York and New Jersey firms. While east coast production has increased in recent years, it is still a minor commodity when compared to Pacific coast production. At present, canned squid is the only US commercially prepared squid product.

Most butterfish reported landed is sold fresh or frozen for human consumption. Demand in the US for butterfish as food is concentrated mainly on the largest and best quality fish.

A small fraction (approximately 0.6-2.0% of all landings) of the catches of the largest butterfish is smoked and sold in specialty markets. This processing is carried out almost exclusively in New York City, and most of these fish come from Suffolk County, New York, landings in the autumn, when large butterfish are most available in that area.

About 20% on average of the annual reported butterfish catch was used industrially from 1965-1975 (the latest year for which data are available). This percentage has probably declined greatly because of the recent increase in landings used for exports. Most of this fraction of the catch is used for bait. Large quantities of butterfish have been periodically taken by industrial (scrap fish) fisheries which do not report landings by species. The composition of such "trash" fish landings may fluctuate markedly from year to year.

Comprehensive data on processing by simple freezing and exports of this production are not collected by NMFS. No precise estimates are, therefore, available on these sectors of the processing and export industries. Over 4.4 million lbs. of butterfish were estimated to have been frozen and exported in 1978. This market declined in 1979. A very preliminary estimate indicates that 85% of the 1980 butterfish catch (9.8 million lbs.) was exported. Exports of US caught and frozen Atlantic squid were probably negligible prior to 1979, in which year this industry also began to develop. The most recent survey of US processors indicates a substantial capacity and desire to enter this export market. The export market for US caught mackerel (other than the traditional,

sporadic and relatively small export market for canned mackerel) has not yet been developed.

The US physical capacity to catch, freeze, and export squid, mackerel, and butterfish undoubtedly is equal to or exceeds the OYs recommended in this Amendment, but much of this capacity is now used for other species which are currently more profitable for US industries. Processor reporting requirements (instituted pursuant to the original Plans) have not been in effect long enough to derive more precise estimates of shore-based and freezer trawler processing capacities.

IX.C. International Trade

In 1979, approximately 5.0 million lbs. of "mackerel" (fresh or frozen) worth $1.6 million was imported into the US. In addition, 1.3 million lbs. of salted or pickled mackerel worth $482,000 was imported. In 1980, 10.4 million lbs. of US canned mackerel worth $13.8 million was exported from the US.

Exports of US canned squid (east and west coast combined) totalled 8.5 million lbs., worth $2.3 million in 1980. No data on imports of squid are available. (For a more detailed discussion of international trade of squid see the Regulatory Impact Review.)

Prior to 1978, US butterfish exports, if any, were negligible. A US butterfish fishery for export was begun in 1978, based almost entirely on Rhode Island landings. Approximately 5.3 million lbs. of whole frozen butterfish was exported in 1978, mainly to Japan (Pt. Judith Fishermen's Cooperative, personal communication). The ex-vessel value of this exported butterfish was approximately $2 million. Detailed information on the processed value of these exports is unavailable, although it is estimated that US processors grossed between $3 and $4 million from these sales.

Butterfish exports for 1979 were reported to be about 400,000 lbs. This sharp reversal from 1978 may have been due to (1) Japanese reports of poor quality or (2) the lack of Japanese import licenses for butterfish that prevented willing wholesalers from importing butterfish. It is estimated that 85% of the 1980 butterfish landings were exported, implying a level of exports of approximately 9.8 million lbs. The value of these exports is unknown. The exact reasons for the renewal of butterfish exports to Japan during 1980 are unknown. Japanese statistical digests do not record butterfish exports and prices separately, consequently, little evidence is available concerning the Japanese markets for 1978-82. A 1979 assessment of the Japanese wholesale market for butterfish by the US Embassy in Tokyo indicated that Atlantic butterfish sold in institutional food markets and was significantly higher priced than their chief substitute, Pacific butterfish. The prices of Atlantic and Pacific butterfish were rising relative to 1978 and their markets appeared to be expanding. More recent evaluations of the Japanese butterfish wholesale markets have not been made.

It is impossible to predict the magnitude of butterfish exports in 1982. At present, foreign demand is greatest for large and roe free butterfish, which are most available to domestic fishermen during autumn and early winter.

The world supply of butterfish (butterfish and Pacific butterfish, Pampus echinogaster, is heavily dependent upon the Atlantic species (74% by weight of total landings of both species from 1970-1977). From 1970-1976, the last year of unrestricted (except by area) foreign fishing for butterfish in the Atlantic Ocean, foreign butterfish catch from what is now the FCZ accounted for about 60% on average of the total harvest of both species (Pacific butterfish are not found within the US FCZ). In 1977, due mainly to enactment of the Act, the total foreign catch of Atlantic butterfish fell to approximately 4.6 million lbs., resulting in a total (all nations) catch of Atlantic and Pacific butterfish that year of about 11.9 million lbs., about one-third of the previous year's catch. The total foreign catch of both species, which averaged about 30.9 million lbs. from 1970-1976, dropped to about 8.8 million lbs. in 1977. The failure of foreign nations to harvest the entire butterfish TALFF in 1978-1980 reflects not a lack of demand for butterfish, but probably a combination of other factors including (a) the failure of some nations with butterfish allocations to fish for any species in 1978, and (b) the possibility that foreign nations may have purposely minimized their catches of butterfish to the greatest extent practicable in order to prevent closure of their squid fisheries, which at present are of far greater importance to foreign fishing nations, and in which

butterfish is an unavoidable bycatch.

The annual TALFF for butterfish was 8.8 million lbs. for 1978, 1979, 1980, and 1982. The 1981 TALFF was 1.7 million lbs. because the Council set an Annual Fishing Level that year. Japan, traditionally the largest harvester of butterfish, was allocated about 1.5 million lbs. of butterfish in 1978, 2.2 million lbs. in 1979, 2.3 million lbs. in fishing year 1980-81, 684,000 lbs. in fishing year 1981-82, and 882,000 lbs. in fishing year 1982-83, which is a small fraction of its average annual catch of butterfish from the Atlantic Ocean in the years prior to enactment of the Act. It is likely that, as foreign butterfish allocations are limited, these countries will seek to maintain their supplies through imports from the US.

X. DESCRIPTIONS OF THE BUSINESSES, MARKETS, AND ORGANIZATIONS ASSOCIATED WITH THE FISHERIES

X.A. Relationship Among Harvesting and Processing Sectors

Squid, butterfish, and mackerel landings are only a small percentage of the potential capacities of harvesters and processors. These species have very small US markets for they are primarily consumed by ethnic communities in the Mid-Atlantic and New England. Given this limited demand, ex-vessel prices are very sensitive to landings. Harvesters are unwilling to land these species if their prices are not high enough relative to alternative species and if increased landings will cause ex-vessel prices to decline rapidly. Processors have shown a willingness to expand their production of these species in recent years because of increased demand for US caught squid and butterfish by foreign countries. This demand has stabilized ex-vessel prices with respect to landings and harvesters have responded accordingly.

A number of joint ventures have also been implemented. The first for one thousand mt with Japan, involved Loligo squid in 1981. During 1982, eight joint ventures were applied for involving Loligo and Illex squid, Atlantic mackerel and Atlantic herring. Seven were approved, and efforts to harvest for over-the-side sales were undertaken for allocations totalling 24,900 mt, of which 14,900 mt were squids. Results of the 1982 joint ventures were mixed, with only limited success realized for those attempted. While the full potential of the joint ventures was not reached, and several were totally unsuccessful, the experience was encouraging. In fact, 14 joint ventures have been applied for in 1983. Thirteen have been approved, primarily for the squid species (Table 17).

X.B. Fishery Cooperatives Or Associations

There are three active fishermen's cooperatives in the Mid-Atlantic area. Although some purchasing of expendable equipment for fishing vessels is undertaken, their main business is marketing member landings. Cooperative operations, which are typical of Mid-Atlantic packing or dock practice, include: supplying fuel, ice, water, and trip services to members. The three cooperatives (all located in New Jersey) are the Belford Seafood Cooperative Association, Inc., the Point Pleasant Fishermen's Dock Cooperative, Inc., and the Cape May Fishery Cooperative.

X.C. Labor Organizations

Labor organizations identified with the harvesting and processing sectors of the fisheries in the Mid-Atlantic area are limited to four organizations: the Seafarers International Union of North America, the International Longshoremen's Association, the United Food and Commercial Workers International Union (UF & CW) of the AFL-CIO, and the International Brotherhood of Teamsters. The following discussion relates to Mid-Atlantic fisheries generally. Information is not available to identify activities that relate directly to Atlantic mackerel, squid, or butterfish.

In the Mid-Atlantic area union involvement is almost entirely limited to onshore seafood handling, processing, and distribution activities. Vessel crews are not organized by any of the identified unions although some attempts have been made in the past to include fishermen in organized unions. The UF & CW recently attempted to organize vessel crews who were employees of a seafood processing company. Although their efforts were met favorably by the crew members, the National Labor Relations Board ruled that the UF & CW was in violation of labor laws because each

boat was owned by a separate owner and, therefore, all boat crews could not be organized under the same union. Since that ruling, the UF & CW has not attempted to organize vessel crews in any other locations.

Onshore seafood handling is generally non-unionized. To the extent that it is, the International Longshoremen's Association is the primary national union involved in seafood handling workers. Most union activity occurs in the region's major urban centers (New York, Philadelphia, Baltimore, and Norfolk) and includes handling workers at boat docks and in warehousing facilities located at processing plants.

Fish processing workers, when unionized, are represented by the UF & CW. This union represents oyster and clam shuckers, fish cleaners and cutters, freezermen, warehousemen, some distribution workers,' and wholesale retail clerks.

Transportation of seafood products, especially from processing facilities to wholesale and retail fish distributors is organized under the International Brotherhood of Teamsters, with headquarters in Washington, D.C. and regional offices in major urban centers throughout the Mid-Atlantic region.

Preliminary analysis of labor union activity in the Mid-Atlantic region indicates that the seafood harvesting, handling, and processing industry is not highly organized. Although union activity occurs in all major urban centers, the overall percentage of union members employed in the seafood industry is relatively low. For example, in the Hampton Roads area, only five percent of all workers employed in the seafood harvesting processing industry are organized by the unions.

The reasons for limited union involvement include the low-wage, seasonal nature of employment in the processing industry and the diverse, highly competitive, independent small businessman characteristics of fishermen, brokers, and processors. In many instances, wages are extremely low, approaching minimum wage in some localities. Often fish processing employees are the lowest paid employees covered by the unions. These employees, subject to difficult working conditions and unstable employment prospects, change employment continuously, leaving employers with no work and hiring on with companies that do have work. Seasonality of employment and constant changeover from shellfish to finfish processing affect steady employment and limit the unions' ability to organize on-shore workers.

Unionization of vessel crews and fishermen is limited by the small size of individual crews and the investor-owner fishing boats. National Labor Relations Board rulings against organization of fishing fleets have added to the organization and administrative problems of including fishermen in national union structures.

X.D. Foreign Investment In The Domestic Fishery

No significant foreign investment is known to exist in these fisheries.

XI. DESCRIPTION OF SOCIAL AND CULTURAL FRAMEWORK OF DOMESTIC FISHERMEN AND THEIR COMMUNITIES

While landings and values of the landings for Atlantic mackerel, squid, and butterfish have been increasing, these species continue to be relatively unimportant to the overall commercial fisheries of the Atlantic Coast. In 1980, 9 counties accounted for 97% of the mackerel landings. For squid in 1980, 12 counties accounted for 97% of total landings (Table 18). For butterfish, only 5 counties contributed 94% of landings in 1980. The leading mackerel counties were Essex, MA (31% of total 1980 landings), Cape May, NJ (26%), Barnstable, MA (13%), and Suffolk, NY (11%). Counties with the largest share of squid landings were Suffolk, NY (23%), Washington, RI (17%), Barnstable, MA (16%), and Bristol, MA (11%). For butterfish, the two leading counties were Washington (63%) and Newport (18%), RI (Table 18).

Mackerel contributed no more than 1% to the total ex-vessel value of all landings in any county in 1980, while squid contributed no more than 4%. Butterfish made the greatest contribution (16%),

to Washington County, RI (Table 18).

If the relative shares of all of the species are combined by county, Washington County, RI, has the greatest involvement, with 84% out of 300% (Table 19). Other leading counties are Suffolk, NY (43%), Essex, MA (37%), Cape May, NY (32%), and Newport, RI (30%). Even on this combined basis, mackerel, squid, and butterfish are significant in terms of the share of ex-vessel value contributed in only one county, Washington, RI, with 20% (Table 19).

Clearly, while the fisheries have been developing, based on the most recent available data (1980) they do not account for a majority of landings or ex-vessel value in any one county. The species included in the plan (especially butterfish) are important to Washington County, RI. This level of relative importance must be considered in light of the management measures in the Plan. Other than the overall quotas, the need to obtain permits, and the NMFS voluntary catch reporting system, the Plan places no obligation on US fishermen.

If the Plan imposed a hardship on US fishermen, then the condition of their communities (stable economic base, alternative employment opportunities, etc.) would be important. However, in the near future, the primary thrust of the Plan is to provide a framework for development, not to restrain catches by US fishermen. When catch levels reach the point where more rigorous measures are needed, it will become appropriate to consider social and cultural factors in more detail.

XII. DETERMINATION OF OPTIMUM YIELD

XII.A. Specific Management Objectives

The objectives of the Plan are:

1. Prevent the exploitation of these resources from exceeding those levels which reduce the probability of successful (i.e., the historic average) recruitment to the fisheries.

2. Promote the growth of the US commercial fishery, including the fishery for export.

3. Provide the greatest degrees of freedom and flexibility to all harvesters of these resources consistent with the attainment of the other objectives of this Plan.

4. Provide marine recreational fishing opportunities, recognizing the contribution of recreational fishing to the national economy.

5. Increase understanding of the conditions of the stocks and fisheries.

6. Minimize harvesting conflicts among US commercial, US recreational, and foreign fishermen.

The management unit is all Atlantic mackerel (Scomber scombrus), long-finned squid (Loligo pealei), short-finned squid (Illex illecebrosus), and butterfish (Peprilus triacanthus) under US jurisdiction, excluding the Gulf of Mexico and the Caribbean Sea.

XII.B. Description of Alternatives

XII.B.1. Amendment

The Amendment changes the squid management regime to allow the RD, in consultation with the Council, to adjust OY at the beginning of the fishing year and throughout the year on the basis of specified guidance. The mackerel regime is changed to reflect the changed mackerel natural mortality rate (from 0.3 to 0.2).

XII.B.2. Alternatives to the Amendment

In the development of the original Plan, earlier Amendments, and previous drafts of the implemented FMP, the Council considered many other alternatives. For any and all of the subject species, these included reversion to PMP management; different OY amounts, limited flexible OY, maximum flexibility and capacity amounts, including ranges for these amounts, the use of Reserves; different combinations of species for merger into one or more management plans, including species for which plans have not been prepared; and continuation of the current management measures with no change.

Because the more flexible squid OY adjustment mechanism intended by the Council was found not to be sufficiently supported in the merger amendment NMFS implemented a limited squid OY adjustment mechanism provided for by that amendment. This assured that the merger amendment would be in place by the beginning of the 1983 fishing year, 1 April 1983. Since then, the intent of the Council to have a more flexible squid OY adjustment mechanism has been more clearly articulated and supported with attendant documentation.

The Council considers the alternatives presented within this Amendment to be appropriate under current and foreseeable future circumstances. The Council will also consider modifications of the alternatives as the result of public comments received after the completion of the public comment period.

The alternatives to the Amendment are:

1. **Take no action at this time.** This would mean that the Plan would continue in effect until 31

March 1986, unless otherwise amended. The limited squid adjustment mechanism would remain intact. Atlantic mackerel specifications would continue to be based upon a natural mortality rate of 0.30, instead of the most recent scientifically determined rate of 0.20. This would not allow determination of OY on as current a basis as possible for squid and would violate National Standard #2 in the case of mackerel.

2. Prepare a Secretarial Amendment to Amend the Council Plan. This would amend the Plan by adopting the more flexible squid adjustment mechanism contemplated by the Council. It would further provide for the best scientific information forming the basis of the Atlantic mackerel specifications. It would grant the RD, in consultation with the Council, the authority to adjust squid OYs based upon certain biological and economic information. It would allow the annual mackerel specifications to be based upon the most recent scientific assessment of natural mortality rate of 0.2. This alternative was considered because, if NMFS prepared the Secretarial Amendment, the Council staff would be able to work on other Plans. However, the alternative was rejected because of timing considerations.

XII.C. Analysis of Beneficial and Adverse Impacts of Potential Management Options

The Amendment would guarantee foreign nations at least a squid bycatch TALFF and would replace the squid Reserves with a procedure for inseason adjustments to OY, DAH, and TALFF, thus increasing management flexibility.

The Plan does not include a guaranteed bycatch TALFF. It is quite possible for the TALFFs to be zero, resulting in prohibited species designation, which means that foreign fishermen may catch but must discard the particular species. The Council's long term policy has been that such a situation wastes the resource and it is preferable to set aside a specific bycatch TALFF. This policy is incorporated in the provisions of the Plan for both mackerel and butterfish. This amendment would extend the policy to the squids.

The Plan has flexibility in the setting of OY and DAH, but requires that the difference between initial OY and initial DAH be divided equally between TALFF and Reserve. The squid fisheries have developed to the point where the concept of Reserves is inadequate and presents a problem relative to the time related review of US fishery performance. The automatic division of the difference between initial OY and initial DAH equally between TALFF and Reserve can create initial TALFFs that are smaller than bycatch requirements while adjustments cannot be made until well into the fishing year. The concept also constrains adjustments to DAH and TALFF that might be necessary for joint ventures that involve direct harvest by foreign nations along with purchases from US vessels.

The Amendment would have an impact on foreign fisheries in that it may reduce foreign catch of the subject species. As a consequence, there would be decreased revenue from foreign fishing fees to the US. However, the long-term economic benefits to the private and public sectors of successful US export, joint venture, and recreational fisheries would far outweigh any short-term losses. The initial and subsequent specification of OY would take these factors into account in order to provide the greatest overall benefit to the nation.

The US fisheries for both Loligo and Illex also have begun to develop in response to foreign demand, and the Council has determined that protection of this growing US export industry is an important consideration for this Plan. Support of US industry efforts to enter international squid markets will be especially important over the next few years, while the new US industry is still highly vulnerable to foreign competition.

The Amendment is responsive to squid stock conditions, whereas the Plan is not. The Plan does not specifically provide for the reduction of the annual squid OYs from the maximum values for biological reasons, only for economic reasons. This amendment, by introducing the concept of a ABC, which is the biologically acceptable upper catch limit for the squids for a particular year, explicitly accounts for stock assessment considerations prior to any adjustment to the OYs for economic reasons.

The primary difference between the Amendment and the Plan is the increased flexibility in the squid regime with Amendment relative to the Plan. The Amendment replaces the squid Reserves with a provision that the OY may be adjusted during a year from its initial value to a value that is judged to be in the best interests of the US fishing industry. This is important because, in the past, there have been indications that foreign nations did not purchase US harvested fish early in the year in order to keep US catch levels down and, thereby, improve the chances of the Reserve being allocated to TALFF. However, foreign nations are guaranteed a bycatch TALFF the same as with mackerel and butterfish. Also, the Plan sets specific values at the beginning of each year for DAH and DAP for the squids, which may be changed only by allocations from the Reserve. With the Amendment, DAH, DAP, and OY are all subject to adjustment during a year if events warrant. The resulting system for the squids can reflect the dynamic nature of the fishery during any year, the constraints on this flexibility being the biological one of ABC plus the guaranteed bycatch TALFF and the fact that TALFF, once actually allocated and accepted by a foreign nation, cannot be taken away.

The mackerel regime is changed in the Amendment relative to the Plan. The mackerel spawning stock size above which a directed foreign mackerel fishery is possible was lowered from 600,000 mt to 400,000 mt. The equation used to estimate the capacity of the recreational mackerel fishery was revised. These revisions were made to reflect the changed mackerel natural mortality rate estimate. They do not represent changes in management policy, but only revisions necessary so the Plan is based on the best and most recent scientific information. Note that the 30,000 mt allowable catch when the stock is less than or equal to 400,000 mt is not changed by the Amendment because that quantity has been determined to be the minimum desirable for the US fishery and for the foreign bycatch. It represented 5% of the biomass with 600,000 mt and only 7.5% with the 400,000 mt quantity.

XII.D. Tradeoffs Between the Beneficial and Adverse Impacts of the Amendment

In the squid regime, the specification of OY, DAH, DAP, and TALFF provides the maximum amount of flexibility possible for setting values at the beginning of each year and for making adjustments during a year. The primary constraint is the ABC, which is the maximum biologically acceptable catch during a given year. Within that constraint, the initial values of OY, DAH, and DAP are estimated based on the best available information on what the US industry will catch and process during the year. Initial TALFF is set at a value considered to be in the best interest of the US industry, although foreign fishermen are guaranteed at least a bycatch (the same concept as with mackerel and butterfish). DAH, DAP, and TALFF may be adjusted during a fishing year as events develop, the constraints being that ABC may not be exceeded, and TALFF that has actually been allocated to and accepted by foreign nations may not be taken away.

One objective of the Plan is the development of the US commercial fishery, including the fishery for export. The approach used to achieve the objective is to set foreign allocations at levels that will reduce the share of foreign supplies that foreign nations can harvest directly, in anticipation that foreign nations will purchase US-caught fish to, at least in part, make up the difference between foreign demand and what the foreign nations may harvest directly. Strand (1980), in a study of Spanish Loligo harvests, market prices, and imports, concluded that the price of Loligo in Spain was negatively correlated to Spanish Loligo harvests, and that allocations to foreign fleets in the FCZ can retard the development of the US export industry. It would be irresponsible to extrapolate this limited work to all of the fisheries included in this Plan, but it is an indication that the concept of the Plan may be valid. However, another indication that this concept is valid is the following statement from the European Weekly Frozen Fish Report (22 April 1981: US Dept. Comm., 1981) concerning Loligo: "Spanish importers see no interest, at this time, in buying from US producers, as long as Spanish ships returning from northwest Atlantic waters can continue their fruitful fishing campaign in these waters. Furthermore, the quality of land frozen squid produced by USA processors cannot, apparently, compare with that of sea frozen squid." With respect to the quality issue, unless there is a large enough constant demand for US produced squid, US processors are unlikely to invest in quality improving changes in their technology. With reduced foreign allocations there is a better chance that foreign nations will participate in technology transfer to the US industry to achieve better quality US products.

It is logical to conclude that, if TALFFs were high enough to satisfy foreign demand, there would be no demand by foreign nations to purchase US-caught fish. Obviously, the development of export markets for US-caught fish involves more than simply reducing foreign allocations. This is recognized in Section XIII.H, which endorses recent Commerce Department initiatives to develop export markets by giving preferential allocations to foreign nations that agree to purchase US-harvested fish. The Council believes that the squid OY adjustment mechanism will result in TALFFs that are reasonable to achieve the objective, that is, low enough to provide some foreign demand for US-caught fish and flexible enough to permit effective implementation of the Commerce Department initiative of giving preferential allocations to foreign nations that agree to purchase US-harvested fish.

Obviously, with this specification, OY in some years can be less than MSY. The reasons for the difference between OY and MSY may be biological (ABC set less than the maximum value because of reduced stock abundance) or economic (to limit maximum foreign allocations to increase the probability of foreign purchases of US caught squid). The biological adjustment is necessary to guard against overfishing. The economic adjustment is consistent with the Council's long term policy, established in the original Butterfish Plan, responding to the problem that the more fish of a particular species foreign nations are permitted to harvest directly, the smaller the incentive for them to purchase US harvested fish of that species.

Relationships Between the Plan and the Objectives

1. Prevent the exploitation of these resources from exceeding those levels which reduce the probability of successful (i.e., historic average) recruitment to the fisheries.

The OYs for Illex, Loligo, and butterfish reflect the best current estimates of MSYs, except for Illex, for which the OY was reduced from MSY in the original Squid Plan to account for biological uncertainties, and this reduction is continued. The procedures for Atlantic mackerel derive the annual OY from the most recent stock assessments, with prescribed systems based upon fluctuations in abundance to assure reduced catch during times of reduced stock abundance.

2. Promote the growth of the US commercial fishery, including the fishery for export.

The only significant limits placed on the US fishery by the Plan are biological, except for the bycatch TALFFs. The butterfish TALFF is restricted to bycatch levels and the squid TALFFs are designed to enhance the development of an export fishery.

3. Provide greatest degrees of freedom and flexibility to all harvesters of these resources consistent with the attainment of the other objectives of this Plan.

The Plan places no constraints on US fishermen relative to harvesting their allocations. Constraints on foreign fishermen are continued unchanged; i.e., the foreign fishing regulations are adopted by reference.

4. Provide marine recreational fishing opportunities, recognizing the contribution of recreational fishing to the national economy.

This objective relates primarily to the Atlantic mackerel fishery. The management of mackerel toward an optimum stock size will accomplish this objective by maintaining a biomass level sufficient for high recreational opportunities and catch. The adopted alternative establishes a system for forecasting the demand for Atlantic mackerel by US recreational anglers based on the historical relationship between the recreational catch and spawning stock size.

5. Increase understanding of the conditions of the stocks and fisheries.

The Amendment continues the permitting and reporting requirements of the Plan, which will result in the collection of necessary data on the US and foreign fisheries. In addition, additional stock assessment, recreational fisheries, and bycatch relationship research is recommended in Section XVI.

6. **Minimize harvesting conflicts among US commercial, US recreational, and foreign fishermen.**

The Plan, by adopting the Foreign Fishing Regulations by reference, adopts the fixed gear avoidance requirements of those regulations. In addition, the New England and Mid-Atlantic Fishery Management Councils are working on the development of gear marking and reporting regulations.

The Plan Relative to the National Standards

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

1. **Conservation and management measures shall prevent overfishing while achieving, on a continuous basis, the optimum yield from each fishery.**

The best scientific information available indicates that neither species of squid or butterfish is currently overfished or at a reduced level of abundance. The mackerel population is rebuilding. Harvests at the OY levels described in the Plan should not endanger future harvests at comparable levels.

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

This Plan is based on the best and most recent scientific information available.

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

The Plan meets the requirements of this standard by simultaneously managing Atlantic mackerel, butterfish, Loligo, and Illex in a complementary manner. The Plan also takes into account catch of mackerel outside of US waters.

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

The OY and DAH estimates described in the Plan will accommodate all US demand for Atlantic mackerel, butterfish, and the squids in the commercial and recreational fisheries without prejudice to residents of any State. The seasonal movements and distributions of these species make it extremely unlikely that fishermen of any State or region could harvest the DAH before the species become available to other US fishermen.

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

The Plan permits growth in the US fishery up to the maximum conservative biological levels. No restrictions, other than overall quotas, the need to have permits, and, if necessary, reporting, would be imposed on US fishermen by the Plan.

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

The Plan anticipates fluctuations in species abundance and expected trends in demand for the squids, Atlantic mackerel, and butterfish.

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

The Plan is consistent with and complements, but does not duplicate, management measures contained in other plans or preliminary fishery management plans. Costs of management should not change significantly from the costs associated with implementing the Plan.

XII.E. Specification of Optimum Yield

OY, ABC, IOY, DAH, DAP, JVP, and TALFF will be specified annually through an administrative process which requires that the Regional Director (RD), in consultation with the Council, prepares the required estimates as described below for Loligo, Illex, Atlantic mackerel, and butterfish, and also provides for public comment on those estimates. The estimates will be prepared at least annually, however, as discussed below, for certain species they may be changed during the year.

Loligo

The maximum OY for Loligo is 44,000 mt. The RD in consultation with the Council, shall determine annual specifications relating to IOY, DAH, DAP, JVP, and TALFF. The RD shall review yearly the most recent biological data pertaining to the stock. If the RD determines that the stock cannot support a level of harvest equal to the maximum OY, he shall establish a lower ABC for the fishing year. This level represents essentially the modification of the MSY to reflect changed biological circumstances. If the stock is able to support a harvest level equivalent to the maximum OY, the ABC shall be set at that level.

From the ABC, the RD, in consultation with the Council, shall determine the IOY for the fishing year. The IOY represents a modification of ABC, based on economic factors. It is intended to provide the greatest overall benefit to the nation by incorporating all relevant factors. The IOY is composed of an initial DAH and initial TALFF. The RD will project the DAH by reviewing the data concerning past domestic landings, projected amounts of Loligo necessary for domestic processing and for joint ventures during the fishing year, and other data pertinent for such a projection. The Joint Venture Processing (JVP) component of DAH shall be the portion of DAH which domestic processors either cannot or will not use. In assessing the level of IOY, the RD shall provide for a TALFF of at least a minimum bycatch of Loligo squid that would be harvested incidentally in other directed fisheries. This bycatch level shall be 1% of the allocated portion of the Illex, mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs (MAFMC, 1982b). In addition, this specification of IOY shall be based on the application of the following factors:

1. total world export potential by squid-producing countries;

2. total world import demand by squid-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.

Proposed annual specifications of the ABC and IOY and its component amounts shall be published in the Federal Register and provide for a public comment period. At the close of the public comment period, a notice of final annual specifications with the reasons, therefore, shall be published in the Federal Register.

Any subsequent adjustments to the IOY shall be published in the Federal Register and may provide for a public comment period.

The IOY may be adjusted by the RD, in consultation with the Council, upward to the ABC at any time during the fishing year. An adjustment may be made to IOY to accommodate DAH needs, including when the the application of the above factors warrants an adjustment in TALFF. However, TALFF may not be adjusted to a quantity less than that already allocated to and accepted by foreign nations or less than that needed for bycatch.

Example

This example shows how the Loligo system would work using assumed data to set the OY, ABC, IOY, DAH, DAP, and TALFF for fishing year 1983-84. (This example is also applicable to Illex.)

Assume the most recent stock assessment concluded that recruitment should be adequate to support a total catch at the maximum OY level (44,000 mt), so ABC equals 44,000 mt.

Assume that through 30 November 1983, US Loligo landings for fishing year 1982-83 totalled 4,000 mt, including 1,100 mt from joint ventures and that this exceeds Loligo landings for all of fishing year 1981-82 of 3,050 mt. Assume that, as of 16 November 1981, 2,400 mt were landed; 79% of the 1981-82 fishing year total. With this information, the projected total catch of Loligo by domestic fishing in fishing year 1982-83 is approximated at 5,000 mt.

Assume that processors have estimated that they can handle 29,000 mt of Loligo during fishing year 1983-84.

Assume that foreign Loligo catches have been 19,300 mt, 20,200 mt, and 13,500 mt for fishing years 1979-80, 1980-81, and 1981-82, respectively. Note that those catch levels represented about 54%, 55% and 37% of the TALFFs and about 63%, 58% and 38% of the allocations in those years, respectively. Foreign nations were allowed to catch more Loligo if they had wanted it. In the absence of estimates of worldwide Loligo abundance and demand, it is, therefore, assumed that an annual foreign catch of about 18,000 mt (fishing years 1979-80 and 1981-82 approximate average) will not result in a dramatic increase in the demand for US caught Loligo by foreign nations.

Assume that 11,000 mt of Loligo is requested and approved for joint ventures. Although the domestic processors have projected a need for 29,000 mt, domestic landings have never exceeded 6,000 mt. Therefore, the initial DAP is set at 11,000 mt, and when added to the JV amount, a DAH of 22,000 mt is set. This DAH creates a balance between joint venture requests and concerns of the shoreside processors. Although the DAP is less than the industry estimate, it allows for a three-fold growth potential from the previous fishing year. The industry's prediction is based upon further development of the export fishery, which is largely dependent on reduced foreign catch.

The amendment requires that alternative TALFF levels be examined, including the maximum possible TALFF and the bycatch TALFF. The maximum possible Loligo TALFF is 22,000 mt (44,000 mt ABC - 22,000 mt initial DAH). Assume the bycatch percentages are 1% each of the allocated portions of the Illex, mackerel, silver hake and red hake TALFFs, so bycatch TALFFs for Loligo range between 369 and 533 mt, depending on the allocations of other species TALFFs and Reserves.

Since the ABC is equal to 44,000 mt and the DAH is 22,000 mt, the maximum TALFF could be 22,000 mt. However, based upon an analysis of the nine factors to establish TALFF, it is determined that initial TALFF should be 3,000 mt. The maximum TALFF of 22,000 mt is felt to be so large as to impede the development of the US export fishery. A simple bycatch would only provide the foreign nations with 369 mt without reserves allocated, or 553 mt with reserves

allocated (see table below). Foreign nations could retaliate by not purchasing US harvested fish.

Therefore, it is proposed in this example that an initial TALFF of 3,000 mt could help stimulate the development of the US fishery for export.

	TALFF	TALFF + Reserve	Bycatch Allowance	Loligo TALFF* Minimum	Loligo TALFF* Maximum
Illex	2,500	2,500	1%	25	25
Mackerel	15,450	30,900	1%	155	309
Silver hake	13,400	13,400	1%	134	134
Red hake	5,500	8,500	1%	55	85
TOTAL				369	553

* Without Reserve = (TALFF) X (Bycatch Allowance).
With Reserve = (TALFF + Reserve) X (Bycatch Allowance).

Within this scenario, if the domestic industry is fully successful, the DAH could grow during the fishing year up to a maximum of 41,000 mt. With the initial DAH at 22,000 mt and initial TALFF at 3,000 mt, the IOY would equal 25,000 mt. If during the mid-season peak of the Loligo fishery, the domestic industry is approaching their initial DAH of 22,000 mt, and is projected to exceed this amount by 5,000 mt, the RD, in consultation with the Council, could adjust the initial DAH from 22,000 mt to 27,000 mt. However, let's further assume that the overseas markets are fair to weak for Loligo. A particular foreign nation offers to purchase the additional 5,000 mt of domestically caught Loligo, if it is allowed to fish directly for an additional 5,000 mt of TALFF. The adjusted OY then would increase from the IOY amount of 25,000 mt to 35,000 mt (5,000 mt for DAH and 5,000 mt for TALFF). In this case the RD, in consultation with the Council, may increase the TALFF upwards to 8,000 mt.

The amounts can change significantly during the fishing year in response to ecological and economic trends expected in a fishery that is in a dynamic state of change. The illustrated flexibility is a vital management tool necessary to protect the best interests of the nation.

Illex

The maximum OY for Illex is 30,000 mt. The RD, in consultation with the Council, shall determine annual specifications relating to IOY, DAH, DAP, JVP, and TALFF. The RD shall review yearly the most recent biological data pertaining to the stock. If the RD determines that the stock cannot support a level of harvest equal to the maximum OY, he shall establish a lower ABC for the fishing year. If the stock is able to support a harvest level equivalent to the maximum OY, the ABC shall be set at that level.

From the ABC, the RD, in consultation with the Council, shall determine the IOY for the fishing year. The IOY represents a modification of ABC, based on economic factors. It is intended to provide the greatest overall benefit to the nation by incorporating all relevant factors. The IOY is composed of an initial DAH and initial TALFF. The RD shall determine the IOY and any adjustments by the same procedures and factors set out above for Loligo, except that it shall provide for a minimum bycatch of Illex squid that would be harvested incidentally in other directed fisheries. This bycatch level shall be 10% of the allocated portion of the Loligo TALFF and 1% of the allocated portions of the mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs (MAFMC, 1982b).

Atlantic Mackerel

The Amendment makes three changes to the mackerel regime. MSY is changed from 210,000-230,000 mt to 152,000-182,000 mt. The spawning stock size below which no directed foreign mackerel fishery is allowed is reduced from 600,000 mt to 400,000 mt. Finally, the equation used to estimate the US recreational mackerel catch is revised. All of these revisions are necessary to reflect the revised mackerel natural mortality rate estimate (from 0.3 to 0.2) as discussed in Sections V.B and V.C. They do not constitute a change in the concept upon which the mackerel management regime is based, only a revision to the regime so that it is based on the best and most

recent scientific information.

The mackerel MSY in the Plan is 210,000 - 230,000 mt at a natural mortality rate of 0.3. The natural mortality rate of 0.3 had been used since the mackerel fishery was managed under ICNAF. The NEFC has reduced the natural mortality rate estimate to 0.2. This results in a revised MSY of 152,000 -182,000 mt (Section V.C).

The natural mortality rate is significant because the mackerel management system in the Plan, specifically the 600,000 mt minimum spawning stock size, is based on the previously used 0.3 rate. With a natural mortality rate of 0.2, the minimum spawning stock size is reduced to 400,000 mt, which is comparable to a minimum spawning stock size of 600.000 mt using a natural mortality rate of 0.3 (Anderson, 1982).

The revised equation for estimating the mackerel catch in the recreational fishery is:

$$Y = (0.01)(X) + (180)$$

where Y is the predicted recreational catch and X is the mackerel spawning stock size in the upcoming fishing year, in metric tons (Section VIII.B).

The specification of mackerel OY, DAH, DAP, and TALFF is:

C = estimated mackerel catch in Canadian waters for the upcoming fishing year.
US = estimated US mackerel catch for the upcoming fishing year.
S = mackerel spawning stock size in the year after the upcoming fishing year.
Bycatch = 2% of allocated portion of the silver hake TALFF and 1% of the allocated portions of the Loligo, Illex, and red hake TALFFs.
AC = acceptable catch in US waters for the upcoming fishing year.
T = total catch in all waters (US and Canadian) for the upcoming fishing year.

If S is less than or equal to 400,000 mt; use Case 1. If S is greater than 400,000 mt; use Case 2.

Case 1: OY is less than or equal to 30,000 mt.
AC is less than or equal to 30.000 mt.
DAH is less than or equal to 30,000 mt - Bycatch.
DAP is less than or equal to 30.000 mt - Bycatch.
TALFF = Bycatch.

Case 2: OY is less than or equal to AC
AC = T - C such that S is not less than or equal to 400,000 mt and that the fishing mortality associated with T does not exceed F0.1.
DAH is between 30,000 mt and AC - Bycatch.
DAP is between 30.000 mt and AC - Bycatch.
TALFF is AC - DAH, but may be no less than Bycatch. If AC - DAH is equal to or greater than 10,000 mt, $\frac{1}{2}$ is initially allocated to TALFF and $\frac{1}{2}$ is initially allocated to Reserve.

The 30,000 mt minimum DAH and DAP in Case 2 may only be reduced to the extent necessary to assure that AC is not exceeded and the foreign fishery receives the bycatch requirements. Since it is not legally possible to set a minimum DAH value, OY and TALFF must be adjusted to account for the minimum US allocation. It must be recognized that while such an adjustment at the beginning of a fishing year may result in an initial OY less than that which is biologically acceptable (i.e., less than AC), if US landings during the year, including amounts authorized for joint ventures, increase above the initial estimates, DAH and OY may be increased by similar amounts up to the point where OY = AC. TALFF would not change from its value at the beginning of a year as a result of these adjustments to DAH and OY.

Subcase 2a: AC less than 30,000 mt and US less than 30,000 mt.
DAH = US - Bycatch (to the extent necessary)

TALFF = Bycatch
OY = DAH + TALFF

Subcase 2b: AC equal to or greater than 30,000 mt and US less than 30,000 mt.
OY = AC - (30,000 - US)
DAH = US - Bycatch (to the extent necessary)
TALFF = OY - DAH

Subcase 2c: US equal to or greater than 30,000 mt.
OY = AC
DAH = US - Bycatch (to the extent necessary)
TALFF = OY - DAH

The minimum US allocation for mackerel in Case 2 is provided to enhance the achievement of objective (2) since it has the effect of reducing the maximum possible TALFF and it provides for increases in US catches, including the development of joint ventures, that cannot be quantified prior to the beginning of the fishing year and thus cannot be included in the development of the estimate of US. Recent experience has shown that joint venture projects are developed randomly throughout the year. The minimum US allocation is a necessary safeguard to permit desirable joint ventures to proceed, even though they may not have been forecasted.

Example

Assume it is late 1982, and the best projection of the total 1982 mackerel catch is 25,000 mt (US and Canadian waters). For that catch, the stock assessment estimates a spawning stock size at the start of 1983 of 472,000 mt. The equation which predicts US recreational mackerel catch estimates a sport catch of about 4,900 mt in 1983-84 at that spawning stock level.

The key problem is to estimate the catch in Canadian waters for 1983-84. It is understood that the 1982 mackerel catch in Canadian waters was minimal because the fish were not available. The average catch for 1976-1981 was 25,360 mt and the peak catch was approximately 45,000 mt in 1974. It is impossible to know whether environmental conditions will be such that mackerel will be available in Canadian waters during the next fishing year. Therefore, in order to be as conservative as possible, it is proposed that 45,000 mt be used as the estimate for fishing year 1983-84.

The allowable catch of mackerel in all waters is that amount which will leave a spawning stock of at least 400,000 mt at the beginning of 1984, but not result in a fishing mortality rate which exceeds F0.1. The assessment indicates that fishing mortality in 1983 can be as high as F0.1 and not reduce the spawning stock in 1984 below 400,000 mt. Therefore, the total allowable catch for fishing year 1983-84 is 103,800 mt, which represents fishing at the F0.1 level and which would leave a spawning stock in 1984 of about 455,000 mt.

If the allowable catch is 103,800 mt, and the catch in Canadian waters is 45,000 mt, then the catch in US waters (OY) may be 58,800 mt.

US commercial landings grew 17% from 1977 to 1978, 24% from 1978-1979, 35% from 1979-1980, and 10% from 1980-1981, for an annual average growth of 22% for the period 1977-1981. If that annual average growth rate is assumed for the future, fishing year 1982-83 landings would equal 4,022 mt and 1983-84 landings would equal 4,907 mt. It is proposed that the non-joint venture US commercial fishery component of DAH equal 5,000 mt (4,907 mt rounded).

Mackerel joint ventures for fishing year 1982-83 totalled 13,000 mt. There is no reason to believe that, if US fishing interests felt they could handle 13,000 mt in mackerel joint ventures during 1982-83, they could not handle a similar amount during 1983-84. Therefore, it is proposed that 13,000 mt be added to the 5,000 mt non-joint venture commercial catch estimate, for a total to 18,000 mt. If this is added to the 4,900 mt recreational catch estimate, the total is 22,900 mt.

As discussed above, the OY is 58,800 mt. If the 22,900 mt US catch estimate (DAH) is subtracted

from the OY, the difference is 35,900 mt. According to the Plan, that quantity is allocated ½ to initial TALFF and ½ to Reserve. In summary, using the above assumptions, mackerel OY = 58,800 mt, DAH = 22,900 mt, DAP = 5,000 mt, initial TALFF = 17,950 mt, and Reserve = 17,950 mt.

Butterfish

Butterfish MSY is 16,000 mt. OY is specified as whatever quantity of butterfish US fishermen harvest annually plus a bycatch TALFF equal to 6% of the allocated portion of the Loligo TALFF and 1% of the allocated portions of the Illex, Atlantic mackerel, silver hake, and red hake TALFFs, up to 16,000 mt. DAH would equal whatever quantity of butterfish US fishermen harvest, not to exceed 16,000 mt minus the TALFF. The Act provides that OY may differ from MSY for economic reasons. In this case, the reason for the difference is the development of the US fishery for export. The concept is simply that if foreign nations are not permitted to directly harvest butterfish, there will be a greater incentive to purchase the fish from US harvesters and processors. It is recognized that butterfish are a bycatch in other foreign fisheries and it is necessary, therefore, to provide a TALFF in keeping with those bycatch requirements. This specification is unchanged from the Plan.

The precise specification of OY is:

OY is less than or equal to 16,000 mt.
DAH is less than or equal to 16,000 mt - bycatch.
DAP is less than or equal to 16,000 mt - bycatch.
TALFF = bycatch = 6% of the allocated portion of the Loligo TALFF and 1% of the allocated portions of the Illex, mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs.

Summary

The ABC, IOY, OY, DAH, DAP, JVP, and TALFF for Illex, Loligo, Atlantic mackerel, and butterfish would be set by NMFS, in consultation with the Council as indicated above. The initial DAH for the squids and butterfish may be adjusted during any fishing year by increases within the OY range if actual catches by US vessels exceed the initial DAH estimates. The annual OY for Atlantic mackerel is set in accordance with the above procedures that depend on the Atlantic mackerel spawning stock size. The system for annually establishing amounts is discussed in Section XIII.C.

The Amendment would continue the procedure of the Plan of permitting joint ventures on a case-by-case basis, so long as joint ventures do not result in a negative impact on US processors. The Council believes that this is a reasonable approach. In other words, joint ventures are considered on a case-by-case basis for Atlantic mackerel, Illex, Loligo, and butterfish and are permitted if such joint ventures would not have a negative impact on the development of the US harvesting and processing sectors.

It is possible that a US/Canadian bilateral fisheries agreement may be developed and implemented during the life of the Plan. In order for the Plan to remain valid following such an agreement, and to the extent that the species included in this Plan are jointly managed pursuant to such an agreement, all of the allowable catch levels are conditioned so that the allowable catch levels would be developed as provided in the Plan or would be the US share of the total catch of the species allowed by joint management procedures, whichever is less. If the US share of the catch was less than the allowable catch level calculated pursuant to the Plan in any year, the allowable catch level would be reduced by reducing the TALFF by the appropriate amount, unless the TALFF was only for bycatch that year.

XIII. MEASURES, REQUIREMENTS, CONDITIONS, OR RESTRICTIONS SPECIFIED TO ATTAIN MANAGEMENT OBJECTIVES

Note: The following measures are intended to implement the Amendment. All references to the Foreign Fishing Regulations are intended to adopt by reference the Foreign Fishing Regulations as they may exist at the time of the approval of this Plan and as they may be amended from time to

time following Plan approval.

XIII.A. Permits and Fees

Any owner or operator of a vessel desiring to take any Atlantic mackerel, squid, or butterfish within the FCZ, or transport or deliver for sale. any Atlantic mackerel, squid, or butterfish taken within the FCZ must obtain a permit for that purpose. Each foreign vessel engaged in or wishing to engage in harvesting the TALFF must obtain a permit from the Secretary of Commerce as specified in the Act. This section does not apply to recreational fishermen taking Atlantic mackerel, squid, or butterfish for their personal use, but it does apply to the owners of party and charter boats (vessels for hire).

The owner or operator of a US vessel may obtain the appropriate permit by furnishing on the form provided by NMFS information specifying, at least, the names and addresses of the vessel owner and master, the name of the vessel, official number, directed fishery or fisheries, gear type or types utilized to take Atlantic mackerel, squid, or butterfish, gross tonnage of vessel, crew size including captain, fish hold capacity (to the nearest 100 lbs.), and the home port of the vessel. The permit issued by NMFS must be carried, at all times, on board the vessel for which it is issued, mounted clearly in the pilothouse of such vessel, and such permit, the vessel, its gear and equipment and catch shall be subject to inspection by an authorized official.

Permits may be revoked by the Regional Director for violations of this Plan.

Vessel Identification

Each US fishing vessel shall display its official number on the deckhouse or hull and on an appropriate weather deck. Foreign fishing vessels shall display their International Radio Call Signs (IRCS) on the deckhouse or hull and on an appropriate weather deck. The identifying markings shall be affixed and shall be of the size and style established by NMFS. Fishing vessel means any boat, ship or other craft which is used for, equipped to be used for, or of a type which is normally used for, fishing, except a scientific research vessel. Fishing vessel includes vessels carrying fishing parties on a per capita basis or by charter which catch Atlantic mackerel, squid, or butterfish for any use.

Sanctions

Vessels conducting fishing operations pursuant to this Plan are subject to the sanctions provided for in the Act.

If any foreign fishing vessel for which a permit has been issued fails to pay any civil or criminal monetary penalty imposed pursuant to the Act, the Secretary may: (a) revoke such permit, with or without prejudice to the right of the foreign nation involved to obtain a permit for such vessel in any subsequent year; (b) suspend such permit for the period of time deemed appropriate; or (c) impose additional conditions and restrictions on the approved application of the foreign nation involved and on any permit issued under such application, provided, however, that any permit which is suspended pursuant to this paragraph for nonpayment of a civil penalty shall be reinstated by the Secretary upon payment of such civil penalty together with interest thereon at the prevailing US rate.

XIII.B. Time and Area Restrictions

Foreign nations fishing for Atlantic mackerel, squid or butterfish shall be subject to the time and area restrictions in 50 CFR 611.50 and the fixed gear avoidance regulations in 50 CFR 611.50(e).

XIII.C. Catch Limitations

The fishing year for Atlantic mackerel, Illex, Loligo, and butterfish is the twelve (12) month period beginning 1 April.

The specification of OYs and other values for the squids, Atlantic mackerel, and butterfish are described in Section XII.E and need not be repeated here. On an annual basis, the RD, in consultation with the Council, and after giving opportunity for public notice and comment, sets initial annual values for the terms specified in Section XII.E.

On or about January 15 of each year, the Council will prepare and submit recommendations to the RD of the initial annual amounts for the fishing year beginning April 1, based on information gathered from sources including: (1) results of a survey of domestic processors and joint venture operators of estimated processing capacity and intent to use that capacity; (2) results of a survey of fishermen's trade associations of estimated fish harvesting capacity and intent to use that capacity; (3) landings and catch statistics; (4) stock assessments; and (5) relevant scientific information.

By February 1 of each year, the Secretary will publish a notice in the Federal Register that specifies preliminary initial amounts of OY, DAH, DAP, JVP, TALFF, and Reserve (if any) for each species. The amounts will be based on information submitted by the Council and from relevant sources including those sources specified above. In the absence of a Council report, the amounts will be based on information from the sources specified and other information considered appropriate by the RD. The Federal Register notice will provide for a comment period. The Council's recommendation and all relevant data will be available in aggregate form for inspection at the office of the RD during the public comment period.

On or about March 15 of each year, the Secretary will make a final determination of the initial amounts for each species, considering all relevant data and any public comments and will publish a notice of the final determination and response to public comments in the Federal Register.

Additional adjustments may be made to annual values for OY, DAH, and TALFF for the Loligo and Illex fisheries during the year. The RD, in consultation with the Council, may modify these values up to ABC, applying the factors described in Section XII.E., for the benefit of the nation. The RD will publish a notice in the Federal Register and provide for comment before such revisions may take effect.

XIII.D. Types of Gear

Foreign nations fishing for Atlantic mackerel, squid, or butterfish are subject to the gear restrictions set forth in 50 CFR 611.1.50(c).

XIII.E. Incidental Catch

Foreign nations fishing for Atlantic mackerel, squid, or butterfish are subject to the incidental catch regulations set forth in 50 CFR 611.13, 611.14, and 611.50.

XIII.F. Restrictions

No foreign fishing vessel operator, including those catching Atlantic mackerel, squid, or butterfish for use as bait in other directed fisheries, shall conduct a fishery for mackerel, squid, or butterfish outside the areas designated for such fishing operations in this Plan.

XIII.G. Habitat Preservation, Protection, and Restoration

The Council is deeply concerned about the effects of marine pollution on fishery resources in the Mid-Atlantic. It is mindful of its responsibility under the Act to take into account the impact of pollution on fish. The extremely substantial quantities of pollutants which are being introduced into the Atlantic Ocean pose a threat to the continued existence of a viable fishery. In the opinion of the Council, elimination of this threat at the earliest possible time is determined to be necessary and appropriate for the conservation and management of the fishery, and for the achievement of the other objectives of the Act as well. The Council, therefore, urges and directs the Secretary to forthwith proceed to take all necessary measures including, but not limited to, the obtaining of judicial decrees in appropriate courts to abate, without delay, marine pollution

emanating from the following sources: (1) the ocean dumping of raw sewage sludge, dredge spoils, and chemical wastes; (2) the discharge of raw sewage into the Hudson River, the New York Harbor, and other areas of the Mid-Atlantic Region; (3) the discharge of primary treated sewage from ocean outfall lines; (4) overflows from combined sanitary and storm sewer systems; and (5) discharges of harmful wastes of any kind, industrial or domestic, into the Hudson River or surrounding marine and estuarine waters.

XIII.H. Development of Fishery Resources

The US commercial fisheries for Atlantic mackerel, squid, and butterfish are relatively minor at this time. Their expansion can be into both US and foreign markets. Development of export markets for these species depends on cooperative and complementary efforts on the part of the Commerce and State Departments, the Council, and the industry. The recommended alternative in this Amendment is intended to establish a management regime that will enhance the probability of export market development. Analysis of developments in the US fisheries and in world markets in the Regulatory Impact Review demonstrates prospects for development of the fisheries managed under this Amendment, particularly as to the squids. However, assistance is needed from the Commerce and State Departments to implement fully the objectives of this Plan by giving favorable allocations to foreign nations that purchase species included in the management unit of this Plan harvested by US fishermen, by negotiating with foreign nations to minimize barriers to the importation of US harvested fish, and by other related means.

XIII.I. Management Costs and Revenues

Costs to develop and implement this Amendment are estimated as follows:

Council development	$ 3,000
Council implementation (monitoring)	9,000
NMFS data collection and enforcement	*
NMFS Northeast Region administration	15,071
NMFS Washington Office administration	17,500
Federal Register publications	6,120
US Coast Guard costs	*
TOTAL	

* Data to be developed and submitted by NMFS and Coast Guard, as appropriate.

XIV. SPECIFICATIONS AND SOURCES OF PERTINENT FISHERY DATA

XIV.A. US Fishermen and Processors

NMFS shall provide, on a timely basis, adequate commercial and recreational catch data to develop domestic annual harvest for plan review and development and to implement the reallocation procedures of the Plan. Catch data shall be provided to the Secretary. At a minimum these data shall include amounts of fish landed, the capacity to process squid, Atlantic mackerel, and butterfish, and the amount of that capacity actually used. The Council does not require additional data to meet its planning needs, but NMFS should collect all data required by the Act. The Secretary may require further specific data relating to the harvesting of squid, Atlantic mackerel, and butterfish be submitted if necessary to manage or plan for management of the fishery.

No more specific data collection methods or procedures are suggested. It is anticipated that a uniform collection system for the region will be in place prior to the expiration of this Amendment.

XIV.B. Foreign Fishermen

Foreign fishermen will be subject to the reporting and recordkeeping requirements set forth in 50 CFR 611.9.

XV. RELATIONSHIP OF THE ADOPTED MEASURES TO EXISTING APPLICABLE LAWS AND POLICIES

XV.A. Fishery Management Plans

This Amendment is related to other plans to the extent that all fisheries of the northwest Atlantic are part of the same general geophysical, biological, social, and economic setting. US and foreign fishing fleets, fishermen, and gear often are active in more than a single fishery. Thus regulations implemented to govern harvesting of one species or a group of related species may impact upon other fisheries by causing transfers of fishing effort. Many fisheries of the northwest Atlantic result in significant non-target species fishing mortality on other stocks and as a result of other fisheries. In addition, Atlantic mackerel, squid, and butterfish are food items for many commercially and recreationally important fish species and Atlantic mackerel, squid, and butterfish utilize many finfish and invertebrate species as food items. Furthermore, research programs often provide data on stock size, levels of recruitment, distribution, age, and growth for many species regulated by preliminary fishery management plans, fishery management plans, and proposed fishery management plans.

XV.B. Treaties or International Agreements

No treaties or international agreements, other than GIFAs entered into pursuant to the Act, relate to these fisheries. It is possible that a fisheries agreement with Canada will be developed in the near future.

XV.C. Federal Laws and Policies

The only Federal Law that controls the fisheries covered by this Plan is the Act.

Marine Sanctuary and Other Special Management Systems

The USS Monitor Marine Sanctuary was officially established on January 30, 1975, under the Marine Protection, Research, and Sanctuaries Act of 1972. Rules and regulations have been issued for the Sanctuary (15 CFR 924). They prohibit deploying any equipment in the Sanctuary, fishing activities which involve "anchoring in any manner, stopping, remaining, or drifting without power at any time" (924.3 (a)), and "trawling" (924.3(h)). Although the Sanctuary's position off the coast of North Carolina at 35°00'23"N, 75°24'32"W is located in the Plan's designated management area, it does not occur within, or in the vicinity of, any foreign fishing area. Therefore, there is no threat to the Sanctuary by allowing foreign fishing operations under this Plan. Also, the Monitor Marine Sanctuary is clearly designated on all National Ocean Survey charts by the caption "protected area". This minimizes the potential for damage to the Sanctuary by US fishing operations.

Potential Impact on Marine Mammals and Endangered Species

Numerous species of marine mammals and sea turtles occur in the northwest Atlantic Ocean. The most recent comprehensive survey in this region was done in 1979 by the Cetacean and Turtle Assessment Program (CeTap), at the University of Rhode Island, under contract to the Bureau of Land Management (BLM), Department of the Interior (University of Rhode Island, 1981). The following is a summary of some of the information gathered in that study, which covered the area from Cape Sable, Nova Scotia, to Cape Hatteras, North Carolina, from the coastline to 5 nautical miles seaward of the 6,000 feet (1000 fathom) isobath.

Twenty one cetaceans and four turtle species were encountered in the survey (Table 20). Also presented in Table 20 are the study team's "estimated minimum population number" for the area, if calculated, and those species currently included under the Endangered Species Act. All information is preliminary.

The study team concluded that "both large and small cetaceans are widely distributed throughout the study area in all four seasons," and grouped the 13 most commonly seen species into three categories, based on geographical distribution. The first group contains only the harbor porpoise, which is distributed only over the shelf and throughout the Gulf of Maine, Cape Cod, and Georges

Bank, but probably not southwest of Nantucket. The second group contains the most frequently encountered baleen whales (fin, humpback, minke, and right whales) and the white-sided dolphin. These are found in the same areas as the harbor porpoise, and also occasionally over the shelf at least to Cape Hatteras or out to the shelf edge. The third group "shows a strong tendency for association with the shelf edge" and includes the grampus, striped, spotted, saddleback, and bottlenose dolphins, and the sperm and pilot whales.

Loggerhead turtles were found throughout the study area, but appear to migrate north to about Massachusetts in summer and south in winter. Leatherbacks appear to have a more northerly distribution. The study team hypothesized a "northward migration in the Gulf Stream with a southward return in continental shelf waters nearer to shore." Both species usually were found "over the shoreward half of the slope" and in less than 200 feet. No live green or Kemp's ridley turtles were found, and the latter's population has been estimated at only about 500 adults (Carr and Mortimer, 1980). The study area may be important for sea turtle feeding or migrations, but the nesting areas for these species generally are in the South Atlantic and Gulf of Mexico.

Outside of the above, the only endangered species occurring in the northwest Atlantic is the shortnose sturgeon (Acipenser brevirostrum). The Council urges fishermen to report any incidental catches of this species to NMFS Shortnose Sturgeon Recovery Program.

The ranges of the subject species of this Plan and the above marine mammals and endangered species overlap to a large degree, and there always exists a potential for an incidental kill. Except in unique situations (e.g., tuna-porpoise in the central Pacific), such accidental catches should have a negligible impact on marine mammal/endangered species abundances, and the Council does not believe that implementation of this Amendment will have any adverse impact upon these populations. As additional information on this subject becomes available, it will be integrated into future Amendments to this Plan.

Oil, Gas, Mineral, and Deep Water Port Development

While Outer Continental Shelf (OCS) development plans may involve areas overlapping those contemplated for offshore fishery management, no major conflicts have been identified to date. The Council, through involvement in the Intergovernmental Planning Program of the BLM monitors OCS activities and has opportunity to comment and to advise BLM of the Council's activities. Certainly, the potential for conflict exists if communication between interests is not maintained or appreciation of each other's efforts is lacking. Potential conflicts include, from a fishery management position: (1) exclusion areas, (2) adverse impacts to sensitive biologically important areas, (3) oil contamination, (4) substrate hazards to conventional fishing gear, and (5) competition for crews and harbor space. We are not aware of pending deep water port plans which would directly impact offshore fishery management goals in the areas under consideration, nor are we aware of potential effects of offshore fishery management plans upon future development of deep water port facilities.

XV.D. State, Local, and Other Applicable Laws and Policies

No State or local laws that control the fisheries that are the subject of this management plan exist other than those listed in Section VII.

Coastal Zone Management (CZM) Programs

The CZM Act of 1972, as amended, is primarily protective in nature, and provides measures for ensuring stability of productive fishery habitat within the coastal zone. It is recognized that responsible management of both coastal zones and fish stocks must involve mutually supportive goals. States with approved CZM programs are Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, North Carolina, South Carolina, and Florida. Copies of this Amendment will be mailed to states with CZM programs for a determination of consistency. Available approved CZM programs have been reviewed relative to this Amendment.

XVI. COUNCIL REVIEW AND MONITORING OF THE PLAN

The Council will review the Plan annually. The review will include the most recent stock assessment data and data on the US harvesting and processing industries. This will permit a review of MSY, OY, DAH, DAP, JVP, and TALFF and the development of required annual estimates of OY, DAH, DAP, and TALFFs, and any modifications to the Plan. These reviews will be carried out so that any amendments to the Plan can be reviewed by the Council and public and then be implemented by the Secretary of Commerce by 1 April of each year. This schedule may be modified as the US fishery evolves.

In order to make the required annual estimates of OY, DAH, DAP, JVP, and TALFF in addition to the reports required by this Plan, information must be developed by NMFS on the status of the stocks involved and on the capacity of the processing sector.

It is recognized that additional research must be carried out to refine the bycatch estimates. NMFS is requested to carry out such studies. Refinements of these estimates will be included, as appropriate, in future amendments to this Plan.

Additional data are also needed on recreational fishing to refine the relationships discussed in Section VIII. NMFS is requested to continue the annual Marine Recreational Fishery Statistics Surveys, or other similar appropriate studies, and to supply the Council with the necessary data for future amendments.

XVII. REFERENCES

Anderson, E.D. 1982. Status of the northwest Atlantic mackerel stock - 1982. NMFS, NEFC, Lab. Ref. No. 82-44. 45 p.

_____. 1981. Status of the northwest Atlantic mackerel stock - 1981. NMFS, NEFC, Lab. Ref. No. 81-38. 40 p.

_____. 1980. Status of the northwest Atlantic mackerel stock - 1980. NMFS, NEFC, Lab. Ref. No. 80-29. 43 p.

_____ 1976a. Measures of abundance of Atlantic mackerel off the northeastern coast of the United States. ICNAF Res. Bull. 12: 5-21.

_____ 1976b. Estimate of maximum sustainable yield of fish stocks in ICNAF Subarea 5a and Statistical Area 6. NEFC, NMFS, Lab. Ref. No. 76-05.

Atkinson, L.P. 1976. Chemical oceanography. In: Sharp, J.H. (ed.). Anoxia on the middle Atlantic shelf during the summer of 1976. Report on a workshop held in Washington, D.C., 15-16 October 1976. NSF Contract No. OCE 7700465. Univ. Del.: 81-84.

Beckett, J.S., W.T. Stobo, and C.A. Dickson. 1974. Southwesterly migration of Atlantic mackerel, Scomber scombrus tagged off Nova Scotia. ICNAF Res. Doc. No. 94, Ser. No. 3330.

Bigelow, H.B., and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. US Fish Wildl. Serv., Fish. Bull. 53(74). 577 p.

Caldwell, D.K. 1961. Populations of the mackerel, squid, and/or butterfish, Poronotus tricanthus (Peck), with systematic comments. Bull. South. Calif. Acad. Sci., 60(1): 19-31.

Carr, A., and J. Mortimer. 1980. Survey and preliminary census of marine turtle populations in the western Atlantic. Final Report, NMFS Contract 03-78-008-0025. 131 p.

Centaur Management Consultants, Inc. 1977. Economic activity associated with marine recreational fishing. Final report prepared for NMFS, Contract No. 6-35195. 206 p.

Chamberlin, J.L. 1977. Monitoring effects of Gulf Stream meanders and warm core eddies on the continental shelf and slope. ICNAF Sel. Pap. 2: 145-153.

Christensen, D.J., W.J. Cliffords, P.G. Scarlett, R.W. Smith, and D. Zacchea. 1979. A survey of the 1978 spring recreational fishery for Atlantic mackerel, Scomber scombrus, in the Middle Atlantic region. NMFS, NEFC, Sandy Hook Lab. Rept. No. SHL 78-43. 21 p.

Christensen, D.J., B.L. Freeman, and S.C. Turner. 1976. The United States recreational fishery for Atlantic mackerel. ICNAF Res. Doc. 76/XII/142. 9 p.

Clark, J.R. 1962. The 1960 salt-water angling survey. US Fish Wildl. Circ. 153. 36 p.

Cohen, E.G. 1975. An overview of the plankton community of the Gulf of Maine. ICNAF Res. Doc. 75/106.

Deuel, D.G. 1973. 1970 salt-water angling survey. USDC, Curr. Fish. Stat. 6200. 54 p.

Deuel, D.G., and J.R. Clark. 1968. The 1965 salt-water angling survey. US Fish Wild. Serv., Res. Publ. 67. 51 p.

Environmental Protection Agency. 1979. Draft environmental impact statement (eis) for 106-mile ocean waste disposal site designation. EPA, Office of Water Program Operations Marine Protection Branch.

Freeman, B.L., and S.C. Turner. 1977. The effects of anoxic water on the bluefish (Pomatomus saltatrix), an actively swimming fish. In: Oxygen depletion and associated environmental disturbances in the Middle Atlantic bight in 1976. NMFS, NEFC Tech. Ser. Rept. No. 3: 431-450.

Fritz, R.L. 1965. Autumn distribution of groundfish species in the Gulf of Maine and adjacent waters, 1955-1961. Am. Geol. Soc., Ser. Atlas Mar. Environ., Folio 10. 48 p.

Haedrich, R.L. 1967. The stromateoid fishes: systematics and a classification. Bull. Mus. Comp. Zool. 135(2): 31-139.

Heald, E.J. 1968. Atlas of the principal fishery resources on the continental shelf from New York to Florida. Inst. Mar. Sci., Univ. Miami. 236 p.

Hildebrand, S.F., and W.C. Schroeder. 1928. Fishes of Chesapeake Bay. Bull. US Bur. Fish. 43. Part 1, 388 p.

Horn, M.H. 1970. Systematics and biology of the stromateoid fishes of the genus Peprilus. Bull. Mus. Comp. Zool. 140(5): 165-261.

Hoy, D.W. and G.M. Clark. 1967. Atlantic mackerel fishery, 1804-1965. US Fish Wildl. Serv., Fish. Leaflet 603. 9 p.

International Commission for the Northwest Atlantic Fisheries/Northwest Atlantic Fisheries Organization. 1952-1979. Stat. Bull. for the years 1951-1977 (Vols. 1 -27). Dartmouth, Canada.

International Commission for the Northwest Atlantic Fisheries (ICNAF). 1975. Report of Standing Committee on Research and Statistics, May-June, 1975. App. I. Report of Assessments Subcommittee. ICNAF, Redbook 1975: 23-63.

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.

Lange, A.M.T. 1982. Status of the squid (Loligo pealei and Illex illecebrosus) populations off the northeastern USA. NMFS, NEFC, Lab. Ref. No. 82-27. 20 p.

_____. 1981. Stock status and estimates of potential yields of squid (Loligo pealei and Illex illecebrosus) populations off the northeastern USA. NMFS, NEFC, Lab. Ref. No. 81-29. 21 p.

Langton, R.W., and R.E. Bowman. 1977. An abridged account of predator - prey interactions from some northwest Atlantic species of fish and squid. NMFS, NEFC, Lab. Ref. No. 77-17.

Leim, A.H., and W.B. Scott. 1966. Fishes of the Atlantic coast of Canada. Bull. Fish. Res. Bd. Canada 155. 485 p.

Maurer, R.O., and R.E. Bowman. 1975. Food habits of marine fishes of the northwest Atlantic. NMFS, NEFC, Lab. Ref. Doc. No. 75-3. 90 p.

Mercer, M.C. 1965. Contribution to the biology of the short-finned squid, Illex illecebrosus (LeSeuer), in the Newfoundland area. Fish. Res. Bd. Canada, MS Rept. Ser. (Biol.) No. 834.

_____. 1969. A.T. Cameron cruise 130, otter-trawl survey from southern Nova Scotia to Cape Hatteras, March-April, 1967. Fish. Res. Bd. Canada Tech. Rept. 103. 24 p.

_____. 1973. Length-weight relationship of the ommastrephid squid, Illex illecebrosus (LeSeuer). ICNAF Res. Doc. 73/72.

Mesnil, B. 1976. Growth and life cycle of squid, Loligo pealei and Illex illecebrosus, from the northwest Atlantic. ICNAF Selected Papers 2: 55-69.

Mid-Atlantic Fishery Management Council. 1982a. Relationship between stock abundance and recreational mackerel catch. Revised.

_____. 1982b. Incidental catch relationships among the foreign fisheries for the squids, Atlantic mackerel, butterfish, and the hakes. Revised.

Moores, J.A., G.H. Winters, and L.S. Parsons. 1975. Migrations and biological characteristics of Atlantic mackerel (Scomber scombrus) occurring in Newfoundland waters. J. Fish. Res. Bd. Canada 32: 1347-1357.

Murawski, S.A., D.G. Frank, and S. Chang. 1978. Biological and fisheries data on butterfish, Peprilus triacanthus (Peck). NMFS, NEFC, Sandy Hook Lab., Tech. Ser. Rept. No. 6. 39 p.

Murawski, S.A., and G.T. Waring. 1979. Biological and fisheries data on butterfish, Peprilus triacanthus, in the northwestern Atlantic Ocean. Trans. Am. Fish. Soc. 108(5): 427-439.

_____. 1978. Status of the northwestern Atlantic butterfish stock: July 1978. NMFS, NEFC, Lab. Ref. Doc. No. 78-47. 15 p.

Nichols, J.T., and C.M. Breder, Jr. 1927. The marine fishes of New York and southern New England. Zoologica 9(1). 192p .

Parsons, L.S. 1970. Northern range extension of the Atlantic mackerel, Scomber scombrus, to Black Island, Labrador. J. Fish. Res. Bd. Canada 27: 610-613.

Parsons, L.S., and J.A. Moores. 1974. Long distance migrations of an Atlantic mackerel (Scomber scombrus). J. Fish. Res. Bd. Canada 31: 1521-1522.

Rathjen, W.F. 1973. Northwest Atlantic squids. Mar. Fish. Ref. 35(12): 20-26.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bull. Fish. Res. Bd. Canada 191. 382 p.

Serchuk, F.M., and W.F. 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 Atlantic mackerel (Scomber scombrus) of North America. Part 1. Early life history, including growth, drift, and mortality of the egg and larvae populations. US Fish Bull. 50: 149-237.

Sharp, J.H. (ed). 1976. Anoxia on the middle Atlantic shelf during the summer of 1976. Report on a workshop held in Washington, D.C., 15-16 October 1976. NSF Contract No. OCE 7700465. Univ. Del. 122 p.

Sissenwine, M.P., and A.M. Tibbetts. 1977. Simulating the effect of fishing on squid (Loligo and Illex) populations off the northeastern United States. ICNAF Sel. Pap. 2: 71-84.

Squires, H.J. 1957. Squid, Illex illecebrosus (LeSeuer), in the Newfoundland fishing area. J. Fish. Res. Bd. Can. 14: 693-728.

Squires, H.J. 1967. Growth and hypothetical age of Newfoundland bait squid, Illex illecebrosus. J. Fish. Res. Bd. Canada 24(6): 1209-1217.

Steimle, F. 1976. A summary of the fish kill-anoxia phenomenon off New Jersey and its impact on resource species. In: Sharp, J.H. (ed.), Anoxia on the middle Atlantic shelf during the summer of 1976. Report on a workshop held in Washington, D.C., 15-16 October 1976. NSF Contract No. OCE 7700465. Univ. Del.: 5-11.

Strand, I. 1980. An economic analysis of Atlantic squid (Loligo) allocations to Spain. Unpub. contract report to the National Fisheries Institute. 11 p.

Summers, W.C. 1967. Winter distribution of Loligo pealei determined by exploratory trawling. Biol. Bull. 133. 489 p.

Tibbetts, A.M. 1975. Squid fisheries (Loligo pealei and Illex illecebrosus) off the northeast United States, ICNAF Subarea 5 and Statistical Area 6. ICNAF Res. Doc. 75/60 (revised).

University of Rhode Island. 1981. A characterization of marine mammals and turtles in the Mid- and North-Atlantic areas of the US outer continental shelf. Annual report for 1979. Prepared for USDI, BLM, under contract #AA551-CT8-48.

US Dept. of Comm. 1983. Fisheries of the United States, 1982. NOAA, NMFS, Curr. Fish. Stats. No. 8300. 117 p. (and earlier reports in this series)

_____. 1981. European Frozen Fish Report. Utilization and Development Branch, NMFS. Boston, MA.

_____. 1980a. Marine Recreational Fishery Statistics Survey, Atlantic and Gulf Coasts, 1979. NOAA, NMFS, Curr. Fish. Stats. No. 8063. 139 p.

_____. 1980b. Fisheries Statistics of the United States 1976. NOAA, NMFS, Stat. Digest No. 69. 418 p. (and earlier reports in this series)

Vovk, G. 1969. Prospects for a squid (Loligo pealei LeSeuer) fishery. Rybin. Khoz. 45(10): 7-9.

Waring, G. 1975. A preliminary analysis of the status of butterfish in ICNAF Subarea 5 and Statistical Area 6. ICNAF Res. Doc. 75/74. 32 p.

Waring, G.T. 1981. Status of the northwestern Atlantic butterfish stock - 1982. NMFS, NEFC, Lab. Ref. Doc. No. 82-45. 20 p.

_____. 1980. Status of the northwestern Atlantic butterfish stock, July, 1980. NMFS, NEFC, Lab. Ref. Doc. No. 80-22. 6 p.

Table 1. US Commercial, US Recreational, and Foreign Catch (thousands of lbs.) of Squid, Atlantic Mackerel, and Butterfish, 1965-1982

	Loligo		Illex		Squid	Mackerel				Butterfish		
Year	US comm.	Foreign in US waters*	US comm.	Foreign in US waters*	Foreign outside US waters+	US comm.	US rec.#	Foreign in US waters*	Foreign outside US waters+	US comm.	Foreign in US waters*	Foreign outside US waters+
1965	1,563	218	979	172	17,636	4,405	9,462	5,599	25,550	7,363	1,651	-
1966	1,592	498	996	260	11,023	6,005	9,997	14,786	28,264	5,765	8,520	-
1967	1,206	2,491	1,559	628	15,432	8,578	9,916	41,852	24,785	5,405	5,106	-
1968	2,390	5,130	1,495	5,714	216	8,661	17,153	123,547	45,937	3,977	11,986	-
1969	1,982	19,053	1,239	2,149	-	9,620	28,769	239,874	41,083	5,375	33,901	33
1970	1,440	36,886	899	5,330	3,053	8,926	35,358	453,175	46,308	4,120	27,446	29
1971	1,603	38,451	1,003	351	19,633	5,304	36,211	763,502	54,001	3,461	19,649	7
1972	1,598	63,950	1,041	37,849	4,118	4,422	34,364	849,522	49,293	1.805	26,941	31
1973	2,436	80,482	1,168	41,059	21,774	2,945	23,639	837,333	84,983	3,432	69,836	-
1974	5,013	71,814	326	45,148	963	2,297	16,842	647,865	98,442	5,573	34,093	7
1975	3,573	70,941	236	39,282	39,117	4,352	11,441	548,932	79,931	4,603	28,138	262
1976	7,941	47,798	505	54,467	92,075	5,979	9,263	454,030	72,892	3,368	31,544	161
1977	2,398	34,359	2,257	52,403	184,032	3,036	1,151	118,302	50,185	3,190	6,274	-
1978	2,846	20,623	849	38,160	204,322	3,538	14,486	818	57,094	7,855	2,919	-
1979	9,374	28,963	2,394	36,211	357,330	4,387	7,308	139	67,484	5,968	1,841	-
1980	9,100	34,935	756	32,823	153,272	5,915	unk	880	45,192	11,790	1,949	-
1981	4,566	20,092	1,365	16,540	65,399	6,201	unk	11,644	42,589	10,584	1,501	-
1982	12,727	34,860	10,725	28,599	unk	7,456	unk	14,600	34,731	17,717	1,801	unk

- = zero.
unk = unknown.
* NAFO/ICNAF Subarea 5 and Statistical Area 6.
\+ NAFO/ICNAF Subareas 1-4 (includes Canada). 1979 and 1980 foreign catch estimates in NAFO/ICNAF Subareas 1-4 from NAFO Statistical Bulletin for 1979 and E. Anderson, NEFC (pers. comm.).
\# 1979 US recreational mackerel catch from US Department of Commerce data (1980). No surveys have been made of recreational squid catches. Recreational butterfish catches have been 0 in years when there have been surveys.
Note: the 14,600,000 lbs. of mackerel caught by foreign fishermen in US waters in 1982 includes a Polish research cruise of 9.6 million lbs.

Sources:
Mackerel - 1965-1980 commercial catch data and recreational catch estimates from Anderson (1981), and do not include reported US commercial catches south of ICNAF Area 6. These averaged 1.3 mt per year, 1965-1980 (0 mt in 1980). No recreational fishery for mackerel exists south of ICNAF Area 6.
Illex and Loligo - 1965-1980 squid catch data from Lange (1981). and do not include reported US squid catches south of ICNAF Area 6. These averaged 17 mt per year (Loligo and Illex combined), 1965-1980, and were 42 mt in 1980. Foreign squid catch outside FCZ almost entirely Illex.
Butterfish -
1965-1978 butterfish catch data from Murawski and Waring (1979) and Waring (1980), and do not include reported US commercial butterfish catches south of ICNAF Area 6. These averaged 46 mt per year, 1965-1980, and were 18 mt in 1980. 1979 and 1980 US butterfish catch data from NAFO/ICNAF provisional statistics. Foreign butterfish catches in Areas 5 and 6 from NMFS foreign fishing quota reports (NEREIS series).
1981 data - Provisional nominal catches in northwest Atlantic, 1981. NAFO. Serial No. N569.
1982 data - unpubl. NMFS stats., except US comm. mackerel and butterfish landings which are from US Dept. Comm., 1983.

Table 2. Reported US Commercial Landings of Atlantic Mackerel, Squid (East Coast), and Butterfish by Distance Caught Offshore (quantity in thousands of pounds, value in thousands of dollars)

Year	0-3 Miles				3-200 Miles				0-200 Miles Total	
	Quantity	Value	$/lb.	% Total Quantity	Quantity	Value	$/lb.	% Total Quantity	Quantity	Value
					Atlantic Mackerel					
1975	1,121	162	.14	27	3,036	322	.11	73	4,157	484
1976	2,021	356	.18	37	3,399	300	.09	63	5,420	656
1977	1,640	328	.20	55	1,363	197	.14	45	3,003	525
1978	2,081	557	.27	58	1,477	219	.15	42	3,558	776
1979	2,140	661	.31	49	2,323	398	.17	51	4,463	1,059
1980	3,584	512	.14	61	2,329	304	.13	39	5,913	816
1981	985	211	.21	17	4,861	609	.13	83	5,846	820
1982	1,733	348	.20	23	5,723	737	.13	77	7,456	1,085
					Squid (East Coast)					
1975	1,840	334	.18	42	2,542	471	.19	58	4,382	806
1976	3,492	696	.20	41	4,941	890	.18	59	8,433	1,585
1977	1,828	652	.36	33	3,632	773	.21	67	5,460	1,425
1978	1,888	723	.38	50	1,851	730	.39	50	3,739	1,453
1979	6,849	2,541	.37	51	6,543	1,732	.26	49	13,392	4,273
1980	6,583	2,229	.34	67	3,207	947	.30	33	9,790	3,176
1981	3,616	1,427	.39	50	3,658	1,091	.30	50	7,274	2,518
1982	7,036	1,745	.25	30	16,579	2,468	.15	70	23,615	4,213
					Butterfish					
1975	1,793	438	.24	40	2,675	640	.24	60	4,468	1,078
1976	1,547	427	.28	50	1,542	444	.29	50	3,089	871
1977	983	322	.33	32	2,060	542	.26	68	3,043	864
1978	801	256	.32	10	7,280	2,650	.36	90	8,081	2,906
1979	946	378	.40	16	5,107	1,749	.34	84	6,053	2,127
1980	984	445	.45	9	10,584	3,403	.32	91	11,568	3,848
1981	1,504	556	.37	19	6,282	2,090	.33	81	7,786	2,646
1982	1,391	477	.34	8	16,326	5,141	.31	92	17,717	5,618

Source: US Dept. Comm., 1980 b and 1983.

Table 3. Reported Annual Average Atlantic Mackerel, Squid, and Butterfish Landings by State by Fishing Gear, 1971-1980 (thousands of pounds)

Gear	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	Total	
						Atlantic Mackerel						
Trawls	7	-	153	189	1	100	1,177	-	71	47	1,743	41%
PN & FT	177	-	673	290	-	262	*	-	*	3	1,406	33
Gill Nets	32	3	121	*	6	27	8	*	1	33	230	5
Other	107	2	598	17	7	89	13	-	*	29	862	20
Total	322	6	1,545	496	15	478	1,198	*	71	112	4,244	100%
						Squid						
Trawls	11	-	1,834	1,291	27	846	655	-	39	211	4,915	83%
PN & FT	5	-	544	267	-	158	*	-	-	-	973	16
Gill Nets	*	-	1	-	-	*	*	-	-	-	1	*
Other	-	-	2	1	-	6	*	-	*	2	11	*
Total	16	-	2,380	1,559	29	1,010	656	-	39	213	5,903	100%
						Butterfish						
Trawls	1	-	92	2,745	17	648	612	-	16	107	4,239	89%
PN & FT	1	-	68	101	-	144	59	-	*	97	470	10
Gill Nets	-	-	*	14	*	2	5	*	*	6	27	1
Other	-	*	*	1	*	22	*	-	-	11	34	1
Total	2	*	160	2,862	18	816	676	*	16	222	4,775	100%

PN & FT = Pound nets and floating traps.
Other = haul seines, purse seines, lines, weirs, dredges, and fyke nets.
* = less than 500 lbs. or 0.5%.
NOTE: Totals may not sum exactly due to rounding and the inability to separate certain State landings by various gear during 1980. Numbers in this table may not total to those reported in Table 2 since not all east coast states are included here.
Source: 1971-1976: US Dept. Comm., 1980b. 1977-1980: unpub. NMFS statistics.

Table 4. Reported Atlantic Mackerel Landings by State by Fishing Gear, 1971-1980 (thousands of pounds)

	Gear	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	Total	
1971	Trawls	2	-	211	177	1	59	949	-	9	65	1,473	29%
	PN & FT	122	-	1,162	2	-	375	-	-	-	32	1,693	33
	Gill Nets	-	-	44	-	*	-	24	-	*	26	94	2
	Other	100	3	1,699	1	9	67	6	-	-	-	1,885	37
	Total	**225**	**3**	**3,117**	**179**	**11**	**502**	**979**	**-**	**10**	**124**	**5,150**	**100%**
1972	Trawls	1	-	116	61	1	55	1,426	-	2	5	1,667	30%
	PN & FT	64	-	1,293	686	-	463	-	-	-	1	2,507	45
	Gill Nets	-	-	23	-	-	2	2	-	5	48	80	1
	Other	27	3	1,129	1	8	24	82	-	*	2	1,276	23
	Total	**92**	**3**	**2,561**	**747**	**8**	**544**	**1,511**	**-**	**7**	**55**	**5,528**	**100%**
1973	Trawls	12	-	17	375	*	64	1,140	-	20	2	1,630	36%
	PN & FT	289	-	1,028	791	-	142	*	-	-	*	2,250	50
	Gill Nets	14	-	36	-	-	-	1	-	-	11	62	1
	Other	65	-	183	132	21	118	14	-	-	*	533	12
	Total	**379**	**-**	**1,263**	**1,297**	**22**	**323**	**1,155**	**-**	**20**	**14**	**4,473**	**100%**
1974	Trawls	1	-	20	107	-	23	756	-	68	9	984	42%
	PN & FT	132	-	517	129	-	190	-	-	-	1	969	41
	Gill Nets	1	-	61	-	1	7	8	2	*	*	80	3
	Other	150	-	7	-	25	102	10	-	-	44	338	14
	Total	**284**	**-**	**604**	**236**	**26**	**322**	**774**	**2**	**68**	**54**	**2,370**	**100%**
1975	Trawls	-	-	20	211	-	13	1,489	-	205	146	2,084	51%
	PN & FT	96	-	375	146	-	255	-	-	-	-	872	22
	Gill Nets	*	-	1	-	-	6	9	*	-	114	130	3
	Other	49	*	596	1	-	84	1	-	-	238	969	24
	Total	**145**	*****	**992**	**357**	**-**	**357**	**1,498**	*****	**205**	**498**	**4,055**	**100%**
1976	Trawls	1	-	821	153	*	41	1,847	-	224	190	3,277	66%
	PN & FT	281	-	353	257	-	145	-	-	-	-	1,036	21
	Gill Nets	10	-	44	-	12	3	5	*	-	86	160	3
	Other	114	*	332	*	-	60	*	-	-	*	506	10
	Total	**405**	*****	**1,551**	**410**	**13**	**249**	**1,852**	*****	**224**	**276**	**4,979**	**100%**
1977	Trawls	10	-	56	95	1	43	531	-	98	4	838	30%
	PN & FT	217	-	437	177	-	327	-	-	-	-	1,158	42
	Gill Nets	56	4	124	-	30	77	15	1	-	9	316	11
	Other	47	1	303	2	2	113	-	-	-	*	468	17
	Total	**330**	**5**	**919**	**273**	**33**	**561**	**547**	**1**	**98**	**13**	**2,780**	**100%**
1978	Trawls	1	-	27	149	1	79	836	-	10	34	1,137	34%
	PN & FT	261	-	717	88	-	241	-	-	-	*	1,307	39
	Gill Nets	107	19	172	-	12	75	4	*	-	20	409	12
	Other	115	2	252	-	3	116	8	-	-	*	496	15
	Total	**484**	**20**	**1,168**	**237**	**16**	**511**	**848**	*****	**10**	**55**	**3,347**	**100%**
1979	Trawls	37	-	103	337	2	245	1,207	-	58	9	1,998	52%
	PN & FT	121	-	364	432	-	303	*	-	-	-	1,220	32
	Gill Nets	90	3	256	-	8	72	5	-	*	11	445	12
	Other	86	8	5	22	2	74	1	-	-	-	198	5
	Total	**334**	**11**	**728**	**790**	**12**	**696**	**1,214**	**-**	**58**	**20**	**3,861**	**100%**
1980	Trawls	2	-	140	221	-	374	1,593	-	11	5	2,346	40%
	PN & FT	183	-	488	193	-	182	-	-	*	*	1,046	18
	Gill Nets	43	-	446	*	-	28	4	-	*	6	527	9
	Other	314	-	1,478	13	-	134	8	-	1	1	1,949	33
	Total	**543**	**14**	**2,550**	**426**	**12**	**719**	**1,605**	*****	**13**	**12**	**5,894**	**100%**

For notes and sources, see Table 3.

Table 5. Reported Squid Landings by State by Fishing Gear, 1971-1980 (thousands of pounds)

	Gear	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	Total	
1971	Trawls	-	-	662	552	86	246	205	-	11	410	2,172	80%
	PN & FT	-	-	315	151	-	65	-	-	-	-	531	20
	Gill Nets	-	-	2	-	-	-	-	-	-	-	2	*
	Other	-	-	-	-	-	-	-	-	-	*	*	*
	Total	**-**	**-**	**979**	**703**	**86**	**311**	**205**	**-**	**11**	**410**	**2,705**	**100%**
1972	Trawls	2	-	300	523	6	643	412	-	4	262	2,152	74%
	PN & FT	-	-	388	227	-	120	*	-	-	-	735	25
	Gill Nets	-	-	-	-	-	*	1	-	-	-	1	*
	Other	-	-	-	*	-	1	-	-	-	-	1	*
	Total	**2**	**-**	**688**	**750**	**6**	**764**	**412**	**-**	**4**	**262**	**2,889**	**100%**
1973	Trawls	3	-	772	1,294	19	447	584	-	13	159	3,291	85%
	PN & FT	-	-	145	327	-	44	-	-	-	-	516	13
	Gill Nets	-	-	*	-	-	-	-	-	-	-	*	*
	Other	-	-	7	-	-	46	*	-	-	-	53	1
	Total	**3**	**-**	**924**	**1,621**	**19**	**537**	**585**	**-**	**13**	**160**	**3,862**	**100%**
1974	Trawls	1	-	745	1,187	13	847	1,287	-	64	169	4,313	81%
	PN & FT	20	-	686	180	-	113	-	-	-	-	999	19
	Gill Nets	-	-	-	-	-	-	-	-	-	-	-	-
	Other	-	-	1	9	-	3	-	-	-	*	13	*
	Total	**21**	**-**	**1,431**	**1,376**	**13**	**964**	**1,287**	**-**	**64**	**169**	**5,325**	**100%**
1975	Trawls	5	-	141	1,577	17	486	942	-	41	101	3,310	77%
	PN & FT	7	-	690	199	-	80	-	-	-	-	976	23
	Gill Nets	-	-	-	-	-	-	-	-	-	-	-	-
	Other	-	-	*	*	-	3	-	-	-	-	3	*
	Total	**12**	**-**	**832**	**1,776**	**17**	**569**	**942**	**-**	**41**	**101**	**4,289**	**100%**
1976	Trawls	41	-	3,037	2,018	35	824	875	-	39	112	6,981	83%
	PN & FT	2	-	560	552	-	283	-	-	-	-	1,397	17
	Gill Nets	*	-	-	-	-	-	-	-	-	-	*	*
	Other	-	-	-	*	-	2	-	-	-	*	2	*
	Total	**43**	**-**	**3,597**	**2,571**	**35**	**1,108**	**875**	**-**	**39**	**113**	**8,380**	**100%**
1977	Trawls	17	-	3,058	746	35	442	685	-	27	61	5,071	88%
	PN & FT	9	-	404	228	-	43	-	-	-	-	684	12
	Gill Nets	2	-	1	-	-	-	-	-	-	-	3	*
	Other	-	-	*	2	-	-	*	-	-	-	2	*
	Total	**28**	**-**	**3,463**	**975**	**35**	**484**	**685**	**-**	**27**	**61**	**5,759**	**100%**
1978	Trawls	4	-	811	638	37	668	431	-	10	129	2,728	76%
	PN & FT	1	-	428	181	-	239	*	-	-	-	849	24
	Gill Nets	-	-	*	-	-	-	-	-	-	-	*	*
	Other	-	-	-	*	-	1	*	-	-	*	1	*
	Total	**5**	**-**	**1,239**	**820**	**37**	**907**	**431**	**-**	**10**	**131**	**3,580**	**100%**
1979	Trawls	34	-	6,185	2,375	23	1,451	557	-	77	431	11,133	88%
	PN & FT	4	-	864	252	-	343	-	-	-	-	1,463	12
	Gill Nets	*	-	1	-	-	-	-	-	-	-	1	*
	Other	-	-	7	2	-	-	2	-	*	11	22	*
	Total	**38**	**-**	**7,057**	**2,628**	**23**	**1,795**	**562**	**-**	**77**	**443**	**12,623**	**100%**
1980	Trawls	6	-	2,626	2,003	-	2,408	571	-	103	277	7,994	83%
	PN & FT	2	-	961	370	-	251	-	-	-	-	1,584	16
	Gill Nets	*	-	5	-	-	-	-	-	-	-	5	*
	Other	-	-	-	1	-	-	2	-	*	5	8	*
	Total	**8**	**-**	**3,593**	**2,374**	**23**	**2,659**	**573**	**-**	**103**	**282**	**9,615**	**100%**

For notes and sources, see Table 3.

Table 6. Reported Butterfish Landings by State by Fishing Gear, 1971-1980 (thousands of pounds)

	Gear	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	Total	
1971	Trawls	-	-	13	1,059	11	271	1,192	-	18	453	3,017	87%
	PN & FT	-	-	57	38	-	83	51	-	1	134	364	11
	Gill Nets	-	-	-	-	-	-	1	-	-	2	3	*
	Other	-	-	-	-	-	-	-	-	-	71	71	2
	Total	**-**	**-**	**70**	**1,098**	**11**	**353**	**1,244**	**-**	**19**	**659**	**3,454**	**100**
1972	Trawls	1	-	78	233	3	299	350	-	4	19	987	64
	PN & FT	-	-	42	34	-	110	142	-	-	195	523	34
	Gill Nets	-	-	-	-	-	-	-	-	*	10	10	*
	Other	-	1	-	-	-	2	-	-	-	29	30	2
	Total	**1**	**1**	**120**	**267**	**3**	**411**	**492**	**-**	**5**	**252**	**1,552**	**100**
1973	Trawls	*	-	99	1,181	8	504	926	-	7	55	2,780	84
	PN & FT	3	-	34	123	-	87	101	-	-	138	486	14
	Gill Nets	-	-	-	-	-	-	3	*	-	5	8	1
	Other	-	-	1	*	-	77	-	-	-	-	78	2
	Total	**3**	**-**	**134**	**1,304**	**8**	**668**	**1,030**	*****	**7**	**198**	**3,352**	**100**
1974	Trawls	-	-	113	1,646	11	609	913	-	12	44	3,348	85
	PN & FT	-	-	49	123	-	124	64	-	-	137	497	13
	Gill Nets	-	-	-	-	-	-	2	*	*	5	7	*
	Other	-	-	*	1	-	63	-	-	-	*	64	2
	Total	**-**	**-**	**163**	**1,771**	**11**	**797**	**979**	*****	**12**	**186**	**3,919**	**100**
1975	Trawls	-	-	21	1,782	8	763	764	-	23	49	3,410	78
	PN & FT	-	-	161	116	-	403	84	-	-	84	848	19
	Gill Nets	-	-	-	-	-	1	7	*	-	8	16	*
	Other	-	-	-	-	-	73	*	-	-	2	75	2
	Total	**-**	**-**	**181**	**1,900**	**8**	**1,239**	**856**	*****	**23**	**143**	**4,350**	**100**
1976	Trawls	9	-	66	1,063	20	744	289	-	20	14	2,225	73
	PN & FT	1	-	224	210	-	207	46	-	-	101	789	26
	Gill Nets	-	-	-	-	1	3	*	-	*	8	12	*
	Other	-	-	-	*	-	5	-	-	-	*	5	*
	Total	**9**	**-**	**290**	**1,273**	**21**	**960**	**336**	**-**	**21**	**125**	**3,035**	**100**
1977	Trawls	1	-	20	1,379	28	499	399	-	26	45	2,397	84
	PN & FT	-	-	36	149	-	151	-	-	-	71	407	14
	Gill Nets	-	-	-	-	*	1	37	*	*	11	49	2
	Other	-	-	-	-	-	-	-	-	-	1	1	*
	Total	**1**	**-**	**56**	**1,529**	**28**	**650**	**436**	*****	**26**	**132**	**2,858**	**100**
1978	Trawls	-	-	55	6,176	66	808	453	-	22	82	7,656	96
	PN & FT	-	-	14	121	-	117	27	-	*	30	309	4
	Gill Nets	*	-	*	-	1	-	1	-	*	-	2	*
	Other	*	-	-	-	-	-	-	-	-	4	4	*
	Total	*****	**-**	**67**	**6,297**	**66**	**926**	**482**	**-**	**22**	**117**	**7,977**	**100**
1979	Trawls	*	-	85	3,707	22	925	522	-	13	263	5,537	95
	PN & FT	1	-	28	100	-	88	52	-	-	-	268	5
	Gill Nets	*	-	-	-	1	8	*	*	-	10	19	*
	Other	-	-	-	5	3	-	-	-	-	-	8	*
	Total	**1**	**-**	**113**	**3,813**	**26**	**1,020**	**574**	*****	**13**	**273**	**5,833**	**100**
1980	Trawls	*	-	374	9,228	-	1,062	313	-	12	45	11,034	97
	PN & FT	3	-	32	-	-	69	21	-	-	84	209	2
	Gill Nets	-	-	-	135	-	2	*	-	*	5	142	1
	Other	-	-	-	6	-	*	*	-	-	1	7	*
	Total	**3**	**-**	**405**	**9,369**	**26**	**1,134**	**334**	**4**	**12**	**135**	**11,422**	**100**

For notes and sources, see Table 3.

Table 7. Recreational Atlantic Mackerel Catch 1960, 1965, 1970 & 1974 (thousands of pounds and thousands of fish)

		1960	1965	1970	1974
North Atlantic (Maine - New York)	Total weight caught	10,100	18,006	41,482	
	Total number caught	10,100	21,809	33,573	
	Average lb./fish	1.00	0.83	1.24	
Mid-Atlantic (New Jersey - Cape Hatteras)	Total weight caught	830	919	29,250	
	Total number caught	750	936	18,441	
	Average lb./fish	1.11	0.98	1.59	
South Atlantic (Cape Hatteras - Florida Keys)	Total weight caught	-	-	-	
	Total number caught	-	-	-	
	Average lb./fish	-	-	-	
Total	Total weight caught	10,930	18,925	70,732	16,845
	Total number caught	10,850	22,745	52,014	9,963
	Average lb./fish	1.01	0.83	1.36	1.69

Source: 1960, 1965, 1970, and 1974 Salt-Water Angling Surveys. NMFS, NOAA, USDC.

Table 8. Estimated Recreational Mackerel Catch (thousands), 1979

	ME - CT	NY - VA	NC - East Coast FL	Total
Number landed (A)	626	1,538	-	2,163
Number harvested (B1)	1,376	330	-	1,705
Number released (B2)	171	3	-	174
Number removed (A + B1)	2,002	1,868	-	3,868
Total Number Caught (A + B1 + B2)	2,172	1,870	-	4,043
Weight (lbs., 000), landed fish (A)	548	1,163	-	1,711
Avg. weight/landed fish (lb.)	0.88	0.76	-	0.79

A = fish brought back whole to shore which were sampled by interviewers. B1 = fish which were killed, but which were not sampled by interviewers. B2 = fish released by anglers. Source: USDC, 1980a.

Table 9. Estimated Total Recreational Catch* (thousands of fish) by Region and Species/Species Group, Ranked by Number of Fish Caught, 1979

New England			Mid-Atlantic			South Atlantic		
Species	Number Caught	% of Total Regional Catch	Species	Number Caught	% of Total Regional Catch	Species	Number Caught	% of Total Regional Catch
Winter flounder	12,448	31	Bluefish	15,610	19	Spot	8,840	13
Bluefish	4,824	12	Summer flounder	12,653	15	Catfishes	5,517	8
Scup & porgies	4,796	12	Winter flounder	10,107	12	Bluefish	4,994	8
Cod	2,602	7	Spot	8,708	11	Croaker	3,778	6
Pollock	2,277	6	Scup & porgies	5,887	7	Pinfish	3,720	6
Atlantic mackerel	2,172	5	White perch	5,284	6	Sea basses	3,341	5
Cunner	2,083	5	Weakfish	4,234	5	Mullets	3,198	5
Tautog	999	2	Searobins	2,499	3	Grunts	3,187	5
Tomcod	833	2	Sea basses	2,181	3	Herrings	2,927	4
Herrings	800	2	Tautog	1,883	2	Dolphins	2,766	4
All others	6,230	16	All others	13,406	16	All others	23,867	36
Total	40,064	100	Total	82,454	100	Total	66,135	100

* = A + B1 + B2 (see Table 8). Source: USDC, 1980a.

Table 10. Loligo, Illex, Mackerel, & Butterfish OY, DAH/DAP, Initial TALFF, & Allocations (thousands of pounds)

Year	Species	Optimum Yield	Initial DAH/DAP	Initial TALFF	Initial Reserve	Final TALFF	Final Allocation
Calendar 1978	Loligo	97,002	50,926	41,887	-	46,076	46,076
	Illex	77,161	13,228	51,806	-	63,933	60,318
	Mackerel	34,171	31,526	2,646	-	2,646	2,496
	Butterfish	39,683	30,864	8,818	-	8,818	8,243
Calendar 1979	Loligo	97,002	30,864	66,138	-	66,138	63,933
	Illex	66,138	22,046	44,092	-	44,092	43,651
	Mackerel	34,171	31,526	2,646	-	2,646	2,452
	Butterfish	39,683	30,864	8,818	-	8,818	1,764
Fishing Year 1979-80	Loligo	97,002	30,864	66,138	-	78,260	70,834
	Illex	66,138	22,046	44,092	-	54,517	51,334
	Mackerel	34,171	30,864	2,646	-	2,646	2,401
	Butterfish	24,251	15,432	8,818	-	8,818	7,359
Fishing Year 1980-81	Loligo	97,002	15,432	39,683	41,887	81,570	77,326
	Illex	66,138	11,023	26,455	28,660	55,115	55,115
	Mackerel	66,138	44,092	8,818	13,228	22,046	21,938
	Butterfish	24,251	15,432	8,818	-	8,818	8,124
Fishing Year 1981-82	Loligo	97,002	15,432	39,683	41,887	80,838	78,900
	Illex	66,138	11,023	26,455	28,660	55,115	53,845
	Mackerel	66,138	44,092	8,818	13,228	22,046	16,949
	Butterfish	24,251	15,432	1,673*	-	3,126*	2,646
Fishing Year 1982-83	Loligo	97,002	15,432	39,683	41,887	81,570	44,864
	Illex	66,138	11,023	26,455	28,660	50,214	46,517
	Mackerel	66,138	44,092	8,818	13,228	19,841	19,180
	Butterfish	24,251	15,432	8,818	-	8,818	2,498
Fishing Year 1983-84	Loligo	97,002	66,579	9,921	9,921	unk	unk
	Illex	66,138	63,933	1,102	1,102	unk	unk
	Mackerel	129,630	50,485	34,061	34,061	unk	unk
	Butterfish	35,274	19,841	2,377	-	unk	unk

- = zero.

unk = unknown.

* = The initial TALFF for 1981-82 was 8,818,000 pounds. The Council certified an annual fishing level of 1,673,000 pounds. Late in the year NMFS transferred to TALFF 1,453,000 pounds, bringing the final TALFF to 3,126,000 pounds. This resulted in 5,692,000 pounds available for foreign allocation in 1982-83, in addition to the 8,818,000 pound TALFF. However, that carry-over was never counted as TALFF and never allocated during 1982-83.

Sources: Optimum Yield, Initial DAH, Final TALFF, and Final Allocations from annual Fisheries of the US, USDC. Initial TALFF and Initial Reserve from Federal Register notices. 1983-1984 preliminary.

Table 11. Loligo, Illex, Mackerel, and Butterfish TALFF, Foreign Allocation, and Foreign Catch (thousands of pounds)

Fishing Year	Species	Final TALFF	Final Allocation	Catch	TALFF Allocated	TALFF Caught	Allocation Caught
1979-80	Loligo	78,260	70,834	42,412	86%	54%	63%
	Illex	54,517	51,334	35,199	94	65	69
	Mackerel	2,646	2,401	869	92	33	36
	Butterfish	8,818	7,359	2,749	83	31	37
1980-81	Loligo	81,570	77,326	44,520	95	55	58
	Illex	55,115	55,115	41,096	100	75	75
	Mackerel	22,046	21,938	11,711	100	53	53
	Butterfish	8,818	8,124	2,458	92	28	30
1981-82	Loligo	80,838	78,900	29,661	98	37	38
	Illex	55,115	53,845	33,029	98	60	61
	Mackerel	22,046	16,949	4,638	77	21	27
	Butterfish	3,126	2,646	1,138	85	36	43
1982-83	Loligo	81,570	44,864	28,073	55	34	63
	Illex	50,214	46,517	28,528	93	57	61
	Mackerel	19,841	19,180	2,628	97	13	14
	Butterfish	8,818	2,498	1,770	28	20	71

Sources: Optimum Yield, Initial DAH, Final TALFF, and Final Allocations from annual Fisheries of the US, USDC. Initial TALFF and Initial Reserve from Federal Register notices. 1983-1984 preliminary.

Table 12. Atlantic Mackerel, Squid, and Butterfish Commercial Ex-Vessel Value (thousands of $) by State, 1971-1982

Year	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	NC	SC	Total**
						Atlantic Mackerel							
1971	14	*	147	16	2	30	49	-	1	7	-	-	265
1972	14	*	208	47	1	46	105	-	1	5	-	-	427
1973	40	-	205	142	4	50	94	-	4	2	-	-	541
1974	34	-	129	45	5	39	109	*	10	12	-	-	383
1975	22	*	90	40	-	63	143	*	33	81	12	-	484
1976	81	*	191	87	5	40	151	*	21	40	40	-	656
1977	78	1	201	63	13	95	49	*	20	3	26	-	547
1978	97	4	331	48	7	127	88	*	2	9	6	-	719
1979	84	2	154	229	3	249	161	-	13	6	7	-	911
1980	79	3	300	103	3	163	157	*	1	4	*	-	814
1981	71	6	224	99	15	228	320	1	2	17	23	-	1,006
1982	50	1	270	131	8	277	326	-	1	13	8	-	1,085
						Squid							
1971	*	-	76	128	16	56	38	-	2	38	1	-	355
1972	*	-	85	134	1	100	77	-	1	29	1	-	428
1973	*	-	143	361	4	97	135	-	4	20	3	1	770
1974	3	-	241	286	2	178	237	-	15	25	12	1	1,000
1975	2	-	122	334	3	134	174	-	13	11	7	5	806
1976	6	-	502	612	10	225	197	-	11	13	5	3	1,585
1977	4	-	569	416	15	223	275	-	10	13	3	3	1,531
1978	1	-	240	417	16	468	215	-	4	41	49	3	1,454
1979	9	-	1,942	953	6	721	219	-	30	145	190	6	4,221
1980	1	-	959	895	6	980	195	-	32	53	75	3	3,199
1981	3	-	527	683	12	861	234	-	13	88	92	3	2,516
1982	1	-	459	257	6	973	857	-	11	525	44	7	3,158
						Butterfish							
1971	-	-	6	205	2	95	193	-	3	100	5	-	609
1972	*	*	23	84	1	139	93	-	1	56	7	-	404
1973	*	-	34	354	2	232	158	*	1	45	4	-	830
1974	-	-	38	453	2	300	135	*	3	39	9	-	979
1975	-	-	41	507	2	327	157	*	5	30	10	-	1,078
1976	5	-	81	382	4	274	83	-	6	30	6	-	871
1977	*	-	19	425	7	215	105	*	7	30	8	-	817
1978	*	-	18	2,340	18	354	123	-	6	28	26	-	2,913
1979	*	-	38	1,287	6	452	196	*	4	86	46	-	2,117
1980	1	-	135	2,913	6	597	106	2	4	42	42	-	3,847
1981	6	*	215	2,416	158	374	144	1	5	44	108	*	3,471
1982	-	-	248	4,712	16	419	104	2	2	45	70	-	5,618

- = zero.
* = less than $500.
** = totals may not equal sum of states due to rounding.
Source: US Dept. Comm., 1980b, 1971-1976. Unpubl. NMFS statistics, 1977-1982.

Table 13. National Average Ex-Vessel Price Per Pound of Butterfish, Squid, and Mackerel, Unadjusted and Adjusted for Inflation*

Year	Atlantic Mackerel		Squid		Butterfish	
	Nominal	Deflated	Nominal	Deflated	Nominal	Deflated
1971	$ .05	$ .05	$ .13	$ .11	$ .17	$ .15
1972	.08	.06	.15	.12	.25	.21
1973	.12	.09	.20	.15	.24	.18
1974	.16	.10	.18	.12	.25	.15
1975	.12	.07	.18	.11	.24	.14
1976	.12	.07	.19	.10	.28	.15
1977	.17	.09	.26	.13	.28	.15
1978	.22	.10	.39	.19	.36	.17
1979	.24	.10	.32	.14	.35	.15
1980	.14	.05	.32	.12	.33	.12
1981	.14	.05	.35	.12	.34	.12
1982	.15	.05	.18	.06	.31	.11

* Index used is national "Producer Price Index" (all goods).

Source: Landings in lbs. and value 1975-1982 from Table 1; 1971-1974 USDC, 1980b.

Table 14. Permitted Mackerel, Squid, and Butterfish Vessels, 1981 and 1982

Fishery	Permit	No. of Vessels 1981	No. of Vessels 1982
Mackerel	commercial	769	1,068
	party/charter	196	247
	incidental	177	274
Squid	commercial	674	892
	party/charter	37	46
	incidental	125	185
Butterfish	commercial	345	553
	party/charter	10	17
	incidental	75	158

Source: Unpublished NMFS data.

Table 15. Mackerel, Squid, and Butterfish Vessel Characteristics, 1982

Permit	Characteristic	Vessel*	Average	Minimum	Maximum
Mackerel	Length	1,068	50	14	176
(commercial)	Gross tonnage	1,068	49	1	560
1,068 vessels	Hold capacity (lbs.)	847	52,839	1	800,000
	Year built	1,044	1968	1913	1982
	Crew size	1,042	4	1	17
Mackerel	Length	247	43	18	90
(party/charter)	Gross tonnage	247	24	1	137
247 vessels	Hold capacity (lbs.)	143	3,779	1	90,000
	Year built	244	1967	1928	1982
	Crew size	237	3	1	8
Mackerel	Length	274	46	14	166
(incidental)	Gross tonnage	274	48	1	542
274 vessels	Hold capacity (lbs.)	205	43,583	1	350,000
	Year built	273	1972	1937	1982
	Crew size	263	4	1	16
Squid	Length	892	55	14	176
(commercial)	Gross tonnage	892	61	1	560
892 vessels	Hold capacity (lbs.)	750	62,838	1	800,000
	Year built	879	1967	1913	1982
	Crew size	879	4	1	17
Squid	Length	46	42	18	86
(party/charter)	Gross tonnage	46	27	2	137
46 vessels	Hold capacity (lbs.)	36	7,514	200	90,000
	Year built	46	1970	1955	1981
	Crew size	45	3	1	7
Squid	Length	185	55	14	166
(incidental)	Gross tonnage	185	69	1	542
185 vessels	Hold capacity (lbs.)	150	60,926	1	350,000
	Year built	185	1971	1917	1982
	Crew size	182	5	1	16
Butterfish	Length	553	63	16	176
(commercial)	Gross tonnage	553	81	1	560
553 vessels	Hold capacity (lbs.)	485	78,382	2	800,000
	Year built	551	1968	1917	1982
	Crew size	552	5	1	17
Butterfish	Length	17	37	20	83
(party/charter)	Gross tonnage	17	23	2	120
17 vessels	Hold capacity (lbs.)	14	7,471	200	65,000
	Year built	17	1973	1958	1981
	Crew size	16	4	1	7
Butterfish	Length	158	56	14	166
(incidental)	Gross tonnage	158	70	1	542
158 vessels	Hold capacity (lbs.)	134	59,109	1	350,000
	Year built	157	1970	1928	1982
	Crew size	157	5	1	16

* = number of vessels with non-zero information.
Source: Unpublished NMFS data.

Table 16. Production of Frozen Squid by Section*
(thousands of pounds)

Year	New England	Mid-Atlantic	South Atlantic	Total#
1965	18	238	9	265
1966	30	963	5	998
1967	372	384	111	867
1968	527	164	29	720
1969	268	471	53	792
1970	51	55	20	116
1971	58	369	70	497
1972	275	182	40	497
1973	470	94	5	569
1974	858	118	144	1,120
1975	432	149	91	672
1976	2,994	211	179	3,384
1977	1,632	131	43	1,806
1978	415	73	9	497
1979	3,596	315	-	3,911
1980	1,094	146	-	1,240
1981	331	25	-	356
1982	515	155	-	670

* Production by firms voluntarily reporting to NMFS. Excludes freezings by firms not reporting to NMFS on a monthly basis, by firms operating plate freezers at the end of fillet lines, and production of fishery products frozen on US vessels.

\# % of total freezings used for human consumption, bait, and for other purposes is unknown.

Source: US Dept. Comm., 1980b and 1983.

Table 17. Summary of Joint Venture Activities in the Northwest Atlantic Ocean

Year	Flag State	US Partner	Species	Tonnage	Permit Status
1981	Japan	Lund's Fisheries	Loligo	1,000	issued
1982	Bulgaria	Joint Trawlers	A. mackerel	6,000	issued
			Loligo	2,000	issued
			Illex	1,000	issued
	Italy	Fass Brothers	Loligo	800	issued
			Illex	800	issued
	Japan	Lund's Fisheries	Loligo	1,000	issued
	Poland	Oceanside Fisheries	A. herring	4,000	issued
	Portugal	Lund's Fisheries	Illex	400	issued
		Lund's Fisheries & Joint Trawlers	Illex	1,400	issued
	USSR	Mid-Atlantic Fishery Export Corporation	A. mackerel	6,500	withdrawn
			Silver hake	13,000	withdrawn
			Red hake	4,000	withdrawn
	GDR	Joint Trawlers	Loligo	2,500	issued
			A. mackerel	5,000	issued
1983	GDR	Joint Trawlers	Loligo	2,500	approved*
			A. mackerel	5,000	issued
	Italy	Sea Harvest, Inc. (Intn'l Seafoods)	Illex	5,950	issued
			Loligo	6,000	issued
	Japan	Charles Stinson	Loligo	300	denied
			A. mackerel	300	denied
			Butterfish	1,000	denied
		Lund's Fisheries (1)	Illex	850	issued
			Loligo	1,000	issued
		Lunds's Fisheries (2)	Butterfish	1,000	pending
			A. mackerel	300	pending
			Loligo	300	pending
	Portugal	Lund's Fisheries	Illex	8,500	issued
		Joint Trawlers	Illex	2,550	issued
		Scan Ocean, Inc.	Illex	4,250	issued
			Loligo	3,000	issued
		Robert Metafora	Loligo	1,500	issued
	Spain	Sea Harvest, Inc. (1)	Illex	2,800	denied
			Loligo	1,300	issued
		Sea Harvest, Inc. (2)	Illex	1,400	denied
			Loligo	1,400	issued
		Stonavar	Loligo	2,000	issued
		Shoreside Co.	Loligo	2,500	issued
	USSR	Scan Ocean, Inc.	Illex	12,000	denied
			Loligo	200	approved*
			A. mackerel	500	pending

* joint venture approved, permit pending. Source: NMFS Northeast Region, pers. comm.

Table 18. 1980 Atlantic Mackerel, Squid, Butterfish, and Total Landings by County (quantity in thousands of pounds, value in thousands of dollars)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Species				All Species				Cumu-
	Quantity		Value		Quantity		Value		lative
County	Pounds	Share	$	Share	Pounds	Share	$	Share	Share of Landings
					Atlantic Mackerel				
Essex, MA	1,807	31%	149	18%	175,622	1%	47,630	*%	31%
Cape May, NJ	1,529	26	141	18	51,438	3	27,254	1	56
Barnstable, MA	752	13	152	19	62,345	1	33,737	1	69
Suffolk, NY	666	11	150	18	30,695	2	39,477	*	80
Lincoln, ME	293	5	31	4	9,307	3	7,620	*	85
Washington, RI	217	4	26	3	39,235	1	14,890	*	89
Newport, RI	210	4	77	9	29,622	1	20,978	*	93
Cumberland, ME	176	3	33	4	45,615	*	23,501	*	96
Ocean, NJ	71	1	14	2	18,224	*	10,828	*	97
Other counties	192	3	43	5	N/A	N/A	N/A	N/A	100
Total	5,913	100%	816	100%	462,103	1	225,914	*	
					Squid				
Suffolk, NY	2,223	23%	826	26%	30,695	7%	39,477	2%	23%
Washington, RI	1,633	17	579	18	39,236	4	14,891	4	40
Barnstable, MA	1,575	16	467	15	62,345	3	33,737	1	56
Bristol, MA	1,095	11	310	10	103,657	1	75,868	*	67
Newport, RI	741	8	316	10	29,622	3	20,978	2	75
Essex, MA	594	6	87	3	175,622	*	47,630	*	81
Cape May, NJ	424	4	134	4	51,438	1	27,254	*	85
Nassau, NY	421	4	146	5	5,783	7	3,344	4	89
Dukes, MA	319	3	94	3	5,532	6	3,905	2	92
Hampton, VA	197	2	36	1	18,980	1	19,335	*	94
Ocean, NJ	126	1	52	2	18,224	1	10,828	*	96
Worcester, MD	103	1	32	1	24,110	*	11,056	*	97
Other counties	339	3	97	3	N/A	N/A	N/A	N/A	100
Total	9,790	100%	3,176	100%	565,243	2%	308,301	1%	
					Butterfish				
Washington, RI	7,241	63%	2,330	61%	39,236	18%	14,890	16%	63%
Newport, RI	2,129	18	483	13	29,622	7	20,978	2	81
Suffolk, NY	1,010	9	533	14	30,695	3	39,477	1	90
Bristol, MA	288	2	84	2	103,657	*	75,868	*	92
Cape May, NJ	242	2	76	2	51,438	1	27,254	*	94
Other counties	658	6	342	9	N/A	N/A	N/A	N/A	100
Total	11,568	100%	3,848	100%	254,647	5%	178,466	2%	

(1), (3), (5), & (7) from unpublished NMFS State Landings Bulletin data.
(2) = each row in (1) divided by Grand Total in (1).
(4) = each row in (3) divided by Grand Total in (3).
(6) = each row in (1) divided by each row in (5).
(8) = each row in (3) divided by each row in (7).
(9) = each for in (2) added to the previous row in (2).
* = Less than .5%.
N/A = not applicable.
Totals are for only those counties with mackerel, squid, or butterfish landings & may not equal sum of rows because of rounding.

Table 19. Counties Ranked by Combined Share of Atlantic Mackerel, Squid, and Butterfish Landings

	County Share of Total Mackerel, Squid, and Butterfish		Contribution of Mackerel, Squid, and Butterfish to Total County	
	Landings (1)	Value (2)	Landings (3)	Value (4)
Washington, RI	84%	82%	23%	20%
Suffolk, NY	43	58	12	3
Essex, MA	37	21	1	*
Cape May, NJ	32	24	5	1
Newport, RI	30	32	11	4
Barnstable, MA	29	34	4	2
Bristol, MA	13	12	1	*
Lincoln, ME	5	4	3	*
Nassau, NY	4	5	7	4
Cumberland, ME	3	4	*	*
Dukes, MA	3	3	6	2
Ocean, NJ	2	4	1	*
Hampton, VA	2	1	1	*
Worcester, MD	1	1	*	*
Other counties	12	17	N/A	N/A
Total	300%	300%		

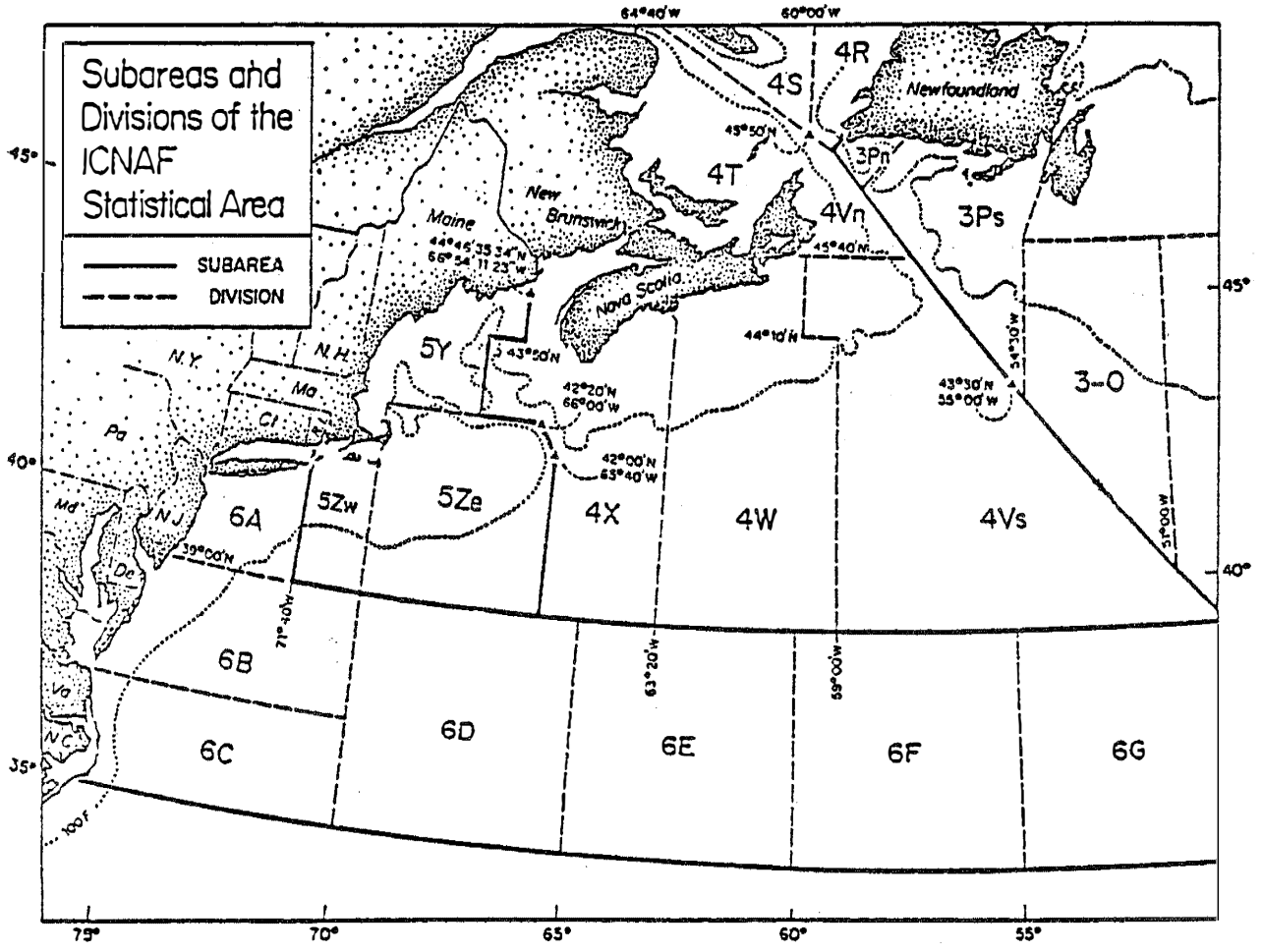
(1) = sum of column (2), Table 18, for each county for mackerel, squid, and butterfish.
(2) = sum of column (4), Table 18, for each county for mackerel, squid, and butterfish.
(3) = sum of column (6), Table 18, for each county for mackerel, squid, and butterfish.
(4) = sum of column (8), Table 18, for each county for mackerel, squid, and butterfish.
* = less than 0.5%.
N/A = not applicable.

Table 20. Cetaceans and Turtles Found in Survey Area

Scientific name	Common name	Est. Minimum Number in Study Area	Endangered	Threatened
LARGE WHALES				
Balaenoptera physalus	fin whale	1,102	X	
Megaptera novaeangliae	humpback whale	684	X	
Balaenoptera acutorostrata	minke whale	162		
Physeter catodon	sperm whale	300	X	
Eubalaena glacialis	right whale	29	X	
Balaenoptera borealis	sei whale	109	X	
Orcinus orca	killer whale	unk		
SMALL WHALES				
Tursiops truncatus	bottlenose dolphin	6,254		
Globicephala spp.	pilot whales	11,448		
Lagenorhynchus acutus	Atl. white-sided dolphin	24,287		
Phocoena phocoena	harbor porpoise	2,946		
Grampus griseus	grampus or Risso's dolphin	10,220		
Delphinus delphis	saddleback dolphin	17,606		
Stenella spp.	spotted dolphin	22,376		
Stenella coeruleoalba	striped dolphin	unk		
Lagenorhynchus albirostris	white-beaked dolphin	unk		
Ziphius cavirostris	Cuvier's beaked dolphin	unk		
Stenella longirostris	spinner dolphin	unk		
Steno bredanensis	rough-toothed dolphin	unk		
Delphinapteras leucas	beluga	unk		
Mesoplodon spp.	beaked whales	unk		
TURTLES				
Caretta caretta	logggerhead turtle	4,017		X
Dermochelys coriacea	leatherback turtle	636	X	
Lepidochelys kempi	Kemp's ridley turtle	unk	X	
Chelonia mydas	green turtle	unk		X

Source: Cetacean and Turtle Assessment Program, University of Rhode Island, 1981.

Figure 1



Northwest Atlantic From Cape Hatteras To Newfoundland,

Showing ICNAF Areas Referred To In The Management Plan

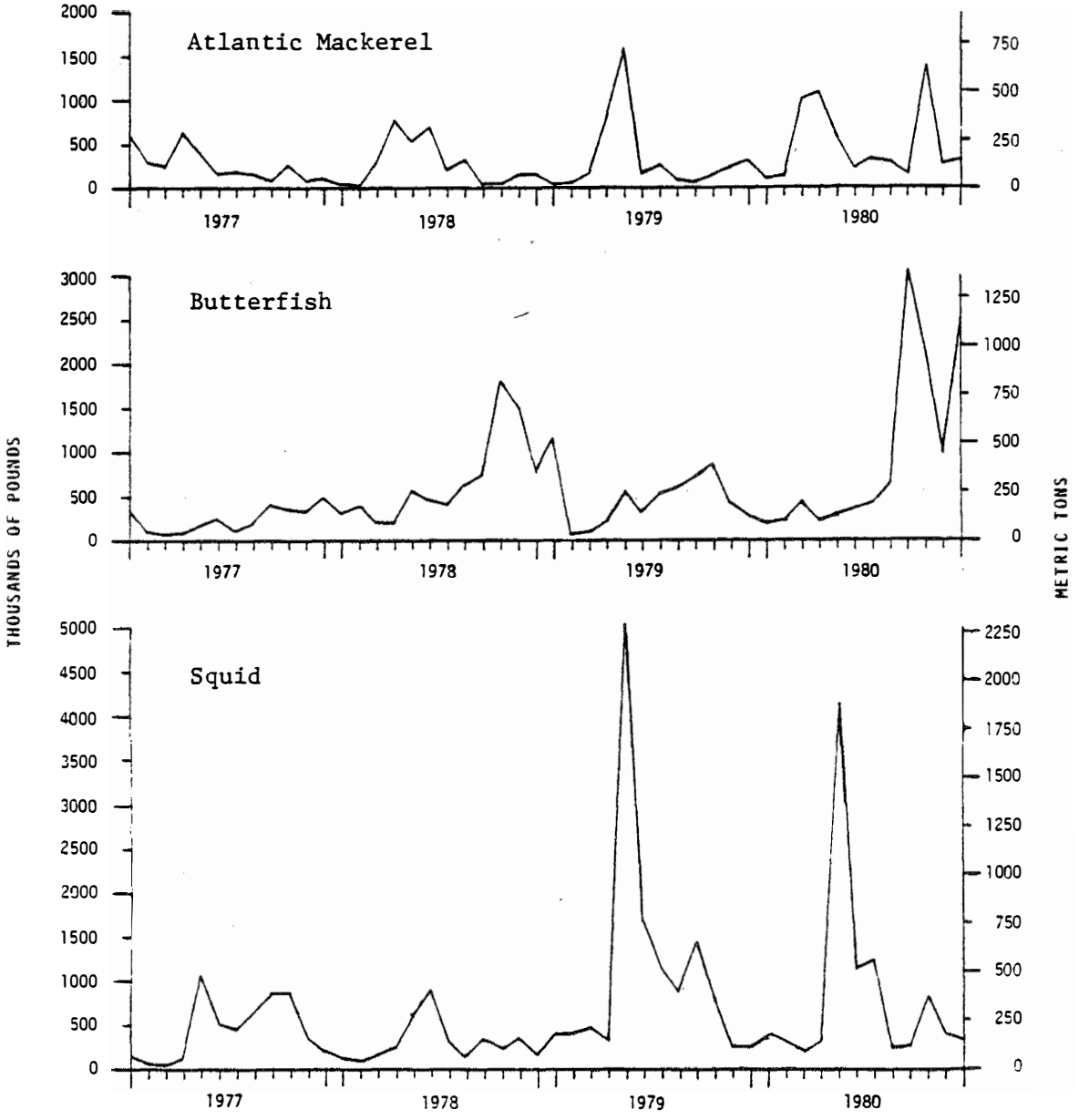


Figure 2

Reported Commercial Landings Of Atlantic Mackerel, Butterfish And Squid, Maine - North Carolina, By Month: 1977-1980
(Does Not Include New Hampshire, Connecticut, And Delaware Landings)

ENVIRONMENTAL ASSESSMENT ON AMENDMENT #1 TO THE FISHERY MANAGEMENT PLAN FOR THE ATLANTIC MACKEREL, SQUID, AND BUTTERFISH FISHERIES (FMP)

Description of the Action

The Fishery Management Plan for the Atlantic Mackerel, Squid, and Butterfish Fisheries (FMP) was prepared by the Mid-Atlantic Fishery Management Council (Council) and approved by the National Oceanic and Atmospheric Administration (NOAA) on October 14, 1982. The FMP consolidated three previous FMPs, Atlantic mackerel, squid (Loligo and Illex), and butterfish, into one management regime for three years, ending 31 March 1986. The FMP was implemented by emergency interim regulations effective 1 April 1983, (48 FR 14554). On 28 June 1983, the emergency interim rules were extended from 30 June 1983, through 27 September 1983.

Amendment #1 (Amendment) provides authority for the Northeast Regional Director (RD) to adjust squid Optimum Yields (OYs) at any time during the fishing year, depending upon specified factors. Additionally, the Atlantic mackerel natural mortality rate (M) is revised from 0.3 to 0.2 on the basis of the latest scientific data available. This lower rate necessitates the use of a minimum spawning stock biomass constraint of 400,000 metric tons (mt) in concept equivalent to the management strategy in the FMP of a 600,000 mt spawning stock biomass constraint which applied before revisions of M.

Since the Amendment changes only the squid OY adjustment mechanism and the natural mortality rate for mackerel, the ending date of the FMP is maintained. Also, the management unit is maintained as all Atlantic mackerel, (Scomber scombrus), squid (Loligo pealei and Illex illecebrosus) and butterfish (Peprilus triacanthus) under United States jurisdiction, excluding the Gulf of Mexico and the Caribbean Sea.

The objectives of the FMP are maintained by the Amendment, and are as follows:

1. Prevent the exploitation of these resources from exceeding those levels which reduce the probability of successful (i.e., the historic 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.

Failure to amend the FMP would mean that the intention of the Council to grant the RD, in consultation with the Council, the flexibility to adjust the squid OY specifications any time during the fishing year based upon biological and economic reasons would not be realized. Additionally, maintaining the natural mortality rate for mackerel at 0.3, instead of 0.2, would violate National Standard 2 (conservation and management measures shall be based upon the best scientific information available).

Alternatives

In the development of the original Plan, earlier Amendments, and previous drafts of the implemented FMP, the Council considered many other alternatives. For any and all of the subject species, these included reversion to PMP management; different OY amounts, limited flexible OY, maximum flexibility and capacity amounts, including ranges for these amounts, the use of Reserves; different combinations of species for merger into one or more management plans,

including species for which plans have not been prepared; and continuation of the current management measures with no change.

Because the more flexible squid OY adjustment mechanism intended by the Council was found not to be sufficiently supported in the merger amendment NMFS implemented a limited squid OY adjustment mechanism provided for by that amendment. This assured that the merger amendment would be in place by the beginning of the 1983 fishing year, 1 April 1983. Since then, the intent of the Council to have a more flexible squid OY adjustment mechanism has been more clearly articulated and supported with attendant documentation.

The Council considers the alternatives presented within this Amendment to be appropriate under current and foreseeable future circumstances. The Council will also consider modifications of the alternatives as the result of public comments received after the completion of the public comment period.

The alternatives to the proposed Amendment are:

1. **Take no action at this time.** This would mean that the Plan would continue in effect until 31 March 1986, unless otherwise amended. The limited squid adjustment mechanism would remain intact. Atlantic mackerel specifications would continue to be based upon a natural mortality rate of 0.30, instead of the most recent scientifically determined rate of 0.20. This would not allow determination of OY on as current a basis as possible for squid and would violate National Standard #2 in the case of mackerel.

2. **Prepare a Secretarial Amendment to Amend the Council Plan.** This would amend the Plan by adopting the more flexible squid adjustment mechanism contemplated by the Council. It would further provide for the best scientific information forming the basis of the Atlantic mackerel specifications. It would grant the RD, in consultation with the Council, the authority to adjust squid OYs based upon certain biological and economic information. It would allow the annual mackerel specifications to be based upon the most recent scientific assessment of natural mortality rate of 0.2. This alternative was considered because, if NMFS prepared the Secretarial Amendment, the Council staff would be able to work on other Plans. However, the alternative was rejected because of timing considerations.

The Amendment is not to be interpreted as limiting the Council's ability to certify Annual Fishing Levels for the species involved pursuant to the MFCMA.

The permitting and reporting requirements for data collection would be conducted by means other than logbooks (see Amendment Section XIV.A).

Loligo and Illex

Loligo Squid

The maximum OY for Loligo is 44,000 mt. The RD in consultation with the Council, shall determine annual specifications relating to Initial Optimum Yield (IOY), Domestic Annual Harvest (DAH), Domestic Annual Processing (DAP), Joint Venture Processing (JVP), and Total Allowable Level of Foreign Fishing (TALFF). The RD shall review yearly the most recent biological data pertaining to the stock. If the RD determines that the stock cannot support a level of harvest equal to the maximum OY, he shall establish a lower Allowable Biological Catch (ABC) for the fishing year. This level represents essentially the modification of the maximum sustainable yield (MSY) to reflect changed biological circumstances. If the stock is able to support a harvest level equivalent to the maximum OY, the ABC shall be set at that level.

From the ABC, the RD, in consultation with the Council, shall determine the IOY for the fishing year. The IOY represents a modification of ABC, based on economic factors. It is intended to provide the greatest overall benefit to the nation by incorporating all relevant factors. The IOY is composed of an initial DAH and initial TALFF. The RD will project the DAH by reviewing the data concerning past domestic landings, projected amounts of Loligo necessary for domestic processing

and for joint ventures during the fishing year, and other data pertinent for such a projection. The Joint Venture Processing (JVP) component of DAH shall be the portion of DAH which domestic processors either cannot or will not use. In assessing the level of IOY, the RD shall provide for a TALFF of at least a minimum bycatch of Loligo squid that would be harvested incidentally in other directed fisheries. This bycatch level shall be 1% of the allocated portion of the Illex, mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs. In addition, this specification of IOY shall be based on the application of the following factors:

1. total world export potential by squid-producing countries;

2. total world import demand by squid-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.

Proposed annual specifications of the ABC and IOY and its component amounts shall be published in the Federal Register and provide for a public comment period. At the close of the public comment period, a notice of final annual specifications with the reasons, therefore, shall be published in the Federal Register.

Any subsequent adjustments to the IOY shall be published in the Federal Register and may provide for a public comment period.

The IOY may be adjusted by the RD, in consultation with the Council, upward to the ABC at any time during the fishing year. An adjustment may be made to IOY to accommodate DAH needs, including when the the application of the above factors warrants an adjustment in TALFF. However, TALFF may not be adjusted to a quantity less than that already allocated to and accepted by foreign nations or less than that needed for bycatch.

Illex Squid

The maximum OY for Illex is 30,000 mt. The RD, in consultation with the Council, shall determine annual specifications relating to IOY, DAH, DAP, JVP, and TALFF. The RD shall review yearly the most recent biological data pertaining to the stock. If the RD determines that the stock cannot support a level of harvest equal to the maximum OY, he shall establish a lower ABC for the fishing year. If the stock is able to support a harvest level equivalent to the maximum OY, the ABC shall be set at that level.

From the ABC, the RD, in consultation with the Council, shall determine the IOY for the fishing year. The IOY represents a modification of ABC, based on economic factors. It is intended to provide the greatest overall benefit to the nation by incorporating all relevant factors. The IOY is composed of an initial DAH and initial TALFF. The RD shall determine the IOY and any adjustments by the same procedures and factors set out above for Loligo, except that it shall provide for a minimum bycatch of Illex squid that would be harvested incidentally in other directed fisheries. This bycatch level shall be 10% of the allocated portion of the Loligo TALFF and 1% of

the allocated portions of the mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs.

Atlantic Mackerel

During 1981, the Council's Scientific and Statistical Committee (SSC) reviewed the Northeast Fisheries Center (NEFC) 1981 mackerel stock assessment and concluded that the natural mortality rate of 0.30 was too high. The 0.30 rate had been developed and used since the mackerel fishery was managed under the International Commission for Northwest Atlantic Fisheries (ICNAF). As a result of discussion between the SSC and the NEFC, it was agreed to review the mackerel natural mortality rate as part of the 1982 mackerel stock assessment.

Revised estimates of M were calculated by E. Anderson, NEFC, from linear regressions between estimates of instantaneous total mortality (Z) derived from numbers-at-age catch data, and fishing effort. The five estimates obtained ranged from 0.145 to 0.222 (average = 0.195). Further refinement of the estimates may prove to be necessary. However, since the results obtained for M averaged 0.195, a value of 0.20 has been used for the most recent Atlantic mackerel assessment in the Amendment.

As a consequence of using an M of 0.20 instead of 0.30 in the 1982 assessment, the present estimate of stock biomass is proportionately smaller. Comparisons have indicated that, on average, biomass estimates are about 40% less using an M of 0.20.

Proposed regulations implementing Amendment #3 for mackerel in US waters have incorporated a 600,000 mt minimum spawning stock biomass constraint and a ceiling of fishing mortality equivalent to F0.1 = 0.40. At the time the regulations were developed, the mackerel assessment was based on a natural mortality rate of 0.30. With the change to an M value of 0.20 the 600,000 mt spawning stock biomass constraint is not consistent with the results of the recent assessment. The consequence of this change is to reduce the estimates of total and spawning stock biomass by about 40%. Applying this percentage reduction to the stock biomass constraint of 600,000 mt results in an equivalent amount of 360,000 mt.

Based upon this information, the Council, at their January 1983 meeting voted to accept the reduced M and to accept a minimum spawning stock size of 400,000 mt as equivalent to the 600,000 mt level previously determined using an M of 0.30. The Council reasoned that a lower natural mortality rate meant that a smaller proportion of mackerel would be lost because of natural causes; therefore, a larger proportion can be harvested without changing total mortality.

The annual OY, DAH, and TALFF for Atlantic mackerel would be set using a series of procedures that depend on the predicted spawning stock size. The availability of mackerel in the US recreational fishery would be the amount predicted by the equation $Y = (0.01)(X) + (180.0)$ where Y is the predicted recreational catch and X is the mackerel spawning stock size in the upcoming fishing year in metric tons (see Section VIII).

If the spawning stock size would be less than or equal to 400,000 mt after the US and Canadian estimated harvests were taken, the mackerel TALFF could be no greater than 2% of the allocated portion of the silver hake TALFF plus 1% of the allocated portions of the red hake, Illex, and Loligo TALFFs. The US harvest could range up to 30,000 mt, minus the TALFF. OY would equal the sum of the DAH and TALFF.

If the spawning stock size would be larger than 400,000 mt after the US and Canadian estimated harvests were taken, the OY would equal that amount which, when taken in addition to the estimated Canadian catch, would result in a spawning stock size of 400,000 mt the following year, but the total mackerel catch (all waters, all nations) could not result in a fishing mortality rate greater than F0.1. The TALFF would equal the difference between OY and estimated US catch (which could be no less than 30,000 mt), but could not be less than 2% of the allocated portion of the silver hake TALFF plus 1% of the allocated portions of the red hake, Illex, and Loligo TALFFs. If the TALFF were greater than 10,000 mt, one-half would be allocated to the initial TALFF and one-half would be placed in a Reserve.

If such a Reserve were created, during October of each year, the RD would project the total amount of mackerel that would be harvested by US fishermen during the entire fishing year. If that amount exceeded the initial US harvest estimate, the RD would leave the excess in the Reserve to allow the US fishery to continue without closure throughout the year. That part of the Reserve not needed to meet the projected US harvest could be allocated to TALFF.

Environmental Impacts

The environmental impacts of the management regimes instituted in the original FMPs were described in the Environmental Impact Statements accompanying the FMPs, and in the Supplemental Environmental Impact Statements or Environmental Assessments accompanying the Amendments, including Amendment #3. The Environmental Impact Statements for the original FMPs were filed with the Environmental Protection Agency and notice of availability published as follows: Mackerel Plan, 2 January 1979; Squid Plan, 22 January 1979; Butterfish Plan, December 26, 1979.

The OY adjustment mechanism for squid maintains the MSY as described in the original plans; this management measure will not alter impacts described in the original squid plans. The Atlantic mackerel revision of M from 0.3 to 0.2 refines the estimate of MSY from the original mackerel plans. However, this revision does not reflect a resource change of any nature, only a mathematical refinement which will not alter impacts described in the original plans. the harvest levels of both squids, Illex and Loligo, and Atlantic mackerel proposed in the recommended alternatives are compatible with the latest stock assessments produced by the NEFC.

The abundance and the availability of the squids and of mackerel have fluctuated widely from year to year. Both abundance and availability (singly and in combination) are conditioned by environmental factors for these species, the most important of which seems to be water temperature. Until recently, domestic vessels engaged in the fisheries were of typical short-range inshore design. If the species were not abundant and available within the range of the vessels, no special arrangement, such as change of port, were made to capture them. The investors and fishermen did not expect that either the squids or mackerel would be concentrated, and consequently fishable, within their range in any one given year. Neither fishery could be depended upon as a source of income either to a household or an institution. Income derived from the fishery was sparse and variable.

Larger vessels (foreign and domestic) enter the fishery recognizing the variability in availability and abundance. They do so after having determined that the risk of locating catchable concentrations is lessened by their longer range (foreign vessels often plan to fish on a world-wide basis) and more sophisticated fish locating equipment. The more important human factor in this instance is the recognition of risk at the outset, both by the supplier/investor and the processor/marketer.

The Council recognizes that the problem exists and that the catch in any year, irrespective of the initial annual OY, could be near zero (consideration is given in the Amendment for the allocation of a sufficient amount of all species to prosecute a foreign fishery on other related stocks). The probability of this actually happening is low. The effect of the Amendment on the human environment, once the special conditions of the fishery are taken into account, is nothing other than the recognition that the condition may occur and recognizing that the condition is the result of environmental factors and not the result of the management measures in this Amendment.

REGULATORY IMPACT REVIEW

FOR AMENDMENT #1 TO THE FISHERY MANAGEMENT PLAN

FOR THE

ATLANTIC MACKEREL, SQUID, AND BUTTERFISH FISHERIES

August 1983

Mid-Atlantic Fishery Management Council

in cooperation with the

National Marine Fisheries Service

I. Introduction

This Regulatory Impact Review (RIR) has been prepared for Amendment #1 (Amendment) to the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (Plan) in compliance with Executive Order (E.O.) 12291. It evaluates impacts of the Amendment as well as the alternatives considered and rejected relative to the provisions of the Plan in effect. It also evaluates impacts relative to the Paperwork Reduction Act (PRA) and Regulatory Flexibility Act (RFA).

II. Identification of problems addressed by the Amendment

This Amendment is intended to address two problems: the need for additional administrative flexibility in the squid regime and a change in the Atlantic mackerel natural mortality rate.

1. Need for increased administrative flexibility in the squid regime.

This problem relates directly to the attainment of Objective 2. In the original Butterfish Plan, the Mid-Atlantic Fishery Management Council (Council) and, by approval of the Plan, the Commerce Department, established the principle of using the specification of Optimum Yield (OY) as a tool to help in the development of the US commercial fishery. The principle was based on the concept that foreign nations will not purchase fish from US harvesters or processors if they are allowed to harvest them directly. It has always been recognized that a lower Total Allowable Level of Foreign Fishing (TALFF) will not automatically develop export markets for US caught fish. However, without the lower TALFFs, it is felt that there is essentially no chance for the export markets to develop.

This concept was introduced into the squid regime with the Plan. However, the Plan continued the Reserves for the squids, so that any difference between OY and Domestic Annual Harvest (DAH) is divided initially $\frac{1}{2}$ to TALFF and $\frac{1}{2}$ to Reserve. The problem is that the automatic division of the difference into TALFF and Reserve and the time limit on reallocation of Reserves can create problems because it is not flexible enough. With the Plan, the squid OY and estimates of DAH are set annually (Section IV.C) and may be increased during the year, so those values are flexible in that they may be adjusted during the year to reflect the dynamic character of the fishery. The TALFF and Reserve provisions do not have this flexibility and, thus, present an impediment to the efficient operation of development efforts. The strategy of the Magnuson Fishery Conservation and Management Act (Act) and this Plan is to develop the US fishery while recognizing that a significant part of such development, particularly in the short run, involves arrangements with foreign nations to purchase US harvested and processed fish, with incentives to the foreign nations provided by preferential allocations from TALFF. To do this effectively requires the ability to adjust TALFF along with the ability to adjust OY and DAH during a year.

2. Change in the Atlantic mackerel natural mortality rate.

Atlantic mackerel management under the International Commission for the Northwest Atlantic Fisheries (ICNAF) and subsequently under the Act was based on a natural mortality rate of 0.3. Recent analyses by the Northeast Fisheries Center (NEFC) resulted in a revision of that value to 0.2. The mackerel regime in the Plan is keyed directly to mackerel spawning stock size estimates. The spawning stock size estimates change as a result of the change to the natural mortality rate. It is, therefore, necessary to change the specifications of the mackerel regime to be consistent with the changed mackerel natural mortality rate.

The solution of this problem does not involve changing the policy that the mackerel regime is based on. It requires changing the regime so the policy is carried out based on the best available scientific information.

III. Plan objectives

The objectives of this Plan are:

1. Prevent the exploitation of these resources from exceeding those levels which reduce the pro-

bability 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 Plan.

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.

IV. Provisions of the Amendment.

The Amendment changes the squid management regime to allow the Northeast Regional Director (RD), in consultation with the Council, to initially specify and adjust OY and its component parts throughout the year on the basis of specified guidance. The mackerel regime is changed to reflect the changed mackerel natural mortality rate (from 0.3 to 0.2).

Loligo

The maximum OY for Loligo is 44,000 mt. The RD in consultation with the Council, shall determine annual specifications relating to Initial Optimum Yield (IOY), Domestic Annual Harvest (DAH), Domestic Annual Processing (DAP), Joint Venture Processing (JVP), and Total Allowable Level of Foreign Fishing (TALFF). The RD shall review yearly the most recent biological data pertaining to the stock. If the RD determines that the stock cannot support a level of harvest equal to the maximum OY, he shall establish a lower Allowable Biological Catch (ABC) for the fishing year. This level represents essentially the modification of the maximum sustainable yield (MSY) to reflect changed biological circumstances. If the stock is able to support a harvest level equivalent to the maximum OY, the ABC shall be set at that level.

From the ABC, the RD, in consultation with the Council, shall determine the IOY for the fishing year. The IOY represents a modification of ABC, based on economic factors. It is intended to provide the greatest overall benefit to the nation by incorporating all relevant factors. The IOY is composed of an initial DAH and initial TALFF. The RD will project the DAH by reviewing the data concerning past domestic landings, projected amounts of Loligo necessary for domestic processing and for joint ventures during the fishing year, and other data pertinent for such a projection. The Joint Venture Processing (JVP) component of DAH shall be the portion of DAH which domestic processors either cannot or will not use. In assessing the level of IOY, the RD shall provide for a TALFF of at least a minimum bycatch of Loligo squid that would be harvested incidentally in other directed fisheries. This bycatch level shall be 1% of the allocated portion of the Illex, mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs (MAFMC, 1982b). In addition, this specification of IOY shall be based on the application of the following factors:

1. total world export potential by squid-producing countries;

2. total world import demand by squid-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.

Proposed annual specifications of the ABC and IOY and its component amounts shall be published in the Federal Register and provide for a public comment period. At the close of the public comment period, a notice of final annual specifications with the reasons, therefore, shall be published in the Federal Register.

Any subsequent adjustments to the IOY shall be published in the Federal Register and may provide for a public comment period.

The IOY may be adjusted by the RD, in consultation with the Council, upward to the ABC at any time during the fishing year. An adjustment may be made to IOY to accommodate DAH needs, including when the the application of the above factors warrants an adjustment in TALFF. However, TALFF may not be adjusted to a quantity less than that already allocated to and accepted by foreign nations or less than that needed for bycatch.

Illex

The maximum OY for Illex is 30,000 mt. The RD, in consultation with the Council, shall determine annual specifications relating to IOY, DAH, DAP, JVP, and TALFF. The RD shall review yearly the most recent biological data pertaining to the stock. If the RD determines that the stock cannot support a level of harvest equal to the maximum OY, he shall establish a lower ABC for the fishing year. If the stock is able to support a harvest level equivalent to the maximum OY, the ABC shall be set at that level.

From the ABC, the RD, in consultation with the Council, shall determine the IOY for the fishing year. The IOY represents a modification of ABC, based on economic factors. It is intended to provide the greatest overall benefit to the nation by incorporating all relevant factors. The IOY is composed of an initial DAH and initial TALFF. The RD shall determine the IOY and any adjustments by the same procedures and factors set out above for Loligo, except that it shall provide for a minimum bycatch of Illex squid that would be harvested incidentally in other directed fisheries. This bycatch level shall be 10% of the allocated portion of the Loligo TALFF and 1% of the allocated portions of the mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs (MAFMC, 1982b).

Atlantic Mackerel

The specification of mackerel OY, DAH, DAP, and TALFF is:

C = estimated mackerel catch in Canadian waters for the upcoming fishing year.
US = estimated US mackerel catch for the upcoming fishing year.
S = mackerel spawning stock size in the year after the upcoming fishing year.
Bycatch = 2% of allocated portion of the silver hake TALFF and 1% of the allocated portions of the Loligo, Illex, and red hake TALFFs.
AC = acceptable catch in US waters for the upcoming fishing year.
T = total catch in all waters (US and Canadian) for the upcoming fishing year.

If S is less than or equal to 400,000 mt; use Case 1. If S is greater than 400,000 mt; use Case 2.

Case 1: OY is less than or equal to 30,000 mt.
AC is less than or equal to 30,000 mt.
DAH is less than or equal to 30,000 mt - Bycatch.
DAP is less than or equal to 30,000 mt - Bycatch.

TALFF = Bycatch.

Case 2: OY is less than or equal to AC
AC = T - C such that S is not less than or equal to 400,000 mt and that the fishing mortality associated with T does not exceed F0.1.
DAH is between 30,000 mt and AC - Bycatch.
DAP is between 30,000 mt and AC - Bycatch.
TALFF is AC - DAH, but may be no less than Bycatch. If AC - DAH is equal to or greater than 10,000 mt, $\frac{1}{2}$ is initially allocated to TALFF and $\frac{1}{2}$ to Reserve.

The 30,000 mt minimum DAH and DAP in Case 2 may only be reduced to the extent necessary to assure that AC is not exceeded and the foreign fishery receives the bycatch requirements. OY and TALFF must be adjusted to account for the minimum US allocation. It must be recognized that while such an adjustment at the beginning of a fishing year may result in an initial OY less than that which is biologically acceptable (i.e., less than AC), if US landings during the year, including amounts authorized for joint ventures, increase above the initial estimates, DAH and OY may be increased by similar amounts up to the point where OY = AC. TALFF would not change from its value at the beginning of a year as a result of these adjustments to DAH and OY.

Butterfish

Butterfish MSY is 16,000 mt. OY is specified as whatever quantity of butterfish US fishermen harvest annually plus a bycatch TALFF equal to 6% of the allocated portion of the Loligo TALFF and 1% of the allocated portions of the Illex, Atlantic mackerel, silver hake, and red hake TALFFs, up to 16,000 mt. DAH would equal whatever quantity of butterfish US fishermen harvest, not to exceed 16,000 mt minus the TALFF. The Act provides that OY may differ from MSY for economic reasons. In this case, the reason for the difference is the development of the US fishery for export. The concept is simply that if foreign nations are not permitted to directly harvest butterfish, there will be a greater incentive to purchase the fish from US harvesters and processors. It is recognized that butterfish are a bycatch in other foreign fisheries and it is necessary, therefore, to provide a TALFF in keeping with those bycatch requirements. This specification is unchanged from the Plan.

The precise specification of OY is:

OY is less than or equal to 16,000 mt.
DAH is less than or equal to 16,000 mt - bycatch.
DAP is less than or equal to 16,000 mt - bycatch.
TALFF = bycatch = 6% of the allocated portion of the Loligo TALFF and 1% of the allocated portions of the Illex, mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs.

V. The Regulatory Impact Review

A regulatory impact review, as required by E.O. 12291. requires two kinds of analysis: (1) an impact review, and (2) a cost-benefit analysis that states whether or not the benefits of the proposed regulations outweigh their costs. Specifically, E.O. 12291 states that a proposed regulation is a "major" rule if it is likely to result in:

1. An annual effect on the economy of $100 million or more;

2. A major increase in costs or prices for consumers, individual industries, Federal, State, or local government agencies, or geographic regions; or

3. Significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets.

If a rule is determined to be "major" then the Regulatory Impact Analysis needs to address the following:

1. A description of the potential benefits of the rule, including any beneficial effects that cannot be quantified in monetary terms, and the identification of those likely to receive the benefits;

2. A description of the potential costs of the rule, including any adverse effects that cannot be quantified in monetary terms, and the identification of those likely to bear the costs;

3. A determination of the potential net benefits of the rule, including an evaluation of effects that cannot be quantified in monetary terms;

4. A description of alternative approaches that could substantially achieve the same regulatory goal at lower costs, together with an analysis of this potential benefit and costs and a brief explanation of the legal reasons why such alternatives, if proposed, could not be adopted; and

5. Unless covered by the description required under paragraph (4) of this subsection, an explanation of any legal reasons why the rule cannot be based on the requirements set forth in Section 2 of the Executive Order.

The Regulatory Impact Review is to assure that:

1. Administrative decisions shall be based on adequate information concerning the need for and consequences of proposed government action;

2. Regulatory action shall not be undertaken unless the potential benefits to society for the regulation outweigh the potential costs to society;

3. Regulatory objectives shall be chosen to maximize the net benefits to society;

4. Among alternative approaches to any given regulatory objective, the alternative involving the least net cost to society shall be chosen; and

5. Agencies shall set regulatory priorities with the aim of maximizing the aggregate net benefits to society, taking into account the condition of the particular industries affected by regulations, the condition of the national economy, and other regulatory actions contemplated for the future.

An impact analysis differs from a cost-benefit analysis in several ways. In an impact analysis, a proposed regulation is analyzed through its potential for changes to the current levels of employment and spending of the various impacted user groups (processors, fishermen, ship chandlers, etc.). A cost-benefit analysis is an attempt to determine whether society (the economy) is made better off if a proposed regulation is adopted. That is, to assure that the proposed regulation will lead to a net increase in the value of goods and services produced by the economy (Anderson and Settle, 1977). The methodological approach at the heart of a cost-benefit analysis is to determine what society will be foregoing if the proposed regulation is adopted. What goods and services would have been produced by available resources (land, labor, capital, etc.) if the proposed regulations divert these resources from their current uses? Once this question is answered, the analyst has determined the "cost" of the regulation which is then compared to the benefits or the goods and services produced by the regulation.

One striking difference between an impact analysis and a cost-benefit analysis is their differing treatment of unemployed resources. Under an impact analysis, the cost of labor used is equal to the prevailing wage rate multiplied by the labor employed. A cost-benefit analysis, in asking the question of what is society foregoing, will use the wage rate if the proposed regulation diverts previously employed labor to other positions. When resources such as labor are fully employed, their hiring price reflects their contribution to the value of goods and services produced in the economy. If the labor (resource) used was previously unemployed (under a cost-benefit analysis) their cost is essentially zero, for by employing idle labor (resources) society is not giving up any goods and services that are currently being produced. (The net return or benefit of society in this case is the increased goods and services that are produced through the employment of the idle labor.) In sum, under an impact analysis, consideration is given to the total economic effects of the

regulation upon government, businessmen, consumers, etc., while a cost-benefit analysis weighs these effects in total to determine whether society as a whole profits from implementation of the regulation.

The analysis below primarily addresses the impacts of the changes to the squid management regime. The regime is changed in three ways. First, an ABC is established to permit the reduction of the maximum allowed catch in any year to account for biological or ecological considerations. Second, the Reserves are replaced with a mechanism that allows OY to be set at the beginning of a fishing year based on a set of factors and to be adjusted during the year as necessary to achieve the Plan's objectives, except that TALFF already allocated to and accepted by foreign nations cannot be taken away. Third, foreign nations are guaranteed a squid TALFF large enough to provide a minimum squid bycatch in other foreign fisheries.

This Amendment also modifies the mackerel regime to account for a revised estimate of the mackerel natural mortality rate. However, the basic regime is continued unchanged.

The analysis replicates much of the analysis in the final RIR prepared for the Plan since the revisions to the squid regime will have similar, if not identical, impacts as analyzed in the previous RIR. The replicated analysis is also provided to aid the public in understanding and commenting appropriately on the Amendment revisions.

In the development spectrum, the squid fishery lies between butterfish and mackerel. At one end is the butterfish fishery which is well on its way to being fully developed by the US fishing industry. On the other end of this spectrum, the mackerel fishery has not yet showed significant signs of development but has strong potential given the strong foreign fishing pressure in the past and the probabilities of declining European stocks. In the middle of this spectrum are the US fisheries for Illex and Loligo squid with the possibility that the entire Illex OY will be taken by US fishermen in the upcoming years, primarily by joint ventures, and, Loligo, as will be shown below, has strong potential for future development. With butterfish and mackerel at opposite ends of the spectrum, the analysis of the squid management regime should show the kinds of impacts, costs, and benefits of developing the mackerel fishery while indicating the kinds of benefits, costs, and impacts that may have already occurred in the butterfish fishery. (Since butterfish can only be caught as bycatch by foreign vessels, who are primarily seeking squids, many of the impacts of varying the butterfish OY are indirectly assessed in the analysis of the squid management regime.)

Recent Trends in the US Illex and Loligo Fisheries

This section reviews the recent trends in the Loligo and Illex fisheries to set the stage for the impact and benefit-cost analysis below and to illustrate the kinds of availabele data that will be needed to analyze the ABC, IOY, DAH, and TALFF levels through the specified guidance established in the Amendment.

US Landings

Loligo landings, including joint ventures, in 1982 reached a peak of 4,864 mt (Table 1). In only one other year during the period 1963-82 (1979) have Loligo landings reached the 4,000 mt level. US landings averaged approximately 1,000 mt from 1963 thru 1975. From 1976 thru 1982 annual landings averaged 3,058 mt, a 200% increase over the 1963-75 average.

Illex landings, including joint ventures, also reached a new peak in 1982 of at least 5,772 mt. The previous peak of 1,780 mt occurred in 1979. From 1976 thru 1982 annual landings averaged 1,453 mt, as compared to a 1963-75 annual average of 472 mt.

Total squid landings in 1982 were at least 10,636 mt. This is 76% higher than the previous peak of 6,032 mt in 1979. From 1976 thru 1982, total squid landings averaged 4,511 mt per year, while for the period 1963-75, total squid landings averaged 1,467 mt annually.

US Prices

For Loligo and Illex, separate prices were not published consistently until 1978 (Tables 2 and 3). In nominal terms, 1982 Loligo prices are equivalent to 1978 ex-vessel prices, but when adjusted for inflation, 1982 Loligo prices are the lowest prices shown. In 1980 the deflated ex-vessel price was $.14/lb. while landings were approximately 4,000 mt. This price decline relative to the surrounding years could possibly be explained by the recession of 1980, causing a decrease in the overall US demand for Loligo, and by the decline in world demand for squid because of the glut caused by record 1979 world landings. The 1982 price decline could have been caused by recessionary forces but may also have been the result of the Loligo joint ventures, for their presence is the only significant difference between the fishery in 1982 and 1979. Joint venture landings may have replaced the export demand that occurred in 1979. A simpler reason may be that 1982 abundance levels were higher. Illex prices exhibit a pattern of a wide variation in total landings with little change in ex-vessel price. The peak price of $.20/lb. for Illex in 1979 has no rational explanation except that for some reason demand increased since 1979 landings are significantly higher than 1978 landings.

Total Revenues

With little change in ex-vessel prices, the primary reason for changes in ex-vessel revenues is due to the mixture of species landed. Total revenues reached a nominal peak of at least $5.7 million in 1982 due to the growth in Illex landings but in deflated dollars total revenue approximated 1979 revenues largely because of the fall in Loligo prices.

US Exports

US exports of squid product have grown dramatically since 1975. NMFS has been recording squid exports since 1978. (Export estimates are based on shipments from East Coast ports so that the chance of including California squid in the estimates is minimized.) For the years 1978-80 squid exports were mainly canned products and were shipped to a few countries (Tables 4 and 5). In 1981, frozen squid exports were approximately 500 mt at $1 million FOB. In 1982 frozen squid increased to 2,584 mt and $4.1 million FOB. In 1981, US product was exported to 14 different countries, while in 1982 to 15 countries, four of which did not receive exports in 1981. Exports to traditional foreign harvesters of squid (Italy, Portugal, Spain, and Japan) increased in 1982 to 1,073 mt, from 293 mt in 1981, a 266% increase.

Joint Ventures

There has been an increasing trend toward joint venture arrangements in the harvest of fish. A joint venture is a contract by a foreign firm to buy fish at sea that is harvested by US fishermen. This usually requires a foreign processing vessel, but the processing vessel may also harvest fish, or be supplied in conjunction with US vessels by foreign vessels. Sometimes the processing vessel will be served by a refrigerated transport vessel where the processed frozen product is transferred and sent to markets.

For 1981-82, 1982-83, and 1983-84, the number of countries, the number of US companies, the number of species, and the amount of squid applied for has increased (Table 6). The actual joint venture catch for 1981-82 was 323 mt of Loligo, while the 1982-83 catch was 2,338 mt of Illex and 1,094 mt of Loligo.

Joint ventures have been very beneficial to US fishermen and processors (many US processors who export the same species are involved in coordinating US joint venture vessels). One fishermen involved in two different squid joint ventures estimated that his vessels earned an average $250,000 more in gross revenues through the joint venture than if they had fished normally for groundfish (John Holt, pers. comm.). Joint ventures have supplied a new market for underutilized fish and new alternatives for US fishermen who would otherwise, because of the season, either not be fishing or be fishing for other species (e.g., yellowtail flounder, summer flounder, sea trout, cod, and haddock) which are already heavily exploited or overfished. While frequently being paid a little less than the shoreside ex-vessel price, fishermen benefit from joint ventures in three ways. First,

they can stay at sea and fish for several days rather than daily steaming to port, thus they catch more fish and use less fuel. Secondly, fishermen not participating in the joint venture find an increased demand for either their harvest of the joint venture species or other species that would normally have been supplied by the joint venture vessels. Finally, in periods of domestic market glut, these vessels can then attempt to sell their excess through the joint venture. In short, joint ventures strengthen the export market by giving fishermen another source of demand for product and fishermen catch more fish while receiving better prices for their efforts.

Besides the increase in the number of countries, the number of US processors, and requests for squid, the joint ventures for 1983-84 differ from their predecessors. One important difference is related to direct exports by US processors. In the Lund-Portugal joint venture, 70% of the Illex will be marketed under the US processor's name. In both the Scan Ocean-Portugal and Scan Ocean-USSR applications, the foreign company has agreed to buy an additional one million lbs. and four million lbs., respectively, of whole round product from the US processor while the entire joint venture catch will be marketed under the name of the US partner to the venture. Finally, within the International Seafood Trading Corporation-Italy joint venture, a long term plan is presented that involves: (1) marketing the catch under the US partner's name in traditional Italian markets; (2) intent to develop a domestic market in the US through the adoption of Italian technology for improved product quality; (3) by the second or third year expanding beyond the traditional Italian markets to world markets; and (4) investment in new plant capacity. The foreign company involved, besides requesting the joint venture allocations, requested equal amounts of direct allocations (7,000 mt Illex, 6,000 mt Loligo). This joint venture highlights the trend in squid joint ventures by including technology transfer and market development for the US partner. It also, by its request for TALFF, symbolizes the trend where foreign countries recognize that the total TALFF is decreasing; to maintain their share of the resource they must be willing to invest in US companies in exchange for direct allocations.

US Consumption

Time series data on US retail consumption of east coast squid are unavailable. However, Fulton Fish Market landings and prices are available. This New York market received approximately 33% of the 1982 non-joint venture domestic catch of Loligo. (It is assumed that almost all of the squid received by this market is Loligo.) Since 1978, squid receipts have increased from approximately 1.6 million lbs. to 2.5 million lbs. in 1982 (Table 7). Correspondingly, wholesale prices have varied with the landings but in current and deflated dollars, 1982 prices were below 1978 prices.

Foreign Catch

The total foreign catch of Loligo, Illex, Atlantic mackerel and butterfish for 1982-83 was 12,734 mt, 12,940 mt, 1,192 mt, and 803 mt, respectively (preliminary estimates provided by Northeast Region, NMFS). Only the butterfish catch exceeds the previous fishing year but if one considers the 1982-83 joint venture catch of 1,094 mt of Loligo and 2,338 mt of Illex, then foreign countries collectively have received catches of Loligo and Illex greater than their previous years catches, when only 323 mt of Loligo was provided through joint ventures (Table 8). As of 5 February, Italy and Japan had already caught more than their 1981-82 Loligo catch even though they were involved in joint ventures. In 1981-82, for the months of February and March, these two countries caught, respectively, 25% and 31% of their total catch. For Spain, Loligo landings must have decreased since total Loligo catch has declined. Since very little Illex is caught in February and March, the only country showing an increase in Illex landings is Italy whose landings are almost double the previous years.

World Market for Squids, 1976-1982

This section reviews the world market for squid. The basic conclusion is that the potential for US exports and joint ventures is strong. While the analysis addresses export potential, the same conclusions hold for joint ventures, which are seen as a first step toward expanding exports. In particular, the Japanese market is described since it is the largest in the world. The Spanish market is described for it shows how US exports are inhibited by trade restrictions. Illex landings from Canadian and South American waters are also described for they are direct substitutes for US

Illex. An analysis of squid processed in Europe is provided to illustrate the price competitiveness of US caught Loligo and Illex in the world market. New Zealand joint ventures are discussed because New Zealand fisheries are undergoing a transformation similar to the US east coast squid fisheries. Finally, the impacts of international policies, exchange rates, sales of foreign caught US squid to third party countries, and trade barriers such as tariffs and import quotas are briefly discussed as additional constraints to US exports and joint ventures.

World

Along with the increase in the total world catch of fish, crustaceans, and mollusks, total squid catch and total world trade in squid products have correspondingly increased. Total squid landings increased from 827,000 mt in 1976 to 1,119,000 mt in 1980 (Figure 1). This rapid growth is from the increased number of and landings by countries that are harvesting squid primarily for export purposes. In 1975 there were 22 countries that reported at least 1,000 mt of squid for any of the species and in 1980 there were 28 countries (Table 9). In both 1975 and 1980, the top five harvesting countries were Japan, Korea, Spain, the USSR, and China. These countries landed approximately 680,000 mt in 1975 (85% of the catch) while in 1980 these same countries landed 883,000 mt (79% of the catch). The remaining countries landed 123,000 mt in 1975 and 236,000 mt in 1980, an increase by 1980 of almost 100% over 1975. (These same countries had peak landings of 430,000 mt for 39% of total world landings in 1979, primarily from the high catches of Illex by Canada and Argentina.)

While Food and Agricultural Organization (FAO) data for 1981 and 1982 are unavailable, world catch probably declined in 1981 and increased in 1982. Japanese landings of squid and cuttlefish and Japanese squid imports both declined 25% in 1981, while squid inventories at year end were down 50% from what they were 12 months earlier. Japanese imports decreased to 71,000 mt in 1981 from 94,000 mt in 1980 and 156,000 mt in 1979. European imports were also down in 1981. From January to September 1981 imports into Spain, Italy, and France were 28,000 mt, a 50% decline from the previous year import total of 56,000 mt (OECD, 1982a). During this period the catch of Illex from Canadian waters declined to 30,000 mt from 70,000 mt in 1980 (NAFO, 1981 and 1982) and landings in Argentina declined drastically from existing national social, political, and economic problems that severely impacted Argentina's fishing industry (Juanico, 1982).

Based on the reported landings by Canadian, French, Japanese, and US fishermen for 1980 and 1981 (OECD, 1982c) and the proportion of these landings relative to total world catch in 1980 (these countries caught approximately 66% of the world catch in 1980), world landings in 1981 are predicted to be 842,000 mt (Figure 1).

Preliminary 1982 data show the following:

1. Japanese landings from coastal waters of common squid (Toradoes pacificos) for the months January to October are up 12% from the previous year (Japan, 1982). Annual coastal landings of squid were 138,200 mt in 1981 and 212,000 mt in 1980; 19% of the total 1980 world catch (Japan, 1982) (see Figure 2).

2. Japanese imports of squid and cuttlefish as of October 1982 were 17% higher than total 1981 reported imports of squid and cuttlefish (Japan, 1982).

3. Landings of Illex from Canadian waters have declined further. As of October-November 1982, landings by Canadian, Japanese, Soviet, Polish, Cuban, and EEC fishermen were 12,000 mt, a decline of 50% from the previous year (NAFO, Monthly Statistics 1981, 1982).

4. Estimates of the total squid catch from Argentinean waters, sea and land frozen, will amount to 30,000 - 40,000 mt for 1982. These catch figures are less than the 1981 catch because of the Falkland Islands issue (European Weekly Frozen Fish Report, 26 April 1982).

5. Landings of squid from New Zealand waters continue to increase (European Weekly Frozen Fish Report, 26 April 1982).

6. Combined US Illex and Loligo landings, foreign and domestic, have increased 8,000 mt from approximately 31,000 mt in 1981 to at least 39,000 mt in 1982 (Table 1).

The Japanese, through imports and landings, dominate the world market. In 1978, the Japanese consumed 546,000 mt of squid (Anders et al., 1982); equal to about 58% of the total 1978 world catch. The increase in Japanese coastal landings and imports along with the increased landings from US and New Zealand waters, should outweigh the decline in catch from Canadian and Argentinean waters, such that, if the other geographic areas of harvest show no decline in 1982, total world catch should be higher in 1982 relative to 1981, but probably not as high as 1980.

Japan

The total demand for squid by the Japanese is well over 500,000 mt per year (Court, 1982). The demand for squid is increasing. Imports as well as Japanese ex-vessel and wholesale prices (fresh and frozen) are increasing even though Japanese landings from coastal waters, the major area of harvest, are up 12% from 1981 levels. As of October 1982, Japanese imports of squid and cuttlefish were 17% higher than total 1981 imports (Japan, 1982), which are approximately 60-70% squid (Table 10). While 1982 imports will not reach the 1979 level of 156,000 mt, they are much higher than the 1970-76 average of 35,000 mt. Since 1967, imports have been steadily increasing except for the period 1980-82 (Tables 11 and 12). During this period, imports from Canada and Argentina increased dramatically and subsequently declined, presumably due to declining Illex abundance in Canadian waters, the strike by Canadian fishermen in 1980, and the economic instability in Argentina. Imports also declined because of high Japanese inventories, low import quotas, and because the Spanish supply was constricted by the Spanish-Morrocan dispute over fishing rights in the Morrocan EEZ (Court, 1982).

Not only have imports increased to Japan, but ex-vessel and wholesale prices (fresh and frozen) are at all time highs (Figure 2). When adjusted for inflation, wholesale prices of fresh squid show a three year upward trend that may by the end of 1982, approach the 1979 peak price.

The relationship between consumer and ex-vessel prices of domestically caught squid has followed a similar pattern to that of fish in general, where there is a growing wedge between the two price levels. From 1968 - 1980 Japanese consumer fish prices have increased 450% while ex-vessel fish prices have increased by only 260% (Court, 1982). This wedge between prices indicates that there is room in the market place for increased US exports to Japan. The size of this wedge, however, is strongly regulated. The Japanese change squid import quotas as Japan's total landings change. Japanese landings are forecasted twice yearly and these forecasts are used to determine the amount of quota which is set by the Japanese government with consultation of industry. In 1978 the government set quotas to obtain a shortage of 40,000 mt. This policy, while protecting Japanese fishermen, led to high domestic prices and a corresponding decrease in consumption (Court, 1980). Therefore, the size of the quota is a key policy tool to control the Japanese market. These quotas have varied from zero (July 1980 to December 1980) to a peak of 40,000 mt (July 1979 to December 1979). The last known quota is 18,000 mt (December 1980 to June 1981). Once the quota has been determined it is divided between approximately 210 trading companies and processor cooperatives with a 'set aside' for fishery development. (In 1979 approximately 70% went to processors, 25% to trading companies, and 5% for fishery development (Court, 1980).) The quota is also simultaneously subdivided into nine catagories: live squid, fresh squid, frozen squid, chilled squid, salted squid, brine soaked squid, dried squid, smoked squid, and prepared or preserved squid. The imports of smoked and prepared or preserved squid are not regulated by the import quotas. In order to export to Japan a US firm has to locate a Japanese company or importer who either owns a quota or can lease a quota. This usually carries a 2-6% commission charge. This charge is above an import tarriff (8.8% in 1980). Court (1982) summarizes the extent of Japanese protectionism:

> "However, the Japanese will make every attempt to minimize exports into Japan. Although a large portion of Japan's 'domestic' squid landings is caught in the waters of Canada, New Zealand, United States, Argentina and other nations, Japanese industry sources who wish to remain anonymous can foresee no reasonable likelihood that the quota system will be abolished or even substantially altered within the near future. It is standard Japanese practice to make every effort to maintain their position in an industry of those already established, and because

the squid fishing industry employs many fishermen and resources and is in very severe financial condition, rather than do anything which could further aggravate this situation, the Japanese government is apt to seek ways to ameliorate the plight of its beleaguered squid fishermen."

While demand is rising, the percentage of total supply that comes from Japanese coastal and distant water fleets will probably decline in the coming years. Larger vessels have been regulated out of the coastal areas in favor of smaller vessels because there has been declining resource and overcapitalization problems in the T. pacificus stocks (Court, 1980). These problems probably still exist, for the Japanese fleet has increased from 277 thousand total vessels with 250 thousand vessels under five mt in 1971 to 401 thousand total vessels with 365 thousand vessels under five mt in 1980 (Taguchi, 1983). The coastal stocks also migrate through the offshore waters of South Korea, North Korea, and the Soviet Union, nations that are politically diverse and quite reliant on fish as a food source, making unified management of the T. pacificus difficult (Court, 1980).

In 1979, the Japanese harvested squid in the extended economic zones of New Zealand, Australia, Canada, and the US (Table 13). They currently have agreements where they are allocated rights to fish in the Soviet and Korean EEZs. For the years 1978-82, Japan, in exchange for granting the USSR fishing rights in her EEZ, is entitled to 143,000 mt of squid annually from the Soviet EEZ. While the allocation has remained constant, fishing fees are increasing (OECD, 1982). In 1979, at least 26% of the Japanese catch came from non-Japanese waters. While landings from Soviet waters are not listed in Table 13, if the 1979 Soviet EEZ catch by Japan equals the 1976 catch of 111,000 mt, the Japanese catch from non-Japanese waters including joint ventures would equal 55%. In 1980 the Japanese squid catch from the waters of New Zealand, Argentina, Australia, South Africa, and the US was over 107,000 mt (Raynes, 1982).

The Japanese have increased their use of joint ventures to maintain their supply of fish and employment of vessels. They were involved in 175 joint ventures in 1977 and 193 in 1981. These joint ventures had a total capital value of $146.7 million in which the Japanese investment was $98.2 million (66.9%). They are distributed around the world with 25 joint ventures taking place in Central and South America, 104 in Asia and Oceania, 16 in Africa, one each in the Middle East and Europe, and 46 in North America. For the next few years it is expected that the total number of joint ventures will stabilize or diminish. Apparently joint ventures are being analyzed by the Japanese companies for profit maximizing purposes (Marine Fisheries Review, Jan. 1983).

Since much of the Japanese squid supply is from outside of Japanese waters, these sources of supply should decline as countries reduce their allocations and raise their fees in order to stimulate joint ventures and domestic activity. These patterns are not only developing in the US, but in New Zealand, Canada, Australia, and Argentina. With increased demand and declining Japanese catch, US catch should increase through increased joint ventures and exports either directly with the Japanese or by agreements with non-Japanese foreign firms that supply the Japanese market. This conclusion is supported by the analysis found in the Combs Report (1979) as well as by Anders et al. (1982), where squid was given high marks for export potential into Japan. For 1983, Japanese squid imports are expected to maintain their current high levels (Ohtagaki, 1983).

Spain

It is estimated that Spain has an annual consumption of 75,000 mt of squid per year; 45,000 mt Loligo spp. and 30,000 mt Illex spp. (Milne, 1982). Approximately 10,000 mt of L. vulgaris, primarily taken from the Canary Island - Sahara fishing grounds within the EEZs of Mauritania and Morroco, is consumed annually. In 1980-81, the Spanish consumed approximately 28,000 mt of Loligo, most of which was caught by Spanish vessels in US waters, although 1,500 mt was supplied by US producers. A minor source of squid is the Patagonian squid from the Falklands which is similar to L. pealei but has the quality of the California squid L. opalescens. The demand for California squid by the Spanish is minute for it has a thin body wall and shrinks dramatically when cooked. Other minor sources of squid are the squids from India, Malaysia, Taiwan, and Thailand. The supply to Spain from these Asian sources has been diminishing because Spanish duties on imports are higher relative to other European countries, so that these squids are being shipped to other European markets.

There are three major sources of Illex to Spain, I. illecebrosus from both the US and Canada and Argentinean squid (Illex argentinus). In 1981, roughly 16,500 mt of I. illecebrosus caught by Spanish vessels entered Spain. There were no reported US exports to Spain. In earlier years alternative sources of I. illecebrosus were from catches in US waters by Russia, Poland, Bulgaria, Romania, Japan, and by Spanish vessels fishing under the Mexican flag (Milnes, 1982).

Spain has caught and received Canadian Illex harvested by Japan, the Eastern Bloc countries, and other countries since 1978 (primarily Japan and the Eastern Bloc countries). However, with Canada's policy of reducing foreign quotas in her EEZ and because of the disagreement between Spain and Canada (over cod quotas), Canada has not given any fishing quotas to Spain and Spain has denied the importation of Canadian fish products, including frozen squid.

Argentinean squid has been supplied to the Spanish market via exports and joint ventures for the past six years. In 1979, many of the Spanish joint ventures as well as Argentinean export companies went bankrupt from Argentina's massive inflation rate which greatly increased their operating costs. For the years 1980-81, only 5,000 mt of squid from this area was brought to the Spanish market. However, squid caught by the Eastern Bloc countries in the Falklands has been supplied to Spain. This supply was approximately 9,000 mt in 1981 (Milnes, 1982).

Other sources of squid are available through New Zealand joint ventures, bycatch of squid in the Spanish hake fishery in the Southeast Atlantic, and attempts to develop fisheries in Norway and Mexico, where the size and texture of the squids are generally unsuitable to the Spanish consumer.

In 1976 Spain depended heavily on US squid (Table 14). At least 32% of the total Spanish supply of squid was from US waters with approximately 38% of the Spanish Loligo supply and at least 21% of the Spanish Illex supply. (The origin of the Illex imports from Japan, Poland, and the USSR is unknown; it could be from Argentinean, Canadian, or US waters (Earl, 1977).

Milnes (1982) estimates that in 1980, between imports and Spanish catch, the Spanish received 35,000 mt of squid from US waters, or approximately 47% of their estimated annual consumption of 75,000 mt.

Spanish import levels show similar patterns to Japanese imports. In 1976, from January - September, Spain imported 16,600 mt (Earl, 1977), in 1978 28,500 mt (Anders, et al., 1982), in 1980 34,200 mt, and in 1981 12,400 mt (OECD, 1982c). Milnes(1982) estimates that annual imports for 1978 were 28,600 mt, for 1979 26,600 mt, and for 1980 39,000 mt (Table 15). However, Spanish import levels are strictly controlled; importers are subject to import duties and special taxes as well as quota restrictions by government control of importers' licenses. The following statements are taken from the European Market Reports:

3/18/81 Reports from Spanish importers indicate that they have not been able to obtain import licenses for Loligo. Imports of Illex from the US have been banned for some time.

4/22/81 Spanish fleet owners can sell their squid free of import duties, at ship load prices payable at 30, 60, and even 90 days ex-frozen store. EEC minimum reference price does not affect large size squid as much because they are generally more expensive.

5/13/81 Illex. Spanish Commerce Ministry has communicated that from 4 May it will consider import license applications, but it has not stated what quantity will actually be granted. Also the Ministry announced increased special compensation tax on Illex imports, whole Illex 20 pesetas/kg (previously 10 pesetas/kg), squid tubes 50 pesetas/kg. These tax increases will probably make importing of Illex into Spain impossible.

11/25/81 Spanish government communicated on 23 November 1981 to importers that it will now consider license applications of Illex imports. This is the first time in six months that the Spanish government has been willing to issue licenses, however, it will neither say what quantity it will allow to be imported or what length of validity the licenses will have. Supplies will not be allowed in due to the continuing embargo on Canadian fish in Spain.

4/13/83 To avoid the 7.2% import duty on frozen products the Spanish government is allowing Spanish joint ventures (Loligo) to import frozen as "fresh" which are duty free. However, these imports will still be subject to (1) variable compensation duties of 15 pesetas/kg and (2) an additional 6% ad valorem on foreign products entering the country.

Furthermore, imports are strongly influenced by Spanish landings:

4/22/81 Spanish importers see no interest at this time in buying from US producers so long as Spanish ships returning from the northwest Atlantic waters can continue their fruitful fishing campaign in these waters.

8/25/82 Shortage of Illex squid, Spaniards awaiting news of catches in US waters, and arrival of Spanish fishing vessels to determine prices which will probably be increasing because of growing demand.

Strand's (1983) analysis of squid allocations to Spain indicates that US exports of squid to Spain are being limited because the Spanish catch in US waters increases the quantity available to Spanish markets, lowering prices received by US exporters, and that foreign catches in US waters decrease the US catch per unit of effort and therefore raise domestic harvesting costs.

Spanish Loligo and Illex prices have been increasing. March 1983 Loligo prices are almost three times higher than April 1981 prices, while for Illex March 1983 prices appear to be close to 25% higher than April 1981 prices (Table 16). These price increases suggest that there is a shortage of Illex and Loligo in the Spanish market (April 1983 prices are presently unavailable).

Given rising prices, import restrictions (many of which are directed at US squid) and declining allocations, it appears that the Spanish industry market strategy is not to reduce import restrictions but to maintain the strongest possible market for Spanish caught squid, causing high prices to Spanish consumers and low prices to US exporters. Milnes (1980) agrees:

> "The extent of government intervention in the squid industry. Measured by any standards, in Spain government intervention has been excessive. The government has pursued a policy of protectionism for the Spanish fleet by employing a combination of high import duties (20%), plus special regulatory taxes (ranging from $200 to $500/mt), plus outright suspension of import licenses. Such is the level of protectionism that Canada has accused Spain of violating the GATT Treaty to which it is a signatory.
>
> "These measures serve to create a level of uncertainty and risk for importers of large proportions. The species regulatory taxes can be changed overnight, with no prior warning and when the goods have been bought and are on route to Spain.
>
> "Unlike in Japan and the EEC countries, no clear overall government supply policy for squid exists in Spain. In those countries the government will assemble all interested parties to evaluate the total demand-supply situation, and after considering the catch expectation of its own fleet, will determine the quantity necessary to be imported, and in which periods of the year, in order to maintain orderly markets.
>
> "However, government policy seems to be based to an increasing extent on the thinking that access to the Spanish market for fishery products should only be given for something in return, and that this something should preferably be fishing quotas.
>
> "As consumers and importers we consider this to be a sensible policy. However, we also consider that for countries which have liberally granted fishing quotas to Spain, and in this respect the most generous by far has been the U.S.A... it is essential for these countries to make sure they have access to their own products in the Spanish market. At present this is not the case; during the last 12 months Spain has continually rejected applications for licenses to import Illex from the U.S.A."

Eventually, these import restrictions will have to be reduced since Spain is one of the world's major

consumers of fish, but her total catch of all species under the current European Economic Community fishery regime is declining significantly, and while participating with Spain in joint ventures, many countries will soon want to exploit directly the squids in their own zones and are becoming increasingly able to do so. Spain might be faced with a doubly difficult situation of insufficient supplies and surplus fishing capacity (OECD, 1982c). In 1981, Spanish joint ventures had climbed to 71 (OECD, 1981). In 1980 Spanish joint ventures provided approximately 13,000 mt of squid to the Spanish market (Milnes, 1982).

If the Illex fishery in Canada for either political or biological reasons (see below) declines, the Canadian level of exports to Spain will decline. With the phase-out of other Spanish suppliers of Loligo and Illex (Japan, the USSR, etc.) from US waters, US exports to Spain should increase, perhaps even rapidly in the future, while there should be an increasing demand by the Spanish for joint ventures.

Canada

One of the major sources of competition for the US Illex export market is the Canadian Illex fishery. Much of the rise in world landings during 1979-81 were Illex landings by many nations from Canadian waters, many of which have vessels that also fish in US waters (Figure 1). As mentioned previously, during this period much of the Canadian catch was exported to Japan, with Japan also harvesting a significant amount. However, based on ICNAF/NAFO catch and scientific reports (Beck, et al., 1982), the high abundance of Illex, and thus catch during 1979, in Canadian waters was abnormally high and is currently in a sharp decline. Since 1952 Illex peak catch from Canadian waters have ranged from 8,000 - 11,000 mt (1956, 1961, 1964, and 1967) and Canadian catch has fallen as low as 1,000 mt (1968-70, 1972-74) such that the 1979 peak catch of 162,000 mt is an order of magnitude above the previous peaks. Since 1979 total Illex catch has declined significantly toward average levels.

Recent data (Canada, 1982) indicate that Canadian catch has declined from 18,230 mt to 10,726 mt over the period January-October 1981 to January-October 1982.

The development of this fishery was largely from declining Japanese catch of common squid in 1976 and 1977. Exports grew to a peak of 35,984 mt in 1979 from minimal levels in 1975. Japan accounted for approximately 58% of these 1979 exports, with the remaining 42% being exported to Norway, Portugal, Spain, Italy, East Germany, Sweden, Bulgaria, Spanish Africa, and the US. From 1978 to 1980 the amount of whole squid exported (FOB Atlantic Canada) declined 39%, indicating that the demand for these exports slackened (Raynes, 1982). From January-November 1981 to January-November 1982 Canadian exports declined to 1,135 mt from 6,771 mt. Exports to Japan over the same period fell to 340 mt from 2,080 mt (Canada, 1982). Since little or no Illex is caught in December, these export estimates are essentially annual estimates.

South America

In South America, very little squid is kept for domestic use with almost all of the squid going towards export (Juanico, 1982; Table 17). (Most of the discussion of South American fisheries is a summary of Juanico). Attempts are being made to develop many of the squid fisheries. Guyana has received a loan of $12.7 million in 1981 from the Interamerican Development Bank to develop its fleet and plants. Squid is a bycatch in their shrimp fishery and new legislation requires shrimp vessels have at least 4,000 lbs. of bycatch squid with each trip. Japan has entered into agreements with Equador and Peru to explore their "Giant" (Dosidicus gigas) squid fisheries, while some of the catch of the several Polish-Peru joint ventures contain unknown amounts of Giant squid. Spain is currently trying to develop joint ventures with the above mentioned countries as well as Brazil, Columbia, and El Salvador (US Dept. Comm., 1983).

The Mexican catch of Giant squid was 22,000 mt in 1980 with a Mexico Department of Fisheries estimate that there is a biomass of 300,000 mt of these squids off Baha California. In 1981 this biomass estimate has been reduced to 100,000 mt. The 1981 Mexican catch was only 23,000 mt (Fishing News International, February, 1983)

Argentinean Illex stocks are the most important squid resource in South America. These stocks are somewhat exploitable beyond the EEZs of Uruguay and Argentina because the continental shelf extends beyond their 200 mile limits. In 1979 Argentineans caught 90,000 mt, the Japanese 25,000 mt, and the German, Soviet, and Polish fleets (combined) 25,000 mt of squid, for a total of 140,000 mt. This is relative to a 1980 estimate of a 500,000 mt biomass. Squid in both Uruguay and Argentina fisheries is a bycatch in their hake fisheries.

Both Uruguay and Argentina are actively seeking to develop their offshore fleets to harvest hake, croaker, anchovy, and squid, but with different approaches. In Uruguay the Fisheries National Institute (INAPE) was established to promote exports. INAPE controls the number of plants and ships in Uruguay and outlaws the use of freezer trawlers. Argentina has attempted to develop its fisheries through joint venture arrangements, primarily with Spain. This development has been hampered by Argentinean economic policy which has overvalued its currency which greatly increased vessel and processing plant operating costs. With peak catches in 1979 and high inventories in 1980 and 1981, total catch of all species has declined.

Unlike most other squid fisheries, Japan is not the major importer of Argentinean and Uruguayan squid (Table 18); Spain and Taiwan were during 1980.

New Zealand

Foreign vessels have been exploiting squid in New Zealand waters for over 20 years, while domestic vessels have shown little interest in the harvest of squid. During 1978-80, Japanese vessels caught at least 2/3 of the total foreign catch, which ranged from 25,000-42,000 mt. Domestic catch declined from 1,800 mt in 1978 to 280 mt in 1980 (Jarman, 1982). Almost all of the squid catch occurred within New Zealand's 200 mile zone.

US east coast joint ventures for squid seem to be following the same pattern as the New Zealand joint venture situation. In calendar year 1977 approximately 1,000 mt of squid was caught by joint venture. The 1980-81 joint venture catch of squid was 33,000 mt. Similar to this Plan, the allocation of New Zealand squid is given to New Zealand vessels, with the remaining unallocated resource divided between foreign companies and governments and joint ventures. Fishing fees are collected (3.5 million NZ$ in 1980). Joint ventures according to Jarman (1982) are restricted by the following criteria:

1. Joint ventures must return at least 5% in new foreign exchange earnings.

2. Joint ventures must increase New Zealand participation in the manning of vessels and management.

3. Joint ventures must submit programs for increasing local employment, product quality improvement, increasing New Zealand equity in the company, and increasing shore-side capacity.

On the other hand, it must be noted that New Zealand joint ventures differ from US joint ventures in that there is little catch by New Zealand vessels, most of the catch is by chartered foreign vessels.

For the 1980-81 season, Japanese, South Korean, Soviet, Spanish, Polish, West German, and Singaporean companies (for a total of 13 companies and 38 large vessels) were operating for squid and finfish. Furthermore, another 41 applications were declined in 1980. In October 1981, joint venture and foreign allocations were extended for a 12 month period pending a government review of how to increase direct involvement by domestic companies in these fisheries in the future.

Provisional catch statistics show that the foreign catch of squid by trawlers declined from 13,577 mt during the 1980-81 season to 215 mt during the 1981-82 season (OECD, 1982c).

Frozen European Squid Prices

The European Weekly Frozen Fish Reports provide weekly price quotes for frozen squid in the major European markets (Madrid and Barcelona, Spain; Nice, France; and Milan, Italy). However, squid is quoted according to market size (length or weight), quality (sea frozen, land frozen, interleaved, with or without ink, whole or tubes), type of shipping (FOB, C + F, CIF, ex-coldstore, wholesale), area of origin (northwest Atlantic, Boston, Sahara Bank, etc.), and by nationality of vessels (Spain, Korea, Japan, unknown). The variations in price quotes with respect to these qualifiers make it exceedingly difficult to compare prices. The price quotes shown in Tables 19-22 were chosen by first locating all L. pealei and I. illecebrosus prices and then, if they were simultaneously reported with price quotes of other squids within roughly the same period of time they were presented in the Tables.

The time period chosen becomes crucial given the wide variation in exchange rates. That is, it is inappropriate to compare a May 1982 price of L. pealei to a January 1983 price of L. vulgaris. In general, FOB (Free on Board, exclude shipping costs) prices are lower than CIF (Cost, Insurance, and Freight to destination) prices, which in turn are lower than ex-cold store prices (include all costs to get the product to the country and all duties), which again are lower than wholesale prices (include the above plus the importer's cost of doing business). Therefore, in comparing price quotes, if an FOB price is higher than an ex-cold store price, it can be assumed that once that produce reached the ex-cold store stage, it would command a higher price than the product it is being compared to.

The purpose of these price comparisons is to indicate the relative scarcity or value of the various squids. High prices generally imply that a market will readily accept more product relative to lower priced products.

In the Madrid market, it is apparent that over the months December to February, Korean supplied L. vulgaris commands higher prices than either Spanish caught L. pealei or L. vulgaris, because Korean FOB prices are almost as high as Spanish ex-cold store prices, so that when Korean L. vulgaris reaches the ex-cold store stage, their prices will be higher. Spanish caught L. pealei prices can be said to be higher than Spanish caught L. vulgaris for two reasons: in the 8 and 13 cm market categories, the prices for larger sized L. vulgaris are lower than for smaller sized L. pealei in the other categories. In general, the larger the squid size, the higher the price. In the Barcelona market, price relationships (May - June 1982) were contrary to the Madrid market. Spanish caught L. vulgaris received a higher price than L. pealei, with the Spanish caught L. vulgaris quite close in price to the Japanese caught L. vulgaris. Wholesale prices of land frozen squid depending on size is anywhere from 35 - 52¢ less than sea frozen L. pealei. (Land frozen L. pealei implies that the squid was processed in the US.)

With respect to Illex in Madrid and Barcelona, comparable price quotes indicate I. illecebrosus from US waters receives higher prices than squid from Argentina and Uruguay waters.

In Nice, sea frozen L. pealei commanded the highest prices in December 1982 and January 1983. Smaller sized L. pealei commanded higher prices than larger sizes of the other Loligos. It is assumed that since 25-50 g is the largest sizes reported for Thailand during this period, that L. pealei is higher valued. In Nice, L. opalescens has a very low value. There is little demand for L. opalescens in Spain because its characteristics are thought to be inferior (Milnes, 1982). There were no alternative price quotes for Illex to compare with the Canadian Illex.

In the Milan market, the highest prices were received by Japanese caught L. vulgaris. However, Japanese caught L. pealei received higher prices than Japanese caught L. reynaudi or European caught L. vulgaris.

In summary, L. vulgaris provided by east Asian countries seem to command the highest prices in the European markets. L. pealei, depending on its quality, may command higher prices than L. vulgaris and usually commands higher prices than L. reynaudi. Available Illex quotes indicate that I. illecebrosus commands higher prices than I. argentinus.

Other Factors

Four additional factors must be considered in the analysis of the US export market for squid: international political relations, foreign exchange rates, third party receipt of US species, and import restrictions.

Countries such as Japan and Spain are heavily dependent on imports of and access to foreign stocks of squid and as such, may be denied access or imports for non-fishery related reasons. For example: "Argentine Under-Secretary for Fisheries, Hugo Carlos Talamoni, in a recent interview stated that Argentina has been forced to shift its fishery exports to Africa and Middle Eastern countries. Talamoni stated that the shift resulted from the sanctions imposed by the European Economic Community during the Falkland crisis..." (Boston Market News Report B-10, 24 January 1983).

Another example of how international relations affect US markets is the controversy between Canada and the EEC concerning the EEC sealskin ban and also EEC compliance to a new six year agreement in which Canada receives low EEC tariff rates in exchange for granting EEC countries fishing licenses. So far these controversies have led to a ban on all Canadian fishery products in Spain, a boycott of Canadian salmon in the United Kingdom, and EEC nations being denied access to Canadian waters.

A more striking example that may take place in the near future is the potential for the US to impose economic and fishing priviledge sanctions upon Japan. Severe reductions of Japanese fishing priviledges in US waters and possibly US imports of Japanese fish products will be imposed if Japan does not comply with the 1986 whaling ban of the International Whaling Commission. In September 1982, 66 US Senators signed a letter in which the Pelly Amendment to Fishermens Protective Act, and 1979 Packwood-Magnuson Amendment to the MFCMA would be invoked against any nation violating IWC decisions (US Senate Committee on Commerce, Science and Transportation Press Release, Sept. 1, 1982).

While US exports of squid have grown, their increase has been restricted by foreign exchange rates. For example: "The most important factor in export sales of US fisheries products continues to be the appreciation of the US dollar against major European currencies. The US dollar gained 29% against the British pound, 45% against the French frank, 40% against the West German mark, 4% against the Spanish peseta, and 47% against the Italian lira as compared with August 1980. High interest rates and high inventory costs coupled with the strong US dollar are helping to price US fishery products out to the European market" (US Dept. Comm., 1983c). Since September of 1981, exchange rates have continued to rise, further hampering US exports (Table 23).

US exports are inhibited if foreign countries receive allocations, harvest US squid, and then export them to another country. For example, Japan, according to European Frozen Fish Market Reports, has exported Loligo pealei to Spain, France, and Italy. In fact, one recent Japanese joint venture application indicated that the Japanese company will sell all of the Loligo pealei harvested to European countries. Spain has exported Loligo pealei to Italy and to France. These exports are directly competing with US exports and taking away potential US markets.

Finally, the US export market is impeded by import restrictions through tariffs and quotas. Almost every foreign market is protected in some way by these trade barriers. In Europe, in addition to individual national restrictions, there exists the EEC Guideprices for squid imports, which increased 6% in 1983 to approximately $3,527/mt for Loligo species and $1,774/mt for Illex species (Lacerda, pers. comm.). From these guide prices, other support prices for reference, intervention, and producer prices are determined. When the import price of a product falls below a reference price, whch is a minimum import price, intervention measures are automatically triggered (Development Planning and Research Assoc., 1983).

Conclusions

The Council believes that high TALFFs diminish export demand and that reducing them enhances the probability that the US squid fishery will develop. When the butterfish TALFF was reduced,

butterfish exports increased. (These events are similar to the history of the Tanner Crab Plan.) The analysis above shows that export demand will be increasing in the future for world squid demand is rising and the major consuming countries are losing their access to the primary fishing grounds. Furthermore the US squids are price competitive with the other squids if not even higher valued. All of these conditions are conducive to increased export demand. It must also be noted that the export markets for the fisheries have been inhibited by foreign tariffs, import quotas, and shortages of licenses needed by willing foreign wholesalers to import these species.

Impact Analysis of the Squid Regime

Impact of Establishing the ABC

The Plan has no provision to adjust the maximum allowable catch in a given year to account for biological or ecological considerations. Maximum OY levels are consistent with the maximum sustainable yield estimates (Section V). However, it is possible that short term stock problems would make it desirable, relative to the long term productivity of the stock, to reduce the allowable catch for a particular year from the maximum level provided.

Setting the ABC for a particular year below the maximum OY level requires a conscious decision that the negative short run economic impacts are outweighed by the increased value (biological or economic) of future stock levels. Such action is consistent with the Act and with the Council's belief that conservation is a paramount concern of management. Reducing ABC from the maximum OY level potentially assures higher future availability with respect to the number of squid, the total weight of squid, or the average size of squid, so the chances that such action will have negative economic impacts over the long run are small. Conversely, if stock problems were to develop without the ability to reduce the maximum catch through the ABC, the higher catches could make the stock problems worse with resulting long term economic problems until the stock recovered.

Impact of Removing the Reserve Mechanism

Reserves were introduced into the squid regime in Amendment #1 to the Atlantic Squid Plan in order to assure its consistency with National Standard 1 as set forth in the Act. National Standard 1 requires that OY be "achieved", a concept interpreted to mean that the management regime is required to provide a reasonable opportunity that every ton of fish included in OY is allowed to be caught. In that plan, OYs were fixed values (44,000 mt for Loligo, 30,000 mt for Illex), as were DAHs (7,000 mt for Loligo, 5,000 mt for Illex). The DAH levels were set to account for past performance of the US fishery as well as to allow for some development. To set the DAH values higher than those used would have been speculative relative to the probable growth of the US fishery, hence not achieving OY, while not allowing for some growth would have unnecessarily put a limit on growth of the US fishery. Hence, the Reserve concept was introduced to set aside a portion of the OY for part of the year (19,000 mt for Loligo, 13,000 mt for Illex) as a buffer for US fishery development while allowing its transfer to TALFF if the growth was not forthcoming.

That system acted as a deterrent to US fishery development because foreign nations knew that if they did not purchase US harvested squid, the Reserve would be allocated to TALFF, i.e., there was an incentive for foreign nations to not purchase US harvested squid. That problem was partly solved in the Plan which replaced the fixed values for OY, DAH, and TALFF with ranges. However, the Plan retained the Reserves, although the Reserves are no longer needed to achieve OY, since OY is a range (less than or equal to 44,000 mt for Loligo and less than or equal to 30,000 mt for Illex) so OY is achieved by catching one squid.

The Amendment makes the OY more flexible through the elimination of the Reserves. The selection of a particular annual OY less than the maximum limit of the OY can be used to stimulate harvesting capacity, processing capacity, and exports. Under the Amendment, TALFFs are likely to be lower than under the Plan because of this flexibility.

In the Plan the difference between OY and DAH was split evenly between initial TALFF and Reserve. If, in the fall of the year, forecasted DAH exceeds the initial DAH, the Reserve is

diminished accordingly with the excess Reserve available for TALFF. If the forecasted DAH is less than the initial DAH, the entire Reserve may be allocated to TALFF.

There are several problems with the Reserve concept within the context of the Plan. There is still the possibility that foreign nations will not purchase US harvested squid so that the Reserves will be allocated to TALFF, thus allowing direct foreign harvesting. In addition, the Reserves may only be allocated to TALFF during the latter part of the fishing year, creating a problem if foreign nations advance proposals to buy US harvested fish in exchange for TALFF allocations of squid; i.e., there are circumstances under which it would be desirable to increase TALFF to further the development of the US fishery. It may also be desirable to decrease TALFF from the value set at the beginning of the year if the US catch or joint ventures increase DAH during the year to such an extent that the likely US catch would exceed ABC minus TALFF. Finally, as the US fishery grows to levels that approximate the maximum OY level, TALFF is reduced to such a small level that dividing it in half to create the Reserve can reduce the TALFF to such a small level that foreign nations cannot take a reasonable bycatch allowance of squid in other fisheries.

The issue of bycatch TALFFs is important for several reasons. It may constrain the US industry to slightly less than the full amount of squid available for harvest, but it is preferable to reductions of the squid TALFF to beneath bycatch requirements and eventually, to zero, i.e., making squid a 'prohibited species' to foreign fleets. A "prohibited species" is defined by the Foreign Fishing Regulations to be any species for which a foreign vessel does not have an allocation, and which thus, must be discarded at sea. "Prohibited species" status therefore, does not prevent mortalities of that species through foreign fishing, but only prevents retention of such catches. It should also be noted that while foreign nations must pay fees (based on species tonnage) to the US for bycatch allocations, no fees are collectible for discarded catch of "prohibited species". A third consideration is that specific bycatch TALFFs constrain foreign catch of a species - when an allocation has been taken, a foreign nation must cease all fishing operations which could lead to significant further catch of that species. A bycatch allocation thus forces foreign nations to fish as cleanly as possible. These constraints are not available under "prohibited species" regulations under which a foreign nation may pursue its permitted fisheries for other species so long as all catch of the prohibited species are discarded at sea. There is less incentive to foreign nations to fish cleanly under "prohibited species" regulations and there is less US control over the size of those discarded catches than exists with bycatch-only TALFFs. It is the Council's belief that conservation cannot be assured under "prohibited species" regulation. In summary, while a squid bycatch TALFF may reduce the amount of squid available to US fishermen as the US harvest begins to approach the maximum limit of OY, the use of a bycatch TALFF, instead of prohibited species status, will ensure that total squid catch does not exceed the OY and will provide some revenue, through foreign fishing fees.

The Amendment attempts to encourage the development of US fisheries through varying TALFF levels so that the annual OY varies within the ranges provided. In order to assess the associated impacts Figure 3 will be used for explanatory purposes.

Foreign harvestors purchase supplies (food, fuel, repairs, etc.) from the US and pay foreign fishing fees. Foreign processing vessels pay permit fees but they may also purchase supplies from the US. The foreign processor then takes the fish to market. Besides foreign fishing fees, the only return the US government receives are any intangible diplomatic benefits that accrue from foreign allocations that have been granted so that the State Department can achieve non-fishery diplomatic goals.

If squid is harvested by US harvestors, they sell their squid to a US processor who then finds an export shipper to bring the product to the foreign market. Along every step of production, supplies are purchased, US citizens employed and wages paid, and profits generated. Out of these profits and wages, taxes are paid and expenditures on other goods and services made. Finally, foreign exchange is earned by the US exporter which decreases the national trade deficit. (The expenditure patterns of joint ventures are a cross between the export and foreign harvest patterns for foreign processing vessels pay no fees; US vessels are harvesting the fish; and the final product may be sold under the joint venture company name, the foreign company name, or the US company name.) Therefore, impacts can be categorized into five major areas: US supply of fishery inputs;

government revenues; foreign exchange/balance of trade; US employment; and industry profits.

Only the first three areas will be discussed. US employment and industry profits will be indirectly discussed throughout the analysis. Throughout the analysis many assumptions, some of which are perhaps heroic, will be made. Since these are emerging fisheries, there is very little data available about the harvesting and processing of squids. This lack of data creates a dependence upon past studies of offshore fishing and groundfish processing. However, for comparative purposes this dependence should give estimates within the proper order of magnitude for many of the participants in the squid fishery are heavily involved in the species discussed in these studies. Table 25 outlines the major impacts discussed.

It is recognized that, since the basic purpose of the Amendment is to reduce foreign catch to stimulate US exports, a precise formula that states that by reducing foreign fishing by "x" amount, exports will increase by "y" amount would be useful. It is further recognized that the resulting impacts should be evaluated at the "margin" or "incrementally" rather than on "average". Available data defy such sophisticated transformation. The basic approach taken here is first to show the average impacts if exports increase and if foreign catches decrease, then to show the range of trade-offs that lead to a balancing off of any of the negative impacts associated with reducing foreign fishing.

US Suppliers of Inputs

When it comes to detailed comparison of US versus foreign fishing, the only good or service that is not purchased by US vessels is the foreign use of marine transportation service to ferry crews and suppliers between their ships and shore. Both foreign and US vessels need food, fuel, ice, repair and maintenance services, etc. At this time no concrete estimates of foreign purchases of these supplies are available. The actual expenditures, based on comments received during the review period of the Plan, suggest that, at the most, in 1982 $5 million was spent by foreign fishing interests in their pursuit of 37,600 mt of fish, of which approximately 28,780 mt was squid. The simple addition of the purchases by foreign vessels, according to comment letters by American suppliers, is less than $1 million. Doubling this figure to account for those suppliers who did not comment leads to a minimum estimate of $2 million.

If foreign fishing is phased out, the question arises as to how much of this $5 million would be recovered by increased expenditures by US fishermen who will be catching more for export.

If we assume that the vessels used by US harvestors have cost structures similar to the offshore trawlers of Virginia (DuPaul and Baker, 1979) then on average, for every $100 of revenue generated at least $20 in non-labor variable costs (fuel, engine overhaul, gear, maintenance, electronics, food, ice, etc.) is incurred. (Ideally, expenditure calculations should be made based on the incremental costs the increased squid harvest has on the total operating costs of the vessels but such data are lacking. Use of averages allows crude calculations of the magnitudes of the impacts.) At estimated 1982 prices, the ex-vessel values of Loligo and Illex are $992/mt and $265/mt respectively. These values imply that for every ton of Loligo, $198 will be spent for supplies and for every ton of Illex harvested $53 will be spent. If processing expenditures on supplies are considered, approximately $127/mt will be spent on non-labor variable cost that will accrue for Loligo and $118/mt for Illex. This estimate is based on assuming that the value of processed Loligo and Illex equal $.77/lb. and $.40/lb., respectively, and assuming that the processor makes a profit of $.10/lb. After subtracting out the ex-vessel value of the squids, the remaining costs are determined on an approximate percent basis: 44% labor, 30% fixed cost, and 26% variable non-labor cost. These assumptions are based on the Hu et al. (1983) analysis of processing costs of the New England Groundfish industry (Table 24). Therefore, the total purchase of supplies incorporated with the harvesting and processing of one ton of Loligo is $325 and for one ton of Illex is $171.

Foreign fishermen do not cleanly catch Loligo and Illex but have bycatches of mackerel, butterfish, silver hake and red hake. For every 100 mt of Loligo, they are catching 32 mt of bycatch and for every 100 mt of Illex, they are catching 1.5 mt of bycatch (Mid-Atlantic Council, 1982b). If foreign vessels spent $5 million in total on supplies, given the total 1982 foreign catch of 37,600 mt, they averaged $133/mt in supply purchases. Since the loss of one mt of Loligo allocation

implies 1.32 mt of catch when bycatch is considered, this yields a loss of $176 in supply expenditures. Similarly for Illex, one mt loss of allocation leads to a loss of $135 of expenditures.

Therefore, if one mt of reduced TALFF leads to a one mt reduction in allocation and therefore catch, but a one mt increase in US exports, the net purchase of supplies will increase by $325 -$176 or $149 for Loligo and $171 - $135 or $36 for Illex. These numbers suggest that for every two mt of allocation that is reduced if only one new ton of exports arises then total expenditures for supplies will not change significantly. For Illex total expenditures will not change significantly if five mt of foreign catch is replaced by four mt of US catch. With the minimum estimate of foreign expenditures of $2 million, these ratios expand approximately to five to one for Loligo and three to one for Illex. It must be noted that while total supply expenditures may not change, New York ship chandlers (the chief suppliers to foreign fishing vessels) will lose much of their current sales if foreign fishing is phased out. Ideally, foreign vessel activity will switch to other underutilized species so that some of these losses will be recouped.

Government Revenues

Foreign vessels must pay permit fees for their vessels and poundage fees for their catch. These fees are calculated to be at least "an amount sufficient to return to the United States an amount which bears an appropriate proportion of the total cost of carrying out the provisions of this Act" (16 USC 1824(b)10). The fee schedule is determined by a ratio of the total fish harvested by foreign vessels in the US FCZ to the total US and foreign FCZ catch (ratio in 1981 = .303). The NMFS then determines the total cost of carrying out the MFMCA (including Coast Guard and State Department costs) and multiplies this total cost ($62,245,700 for FY 1982) by the ratio to determine the foreign share of the MFMCA costs. This share determines the 1983 fee collection target which has been set at $87,400 in permit fees and $43.8 million in poundage fees for a total of $43.9 million.

The poundage fee for Loligo is $114/mt and the poundage fee for Illex is $31. A one ton reduction of foreign catch in these species, as noted above, also implies, through bycatch relationships, reductions in the foreign catch of butterfish, silver hake, mackerel, and the other squid. Therefore, including bycatch species in the poundage fee calculation, the foreign catch of one ton of Loligo leads to a collection of approximately $159 and a catch of one ton of Illex leads to approximately $41. With the 4% surcharge, these adjusted poundage fees are approximately $165 for Loligo and $44 for Illex.

Along with foreign fishing fees, the government collects taxes from the profits and employees of those firms that supply foreign fishing interests. Above, it was estimated that, at the most, foreign vessels were spending $176/ton on Loligo and $135/ton for Illex, so some fraction of these figures end up as tax payments.

In addition to the taxes paid by suppliers to the domestic harvestors and processors, taxes are generated through the wages paid to crew members and plant employees and the profits of the boat owners and processors. According to DuPaul and Baker (1979), owners of Virginia trawlers showed a net return of approximately 13% while crew share equaled approximately 50% of ex-vessel gross revenues. (These figures ignore property taxes of under .5% and payroll taxes paid by the boat owner. The study lumped these payroll taxes with settlement fees and miscellaneous expenses for a combined percentage of 3%.)

In the previous section, it was assumed that the processors' mark up was $.10/lb. or $220/mt for Loligo and Illex and that labor costs were $212/mt for Loligo and $172/mt for Illex. This implies that the taxable income from processing approximates $432/mt for Loligo and $392/mt for Illex. Similarly (also developed previously) assuming a 13% return and crew shares of 50%, taxable income at the ex-vessel level is $625/mt for Loligo and $167/mt for Illex. Combined, the taxable income from Loligo is $1,057 and from Illex is $559.

In asking the question does the US Treasury collect more revenue from foreign fishing fees or from the potential taxes of the increased exports caused by reducing TALFFs, two prior questions must be answered: (1) what are the increased tax collections from income generated in the fishing and

processing sectors and (2) are there any multiplier effects? Multiplier effects are the effects when the wages paid to crew members and processing employees and the profits of boat and processing plan owners spent induces additional spending and income throughout the economy. One source of additional expenditure has already been identified: the purchase of supplies.

For Loligo, the average tax rate in order to outweigh the loss of foreign fishing fees, assuming that one ton of lost foreign catch is replaced by one ton of exports, would have to be 16% and for Illex it would have to be 8%. There is no precise estimate of these tax rates nor is there good financial data on vessel and processor tax payments. For comparative purposes, consider that in 1979 tax revenues averaged 20% of the total value of goods and services produced in the country (Tax Foundation, Inc., 1981). If tax rates were higher, the US treasury could collect more revenue under exports than under foreign fees.

With respect to the multiplier issue, DuPaul and Baker (1979) estimate a multiplier for the Hampton-Newport News, VA area of 2.49. That is, for every $1 of income generated at the crew level another $1.49 of income is generated at the service sector as the initial $1 is spent. Hu et al. (1983) cites studies that suggest the income multiplier for income generated in the processing sector is approximately 1.16 while DuPaul and Baker (1979) assume that this multiplier is also equal to 2.49. These income multipliers suggest that taxes collected from stimulated exports vis-a-vis reduced foreign catches, should not be significantly less and could be greater than what is currently collected with foreign fishing fees.

With respect to expenditures on supplies, income generated by these expenditures are taxable too. For both Loligo and Illex on a per ton basis, expenditures stimulated by exports outweigh ($325/mt for Loligo and $158/mt for Illex) those by foreign fishing nations ($176 for Loligo and $135 for Illex). Again, these figures support the contention that tax revenues generated under the Amendment should not significantly decrease and could potentially increase.

Foreign Exchange

As noted previously, exported squid and foreign fishing fees both bring into the country needed foreign exchange. (Foreign exchange is the purchase or sale of one national currency for another.) Foreign exchange transfers purchasing power and provides credit for foreign trade (Kindleberger, 1968). The increased availability of foreign exchange makes it easier to export. However, exported squid, unlike foreign fishing fees, has significant trade effects. In general, exports stimulate the economy in terms of income and employment while imports do the opposite. For fisheries, the balance of trade is negative. In 1982, US exported $1.1 billion while importing $4.5 billion of fisheries (US Dept. Comm., 1983). Excluding Canada and Mexico, Italy ($512 million) and Japan ($310 million) sell the US the most fish while Spain is further down the list at $38 million. On the export side, $9 million was exported to Italy, $3 million to Spain, and $620 million to Japan.

These numbers imply that the US buys approximately $228 million more from the top three squid consuming countries in the world than it sells to these three countries. Italy and Spain alone account for a trade deficit of $538 million. This trade deficit is 23% of the total trade deficit once Mexico and Canada are excluded. (These countries are excluded since a lot of the trade deficit can be attributed to exchange between companies that are wholly or partially US owned. If these countries are included, the trade deficit of Italy and Spain combined equals approximately 16%.) This trade deficit is illustrative of the potential leverage that can be used to stimulate exports within the "fish and chips" policy of NMFS. Once TALFFs are determined, the squid fisheries bring $165/mt of Loligo in foreign fees and $176/mt in purchases of domestically produced supplies while Illex brings in $44/mt in foreign fees and $135/mt in purchases. This implies that $5.4 million and $2.3 million of foreign exchange was needed by the foreign 1982 fisheries for Loligo and Illex, respectively, for a total of $7.7 million.

The 1982 estimates show that 4,864 mt of Loligo and 5,772 mt of Illex (including joint ventures) were harvested. Using the EEC minimum guide prices as minimum estimates of the export prices for Loligo ($3,527/mt) and Illex ($1,774/mt) suggests that above current levels, Loligo will only have to expand by 1,531 mt and Illex by 1,297 mt to achieve an equivalent level of foreign exchange. These estimates are equal to 18% of the foreign catch of Loligo and 19% of the Illex

catch in 1982. Therefore, a mild expansion of exports will replace the total amount of foreign exchange earned from foreign fishing while reducing the fisheries trade deficit and increasing employment and income in the economy.

Impacts of Varying the Loligo and Illex IOY, DAH, and TALFF

Loligo

For Loligo, OY can be less than or equal to 44,000 mt. It is the sum of the actual US catch and the foreign catch, so at any time of the year, OY is achieved. Prior to the start of a fishing year, IOY is estimated. This estimate consists of a forecast of DAH (the sum of US catch for joint ventures and US catch for shoreside processing) and the level of TALFF that maximizes, in conjunction with DAH, the benefits received by the nation from the fishery.

IOY for any year can be set lower than ABC for economic reasons. In order to maximize the economic value of the fishery, TALFF may be reduced such that, when combined with expected DAH, IOY is less than 44,000 mt. As will be developed below, a strong case can be made that there is some point in the range of TALFF below which reductions in TALFF will lead to an expansion in DAH, either by stimulating exports directly or through stimulating joint ventures. During the year, US catch can expand, causing IOY to increase up to ABC. At no time can the US catch expand beyond ABC minus the allocated TALFF or ABC minus the bycatch. Similarly, TALFF can expand or contract, but at no time can the sum of DAH and TALFF exceed ABC. TALFF cannot be reduced below that which has already been allocated or below that amount needed by bycatch in other foreign fisheries.

Beyond some point, a reduction in TALFF will lead to an expansion of DAH. This assertion cannot be empirically verified from existing data, but a review of the most recent trends in foreign, US, and world catches are quite supportive. Since 1976 domestic landings have ranged from approximately 1,000 mt in 1977, a year when no joint ventures existed, to 5,000 mt in 1982 (Tables 1 and 2). Assuming 1982 export prices prices received by processors in domestic markets are equivalent, $1,698/mt, while joint ventures receive prices similar to ex-vessel prices, $992/mt, DAH levels over the past years range in value from approximately $1 to $6 million (Figure 4).

Over the same period TALFF has varied little from 37,000 mt, while actual foreign catch has ranged from 13,000 mt to 20,000 mt (Table 26). As developed earlier, in 1982 foreign fishing vessels paid $165/mt of Loligo in foreign fishing fees and they may have purchased as much as $176/mt of supplies, for an estimated total injection into the economy of $341/mt of Loligo harvested. In other words, for every metric ton of Loligo that TALFF is reduced, the economy could lose up to $341 in revenues. Using $341 as the price foreigners pay for fishing, the value of their catch has ranged from roughly $4 million to $7.5 million (Figure 4). Potentially, if the TALFF were set at 37,000 mt, $13 million could be injected into the economy.

The trends in US and foreign catch from 1976 to 1982 do not show an inverse relationship. TALFF levels have always been much greater than foreign catch and final allocations (Table 26). (Final allocation is the final amount of TALFF awarded to a specific country.) Therefore, TALFF levels have not been such that foreign access to Loligo was constrained. Furthermore, over the past four years, the overwhelming majority of the Loligo TALFF has been allocated to Spain, Italy, and Japan; three of the largest markets for US caught squid as well as competitors of the US industry. For 1981-82, 100% of the allocated TALFF went to these countries (Table 7). This suggests that not only the size of the TALFF but how it is allocated influences DAH.

If TALFFs and allocations have not been constraining foreign catches, then presumably world market conditions have caused them to range from 13,000 mt to 20,000 mt. World squid landings have increased steadily until 1980 (Figure 1) while the combined US and foreign catch of Loligo have declined as a percentage of world squid landings (Table 9). Since 1980, estimates and reports of world landings as well as market price trends indicate that for the years 1981 and 1982 world squid supply declined substantially relative to demand. A significant shortage of squid exists. The major squid producing and consuming countries are also simultaneously being denied access to foreign fishing grounds around the world. The decline in world landings and these fishing rights has

increased the demand for Loligo so that at some point, because of this demand, reductions in TALFF should lead to increases in DAH. (On a smaller scale, this relationship was successfully tested in the butterfish fishery.) Very recent events suggest that this point has already been reached.

The 1982-83 final allocations declined to their lowest level because of an increase in US harvests (Table 26). This is an indication to the foreign nations that their fishing rights to US stocks will decline. This probably led these nations to import US squid and participate in joint ventures in order to maintain squid supplies in their markets. Starting in 1982-83, US joint ventures and exports started to expand such that for 1983-84 the Loligo OY is 44,000 mt with a DAH of 22,000 mt, 11,700 mt of which is the JVP estimate (Federal Register, Vol. 48, No. 81, 26 April 1983). While the maximum TALFF is 22,000 mt, much larger than the 1982-83 foreign catch, half of this is held in Reserve, as discussed above. With a continuing world shortage of squid and early indications that US exports can be of high enough quality to compete with other squid products, coupled with significant increases in joint venture applications, it is likely that at least part of the Reserve will not be allocated to TALFF. This suggests that, if the TALFF is reduced below 20,000 mt, the substitution of DAH for TALFF will occur.

Evaluated at 1982 prices, the 1983-84 OY represents approximately $37 million, $7.5 of which will be earned from foreign fishing fees and foreign supply purchases if 37,000 mt of TALFF is allocated and harvested. The DAH value is roughly $29 million (Figure 4).

The impacts of reducing TALFF below 20,000 mt depend on the degree of substitution. A one mt reduction in TALFF leads to an estimated decrease in revenues to the fishery by foreign vessels of $341. Will this spending be replaced by a lesser, greater, or equivalent amount of revenues from increased exports or JVPs? This will depend on the rate of substitution between TALFF and DAH and the resulting degree to which DAH is made up of exports or joint ventures. To date, available data defy actual quantification of this relationship. However, the reduction in TALFF from 1982-83 by 15,000 mt to 22,000 mt and the simultaneous increase in DAH from 5,000 mt to 22,000 mt suggests a rate of substitution of one mt of DAH for every one mt of reduced TALFF.

If there actually is a one for one substitution between TALFF and DAH, and DAH expands by one mt of exports, the gross revenues received from the fishery will likely increase from the 1983 level as TALFF is reduced. The $341 not received from foreign vessels will be replaced by $1,698 of revenues from export, a net increase of $1,357. If this rate of substitution is reduced to zero, potentially OY and DAH could grow to a level of $64 million in gross revenues (Figure 4, solid increasing lines). This suggests that the risk of losing foreign revenues in excess of DAH generated revenues through reduced TALFFs is small.

If the trade off is less than one for one and DAH expands only through joint ventures, the rate of substitution can be no less than approximately three mt of reduced TALFF for one mt of JVP in order to maintain the 1983 level of gross revenues. If it is less, for example, four mt of TALFF for one mt of JVP, the total value of the OY will decline (Figure 4, dotted parallel lines).

The degree to which IOY differs from ABC will depend on whether there is less than a one for one tradeoff. For example, if a reduction in TALFF by three mt leads to only a one mt increase in DAH, and TALFF is reduced to zero from its 1983 level, the resulting IOY will be 37,000 mt. Only an increase in export of JVP demand beyond that which is caused from the reduced TALFF will lead to meeting a ABC of 44,000 mt. It must also be noted that in addition to the rate of substitution, if foreign fishing fees increase (decrease) or the average revenues from one mt of exports or JVP decrease (increase), the resulting net return to the economy from decreasing TALFF will decrease (increase).

This Amendment guarantees squid bycatch TALFFs. That is, DAH cannot exceed ABC minus bycatch TALFF. The economic impacts will depend on the capability of DAH to expand beyond these levels. The tradeoffs between DAH and TALFF were discussed above the associated impacts apply. Another way to evaluate these impacts is to estimate the maximum potential revenue lost from not allowing US fishermen to harvest the amount of squid included in the bycatch TALFFs. Those impacts depend on estimates of the maximum amount of bycatch potentially needed and of

the highest price US fishermen and processors can receive for squid.

The bycatch TALFF for Loligo is 1% of the allocated portions of the Illex, mackerel, silver hake, and red hake TALFFs. Assuming that current maximum TALFF levels for these species (2,500 mt of Illex, 30,900 mt of mackerel, 13,400 mt of silver hake, and 8,500 mt of red hake) are continued in the future, for a total bycatch requirement for Loligo of 553 mt. At a $1,698/mt export price this could lead to a loss in DAH revenues of about $900,000.

The DAH revenues shown above would be offset somewhat by increased purchases of supplies by foreign vessels. In all probability, future bycatch TALFF requirements will be reduced because of ongoing expansion of DAH in the Loligo fishery, as well as the continuing attempts of the Councils and NMFS to increase the export and domestic development of mackerel and the hakes. Therefore, it is expected that the impacts of this provision will probably not be significant.

Illex

The US Illex fishery has developed so rapidly that the issue of the substitution between DAH and TALFF as outlined in the Loligo analysis need not be addressed in detail. The projected maximum TALFF for 1983-84 is just 2,900 mt, an amount intended to satisfy the bycatch of Illex in other foreign fisheries (Federal Register, Vol. 48, No. 81, 26 April 1983). This TALFF level is a 20,000 mt reduction from the 1982-83 level. (Until 1983-84 TALFF varied little from its maximum allowable level of 25,000 mt, Table 26.) The main reason for the reduction in TALFF is the expansion of DAH from approximately 6,000 mt to 27,100 mt through joint ventures, which total 22,100 mt for 1983-84. This expansion may have resulted from the same factors that led to the increase in the Loligo DAH plus the additional factors of a shortage of Illex coming from Canadian and Argentinean waters as discussed earlier.

Using 1982 prices, the 1983-84 OY has an estimated value of $11 million, a $5 million increase from the 1982-83 value of $6 million. Foreign revenues declined from $2 million to $.5 million. If the demand for US harvested Illex remains high, then the only way the economic value of the OY will increase is if either joint venture and export prices increase or through exports increasing as a percentage of DAH.

OY could be reduced below its maximum 30,000 mt level. The demand for joint ventures may slacken greatly such that a potential for large TALFFs may exist. If so, the Loligo analysis and conclusions should be representative of the impacts of varying the OY level. The only difference will be the magnitude of the inputs since the foreign fishing fees, foreign expenditures, and Illex prices are all lower than their Loligo counterparts.

As noted above in the Loligo discussion, this Amendment guarantees squid bycatch TALFFs. The bycatch TALFF for Illex is 10% of the allocated portion of the Loligo TALFF and 1% of the allocated portions of the mackerel, silver hake, and red hake TALFFs. A similar analysis to that done above for Loligo (the bycatch in the Loligo fishery equalling 1,000 mt) leads to an Illex bycatch TALFF of 1,428 mt, which at $882/mt exported, equals approximately $1.3 million in DAH revenues. These DAH revenues would be offset somewhat by increased purchases of supplies by foreign vessels. In all probability, future bycatch TALFF requirements will be reduced because of ongoing expansion of DAH in the Illex fishery, as well as the continuing attempts of the Councils and NMFS to increase the export and domestic development of mackerel and the hakes. Therefore, it is expected that the impacts of this provision will probably not be significant.

Benefit-Cost Analysis of the Squid Regime

A taxonomy of the benefits and costs are outlined in Table 25. The impacts of US suppliers, government revenues, and foreign exchange are not considered directly in the analysis. They are not directly considered because they reflect a substitution of claims upon the resource. They do not directly stimulate the production of new goods and services within the economy. All of the goods and services supplied by foreign fishermen will potentially be replaced or exceeded by US domestic purchases. Any excess purchases by US fishermen and processors should not cause a rise in prices by non-fishery sector purchasers of these goods and services. Taxes collected from

fishermen and processors are not included in the analysis because they reflect a transfer of income to the government and to include them would be a double counting of the actual benefits (Anderson and Settle, 1977). Taxes are paid out of profits. To count tax collections as an additional benefit while also including them in profits would be double counting taxes. Only if estimates of after-tax profits were developed could taxes be legitimately included as a benefit. This analysis does not estimate after tax profits. Foreign exchange benefits are not included because they are to some extent reflected in the other benefit items and the other macro-economic benefits, besides increased income and employment, are too subtle to attempt to quantify.

The methodological approach taken here differs from the standard benefit-cost analysis because of data limitations, the exact relationship between export demand and foreign allocation cannot be specified. Consequently, benefits and costs cannot be associated with the standard approach of measuring the total changes in consumer and producer surpluses. (These are the differences between willingness to pay, opportunity cost, and the actual price paid or received.) Furthermore, the flow of benefits relative to costs cannot be specified because of the three year life of this Plan. Certain benefits and costs may not be immediately achieved unless the basic structure of the Plan is maintained for a longer period. For example, the reduction of the costs associated with foreign fishing may not be reduced since a large part of these costs are fixed (such as data collection procedures) and cannot be reduced gradually if foreign fishing is reduced gradually. The analysis below takes a static approach in which the magnitudes of the benefits and costs are compared on an average basis. The total benefits and costs will depend on the degree to which TALFFs are reduced by reduction of OY or by increases in DAH.

Benefits

The benefits of the Amendment can be attributed to four areas: ex-vessel, processing, administrative, and technological. At the ex-vessel level, it is obvious that profits (revenues minus the total financial cost of harvesting) will be *made*, otherwise there will be no reason for the vessel owners to seek squid. These profits are a reward to the boat owners for putting together the resources (boats, crew, trucking, etc.) utilized in the harvest and sale of squid. In order to be willing to undertake this task, the boat owner expects to receive a certain level of profit. If he earns more, the difference is called the excess profit (economists call this economic profit) level. Only the excess profit level, not total profits, accrue as a benefit for they reflect income earned beyond the expected wages or return to the boat owner for his entrepreneurship. DuPaul and Baker (1979) estimate that the financial return to the average Virginia trawler was approximately 13% in 1978. If the assumption is made that a boat owner requires at least a 13% profit from harvesting using normal fishing patterns than the owner must expect to earn a greater than 13% profit on squid in order to change his normal fishing pattern.

Rationally, boat owners should expect as a return on their investment an excess of what they could earn in other financial markets. If this was equal to 10% in 1978, then the excess profits earned under normal fishing was 3% in 1978. If these excess profit levels still exist today, the squid will have to earn at least 4% in excess profits in order for the boat owner to pursue squid. Therefore, a minimum estimate of the excess profits from squid harvest could be 1% of the ex-vessel revenues of the squids. Otherwise, squid would not be landed.

Increased squid landings require increased labor, fuel, and other inputs, which may come from possibly three basic sources: (1) unemployed supplies, (2) fully employed supplies from non-fishery sectors, and (3) fully employed supplies from the fishery sector. If the supplies used were previously employed, then their social cost, as opposed to their financial cost, is zero.

Given that national unemployment is approximately 10% and that the major countries in the squid fishery, according to the 1970 Census, had unemployment rates 50% higher than the national level (6.5% versus 4.4%), it is highly likely that the increased labor required for squid export development will be previously unemployed. (Possible situations in the hiring of unemployed labor if unemployment in the fishing industry is similar to the national average: (1) at least one out of ten fishermen are unemployed and the unemployed are rehired; (2) if all fishermen are gainfully employed then out of every ten "new" fishermen employed, nine of them will have been previously employed; (3) finally, if the average crew member works an average of nine out of ten available

fishing days, squid exports may increase crew employment another day.)

If the labor required for squid export comes from previous employment outside of fisheries, then the financial cost of harvesting is not reduced to reflect the social cost of production, for society would be giving up the goods and services that otherwise would be produced. (However, there would be a possibility that the vacant position would be replaced by a previously unemployed worker.)

With respect to the last category, "fully employed resources within the fishery", some of the effort attracted to the squid fishery is likely to come from fishermen currently exploiting species such as cod, haddock, yellowtail flounder, summer flounder, scup, and scallops. All of these species are fully exploited (US Dept. Comm., 1982). In most fully exploited fisheries there exists an over-application of labor, fuel, and other resources in the harvesting sector, and thus the level of catch could be maintained with fewer resources. That is through a reduction in effort (boats, labor, fuel, etc.) applied to these fisheries, the remaining vessels can fish more effectively, while the potential for depressed stocks to rebound increases. The transfer of the redundant resources toward an underutilized species such as squid implies that society is not giving up any previously supplied goods and services, but gains the value of the increased production of squid. Society also gains from the increased production and reduced harvesting costs that accrue in these other fisheries. Therefore, the financial costs of harvesting squid should be appropriately discounted to reflect the true social cost of the additional squid harvest. Therefore, a minimum estimate of the social benefit from the harvest of Loligo for export would be the sum of: 1% of the ex-vessel gross revenues to account for the boat owner's profit and 10% of the wages paid to labor.

At the processing level many of the same assertions discussed with respect to crew employment can still be utilized in estimating the social cost of hiring processing employment. Hu et al. (1983), Georgianna et al. (1978), and Peterson and Smith (1979) all note that there is much idle physical capacity in the processing industry in the northeast region. All processing plants show strong seasonality in their production levels. Hu et al. (1983) shows that processing plants during the year will vary their number of employees from 40% to 80% of peak hiring levels. To the extent that squids are landed during off-peak months, the probability of utilizing unemployed labor is significantly higher than during peak months (off-peak months are January, February, and March). During this period very little Illex is landed, while over the past three fishing years, Loligo landings have ranged from 2 - 13% of annual landings.

During the peak production season the extent to which squid replaces other fish in the processing line is not entirely clear. Georgianna, et al. (1978) stated: "There is other evidence that there is little or no causal connection between the development of non-traditional species and excess capacity of traditional species. World demand for squid was perceived to be very high and large amounts of it were landed in New Bedford and Cape Cod during May, 1979. Historically, according to our observations, May is a month of full or over-utilization in processing flounder and scallops, the traditional species in New Bedford. Yet there were large amounts of squid bought by New Bedford processors. According to the port agents in New Bedford, 1.3 million lbs. of squid was purchased which is approximately the amount of scallop landings in the port over the same period. Every fresh fish processing firm except one purchased squid at an average ex-vessel price of 41 cents, roughly double the price of cod."

With this potential substitution in mind, and using the same arguments used in analyzing the benefits at the vessel level, a conservative estimate of the benefits of processing one mt of Loligo is: 1% of the final wholesale squid revenues plus 10% of the labor costs. This latter assumption is based on two assertions: (1) the likelihood that squid demand will be consistent and high enough that processors will increase their use of physical capacity and (2) the studies cited above focused only on New England processors. Relative to New England processors, the Mid-Atlantic processors are not as large or as well developed, and presumably more eager to expand capacity. (The majority of joint ventures involve owners of Mid-Atlantic processing facilities.)

The Amendment should reduce administrative costs. Allowing increased flexibility in the determination of DAH and TALFF increases the possibility of expanding the US fishery. Removal of the Reserves, allowing unallocated TALFF to be transferred to DAH, and increasing TALFFs

will allow for the potential needs to expand ongoing joint venture harvests; to meet unexpected export demands; and to stimulate the expansion of one fishery by increasing TALFF in another fishery in exchange of increased export or joint venture purchases. This flexibility enhances the benefits potentially received from the squid fisheries. Furthermore, as a result, TALFF levels may be eventurally reduced and, if TALFFs are maintained at low or non-existent levels, substantial administrative cost savings can be realized.

The administrative costs of foreign fishing can be significant since approximately 90% of the total east coast foreign catch is associated with the squid fisheries, if one considers directed catch and bycatch (US Dept. Comm., 1982; Canadian landings excluded). The total east coast foreign catch is approximately 35% of the total foreign catch in the US FCZ in 1982. If foreign fisheries are phased out, a portion of the resources being devoted by NMFS, the Councils, and the Commerce and State Departments towards foreign fishing could be reduced or applied to other fishery problems. Therefore, because foreign fishing fees presumably reflect only management costs and because there is Congressional intent under the MFCMA to phase out foreign fishing, the social cost of losing these foreign fishing fees is probably not substantial.

Similarly, Coast Guard costs could be reduced because there would be less need for ship patrols (patrol effort ranges from $4,480/day for patrol boats to $39,640/day for high endurance cutters), fewer boardings (depending on the vessel used boarding costs range from $740 to $19,824/boarding), and reduced overflights (costs range from $400 - $2,479/hour).

Technological and market expansion benefits, from restricting foreign fishing are currently occurring. In many of the joint venture applications for 1983-84, foreign partners are: (1) offering training and expertise to US fishermen and processors to improve product quality, (2) willing to help finance the building and improving of processing facilities, (3) marketing part or all of the joint venture catch under the US company's name, and (4) buying additional fish from shore based processors. All of these actions benefit the US fishermen and processor, but they also may indirectly benefit the US consumer. With the quality improvement in US production, the consumer will have higher quality products. As discussed previously, there is no evidence that consumers have paid higher prices because of squid development (Table 7).

The Amendment would increase this transfer of technology and market information as foreign nations will want to maintain the quality and size of their squid supplies. In fact, it can be argued that the flurry of joint ventures and the various technological demonstrations by foreign nations that have occurred are the result of the Plan moving toward final approval and implementation. Joint ventures probably are being used to delay the time in which squid will only be available through export from the US. The nations participating in joint ventures realize that foreign access to the FCZ, as in the zones of other countries in the world, will be phased out. The recent amendments to the MFCMA verify Congressional intent that OY determinations promote the development of underused fishery resources by US fishermen.

These technological and market expansion benefits cannot be quantified in a meaningful way. Therefore, they are categorized as "substantial" to imply that they will, in all likelihood, lead to benefit levels of million dollar magnitudes over the long term.

Costs

There are four major costs that accrue from phasing out foreign fishing: (1) loss of excess foreign fishing fees; (2) loss of State Department benefits; (3) loss of "fish and chips" flexibility; and (4) increased administrative and enforcement costs as the US fishery develops. (Frequently on behalf of the entire economy, the State Department issues fishing rights to nations in exchange for non-fishing related concessions. For lack of a better term, these are called State Department benefits.)

In order to assess the costs of losing foreign fishing fees, it must be realized that these fees end up in the general treasury and are only indirectly transferred to NMFS through budget appropriations. It must be realized that, as the US fishery develops, there will be a concurrent reduction of foreign fishing fees.

The foreign fishing fees are primarily collected to cover the costs of monitoring and regulating foreign fishing in the FCZ. In the analysis that led to the establishment of these fees, there is no direct reference by NMFS that they are an attempt to generate revenues in excess of costs. Therefore, one could conclude that foreign fishing fees reflect only the costs to US taxpayers of allowing foreign fishing. NMFS has the authority to charge higher fees but has not fully exercised this authority. (The impacts of reducing foreign catch were discussed previously, see Impacts of Varying the Loligo and Illex IOY, DAH, and TALFF.)

The State Department may use foreign allocations to receive a political good, such as military access in a foreign nation or to receive an economic good such as the lowering of a tariff on US produced goods. These "goods" are both examples of what could be labeled as State Department benefits. These benefits should not be substantial, for relative to the sum total of all international negotiations, foreign allocations of east coast squid probably play an unimportant role. While they may help facilitate such negotiations, there are many other substitutes that can accomplish the same goal. (For example, the lowering of import duties on Spanish produced products and Japanese cars.)

Another cost that needs to be considered is the loss of "fish and chips" flexibility. If TALFFs are reduced, the ability to use foreign allocations of squid to countries to stimulate the development of other species is diminished. (For example, foreign allocations of squid may be granted to Spain if Spain promises to buy US processed mackerel or to reduce import duties on US processed butterfish.) On the east coast, the likely species for development are mackerel and the hakes. These species, in terms of world markets, are not as highly ranked as the squids. Therefore, the loss of "fish and chips" flexibility in this vein should not be substantial, especially when the purpose of "fish and chips" is to develop US exports.

As the US fishery develops, resources devoted toward the administration and enforcement of the regulations will incrementally increase. This incremental increase should not be substantial. The current level of management and enforcement is adequate until DAH approximates the maximum of the OY range. The only regulations that may potentially restrict US harvesters is when harvesting capacity exceeds the ABC minus allocated TALFF. When this occurs, the US fishery will have to be closed and harvesters will only be allowed to land the species in question as bycatch (no more than 10% of the vessel's total catch of all species). With shoreside processors having preferential access to US harvested squid, as long as joint ventures and TALFFs buffer the difference between shoreside landings and OY, these regulations are not likely to come into play. For the 1983-84 year, NMFS has estimated that shoreside landings are approximately 5,000 mt of Illex, 10,300 mt of Loligo, 5,000 mt of mackerel, and 10,000 mt of butterfish, which are 25,000 mt, 33,700 mt, 96,700 mt, and 5,000 mt less than maximum OY levels, respectively. The incremental costs of the administration and enforcement due to the expanding US fisheries should not be substantial during the next two fishing years, which is the life of the Plan.

Net Benefits of the Squid Regime

There is a strong potential for US exports and joint ventures to expand. The major consumers of squids are also the major harvestors. Their distant water fleets are and will be continously phased out of prime squid areas located in the Exclusive Economic Zones of other countries while the demand for squids in their home markets seems to be expanding. Furthermore, Loligo and Illex receive high, if not premium, prices relative to other substitutable squids in their home markets. It is likely that these forces alone will stimulate US exports even if TALFFs are not reduced. If TALFFs are reduced, the resulting shortage of squid to these consuming nations should stimulate exports further. One third of the supply of squid to Spain, the second largest consumer of squid in the world, comes from US waters. A prime example of this assertion exists in the butterfish regime where butterfish can only be taken as a bycatch to other foreign fisheries. Another example is the North Pacific Tanner Crab Regime where future TALFFs will be set to zero to stimulate exports.

In the butterfish fishery, TALFFs have steadily declined until 1982-83 (Table 26). In this last year. TALFF was set at 4,000 mt but was increased by 2.582 mt, the TALFF from the previous fishing year that was deferred under the Annual Fishing Level Provisions of the MFCMA. However,

allocations to foreign countries (the actual assignment of TALFF to specific foreign countries) has shown a decline with foreign catch correspondingly declining sharply to almost their lowest level since 1965 (Table 1). Over this same period, US domestic catch has increased dramatically to its highest level since 1965. While no specific butterfish export data exist, one can surmise that prior to 1976 there was little export of butterfish and, therefore, catch levels during the 1965 to 1976 period reflect domestic consumption. The highest level of domestic consumption would approximate 3,300 mt implying that in 1982 exports of butterfish were approximately 4,000 mt.

It is not completely accurate to state that the increase in butterfish harvest over the years has been primarily from the reduction in TALFFs, other factors need to be considered. For example, the demand for butterfish may have grown beyond directed foreign catch levels. More importantly, foreign countries may have purchased butterfish as a "chip" in consort with the NMFS ongoing "fish and chips" policy to gain access to other foreign fishing allocations. This "fish and chips" policy has been greatly enhanced by the most recent amendments of the MFCMA. Under these amendments, once a TALFF is determined, only half of the TALFF can be allocated amongst the foreign countries. Each country can only have its allocation increased after showing proof that it has expanded the US export market by such means as increased purchases of US fishery products or by reducing trade barriers to US fishery exporters. These MFCMA amendments should go a long way in stimulating exports and joint ventures; not only for the squid fisheries but to the mackerel fishery as well.

Potentially the benefits of the Amendment outweigh the costs. If the Amendment is unsuccessful in promoting exports, the loss borne by society will be only those foreign fees and economic profits of foreign suppliers that would have been produced in excess of the associated administrative cost of managing and monitoring foreign fishing activity. This loss should not be substantial. Loss of "fish and chips" flexibility and State Department benefits will be eventually forthcoming because of the trend toward increasing development of the US fishery, especially for export.

If there exists a one mt increase of exports for every one mt decline in foreign catch, it is obvious that the benefits will outweigh the costs. The analysis above shows that even if there is not a one for one replacement of export for foreign catch, the probability of the benefits outweighing the costs is quite high. On one hand, the benefits that the US receives from allowing foreign fishing seem to be low, especially when one considers that foreign fishing fees are assessed according to their administrative cost. On the other hand, the possibility of high exports due to reduced TALFFs is quite high when one considers: the history of the development of the butterfish fishery, that the largest foreign harvesters of squid are also the largest consumers and sellers of squid on the international market, that the world demand for squid seems to be rising, especially in the home markets of these foreign harvesters, and the ongoing growth in both the Loligo and Illex fisheries.

Impact and Benefit Cost Discussion of the Butterfish and Mackerel Regimes

Butterfish

One of the major objectives established in the original Butterfish Plan is the development of the US fishery for export. It was determined by the Council and approved by the Secretary that a reduction in the foreign butterfish fishery was a necessary initial step in accomplishing this goal. This reduction in foreign catch is not only designed to secure a greater potential export market for US processors, but also to provide the highest possible butterfish availability and catch per unit of effort for US harvesters in their still largely inshore and high cost (compared to other nations) butterfish fisheries. The OY for butterfish was accordingly set beneath the maximum sustainable yield level in the original Plan and its Amendments. Another major consideration in butterfish management is the fact that butterfish is a relatively large bycatch in the foreign Loligo fishery, and is a comparatively minor but consistent bycatch in other foreign fisheries.

Because of these considerations, the Plan established the butterfish TALFF (and thus in part, OY) as only that amount necessary for foreign nations to harvest their allocations of the squids, mackerel, and silver and red hake. This is in keeping with the policy established in the original Trawl Fisheries of the Northwest Atlantic PMP and the original Butterfish Plan.

The maximum US butterfish harvest equals 16,000 mt minus the bycatch TALFF. As discussed under the squid analysis, this may constrain the US industry to slightly less than the full amount of butterfish available for harvest, but is is preferable to reductions of the butterfish TALFF to beneath by-catch requirements and eventually, to zero, i.e., making butterfish a 'prohibited species' to foreign fleets. Using the bycatch percentage allocations in this Plan, the maximum butterfish TALFF would not exceed about 3,700 mt assuming a Loligo TALFF of 37,000 mt; Illex, silver and red hake, and mackerel TALFFs totalling 150,000 mt; and all TALFFs are allocated to foreign nations. The Amendment does not change these relationships although, to the extent that the Amendment fosters the reduction of the squid TALFFS, the butterfish TALFF will decrease proportionately. However, these decreases, and their impacts, are not significant. The butterfish bycatch in the Illex fishery is 1% of the allocated Illex TALFF. The 1983-84 Illex TALFF is 1,450 mt, so the butterfish bycatch TALFF is 14.5 mt. In the Loligo fishery the butterfish bycatch is 10%, so if all of the 1983-84 TALFF were allocated, the butterfish bycatch would be 1,100 mt, or about 7% of the maximum allowable butterfish catch (16,000 mt).

Mackerel

The mackerel regime provides a greater opportunity for the development of the US fishery. The mackerel regime operated under Amendments 1 and 2 to the Atlantic Mackerel Plan with an OY of 30,000 mt and a spawning stock size of less than 700,000 mt. Recent developments in the mackerel fishery, particularly with regard to joint ventures, led the Council to conclude that limiting the US fishery to 14,000 mt when there is no critical stock problem is too constraining on the development of that fishery. The minimum spawning stock size not only provides more flexibility for the development of the US fishery, but also provides an increased possibility for a directed foreign mackerel fishery which could in turn be used to provide incentives for foreign purchases of US harvested mackerel. Increasing the possibility of a directed foreign mackerel fishery adds mackerel to the list of species that are available for "fish and chips" bargaining. The intent is to make mackerel a target for development, particularly through joint ventures.

The Plan established 600,000 mt as the mackerel spawning stock size beneath which there exists no directed foreign fishery or a large scale US commercial fishery to balance the need to maintain a spawning stock size adequate to produce, under normal environmental conditions, average recruitment; maintain a total stock size large enough to provide ample opportunities for a successful recreational fishery; and provide for and promote the growth of the US commercial fishery, especially for export. The Plan recognized that the larger the spawning stock size, the larger the probability of both good recruitment and large recreational catch, even beyond 600,000 mt. The Plan also recognized that it is both impossible and undesirable to maintain constantly a mackerel stock size at the highest levels ever observed. It is reasonable to assume that, past some (unknown) level, increases in stock size do not influence recruitment/catch as much as natural environmental and other factors, and would not outweigh the losses to the commercial fishery that would be required. Maintaining the spawning stock at some intermediate level and limiting catch to an intermediate fishing rate (F0.1) was deemed a reasonable compromise which safeguarded all recreational and commercial interests. Technical discussions of the relationships between spawning stock size, recruitment, and sport catch are given in Anderson (1980) and Mid-Atlantic Council (1982a). The recreational catch projections are used to estimate DAH, they are not a specific recreational quota.

The Amendment does not change the basic mackerel regime. The Act requires that fishery management plans be based on the "best scientific information available" (National Standard 2). The NEFC has revised the estimate of natural mortality from 0.3 to 0.2, which was accepted by the Council. If the Amendment did not incorporate that change into the Plan, the Plan would not be based on the "best scientific information available". That change leads to three revisions to the mackerel regime. The maximum sustainable yield is changed from 210,000-230,000 mt to 152,000-182,000 mt. The spawning stock size below which a directed foreign fishery is allowed is reduced accordingly from 600,000 mt to 400,000 mt. Finally, the equation used to forecast the US recreational mackerel catch is revised.

The lower natural mortality rate, all other factors held equal, should imply faster growth in the stocks; i.e., 1984 spawning stock size is predicted to be 525,000 mt with the new natural mortality

rate rather than 472,000 mt with the old rate.

If the Amendment had been in effect for fishing year 1983-84, the OY would have been about 58,800 mt. Given that the combined US commercial, US recreational, and foreign catch of mackerel since 1977 has been below 15,000 mt. Therefore, while the Amendment would reduce the range of possible TALFFs by continuing the minimum 30,000 mt US allocation while lowering maximum possible catch, the impacts in terms of what has actually been happening in the fishery is insignificant.

It is logical to conclude that while butterfish and mackerel are at opposite ends of the spectrum in comparison to the squids, their bycatch relationships intertwine their future development. If their TALFFs were high enough to satisfy foreign demand of these species, there would be no demand by foreign nations to purchase US-caught fish. Obviously, the development of export markets for US-caught fish involves more than simply reducing foreign allocations. The Commerce Department has recently attempted to develop export markets by giving preferential allocations to foreign nations that agree to purchase US-harvested fish. The Council believes that the TALFFs in this Amendment are reasonable to achieve the objective, that is, low enough to provide some foreign demand for US-caught fish and high enough to permit effective implementation of the Commerce Department initiative of giving preferential allocations to foreign nations that agree to purchase US-harvested fish.

VI. Alternatives to the Proposed Amendment.

Because the more flexible squid OY adjustment mechanism intended by the Council was found not to be sufficiently supported in the Plan, NMFS implemented a limited squid OY adjustment mechanism provided for by the Plan. This assured that the Plan would be in place by the beginning of the 1983 fishing year, 1 April 1983. Since then, the intent of the Council to have a more flexible squid OY adjustment mechanism has been more clearly articulated and supported with attendant documentation.

The Council considers the alternatives presented within this Amendment to be appropriate under current and foreseeable future circumstances. The Council will also consider modifications of the alternatives as the result of public comments received after the completion of the public comment period.

The alternatives to the Amendment are:

1. **Take no action at this time.** This would mean that the Plan would continue in effect until 31 March 1986, unless otherwise amended. The limited squid adjustment mechanism would remain intact. Atlantic mackerel specifications would continue to be based upon a natural mortality rate of 0.30, instead of the most recent scientifically determined rate of 0.20. This would not allow determination of OY on as current a basis as possible for squid and would violate National Standard #2 in the case of mackerel.

2. **Prepare a Secretarial Amendment to Amend the Council Plan.** This would amend the Plan by adopting the more flexible squid adjustment mechanism contemplated by the Council. It would further provide for the best scientific information forming the basis of the Atlantic mackerel specifications. It would grant the RD, in consultation with the Council, the authority to adjust squid OYs based upon certain biological and economic information. It would allow the annual mackerel specifications to be based upon the most recent scientific assessment of natural mortality rate of 0.2. This alternative was considered because, if NMFS prepared the Secretarial Amendment, the Council staff would be able to work on other Plans. However, the alternative was rejected because of timing considerations.

VII. RIR Conclusions

The Amendment will not negatively impact the economy by $100 million or more. Even if foreign fishing is phased out completely, the loss in foreign fishing fees and expenditures for supplies would not be more than $10 million for either fishery. If the peak catch levels of foreign catches found in

Table 26 were multiplied by the corresponding foreign fishing fees the value would be approximately $5 million. These catch levels reflect the magnitude of foreign usage of their allocations when it is considered that prior to 1979-80 there was little direct management of these species and that TALFFs and allocations are seldom converted to actual catch. This $5 million when added to the estimate of $5 million worth of purchases of US goods and services by foreign vessels is far below $100 million. Furthermore this sum or joint ventures will have to be discounted by the benefical impacts of any increased exports (increased taxes from US citizens, increased employment, foreign exchange earnings, and reduced management costs due to lower foreign fishing.)

There should not be a major increase in the costs or prices for consumers, if anything consumers will be consuming higher quality products at lower prices given the technology transfer effects and market development of the Amendment. Since the Amendment is not restricting or distributing rights to the the supply of fish there should be no major increase in prices or costs to industry or to governmental agencies beyond present levels. Adequate safeguards are present such that US vessels and processors operating for supplying domestic markets will not be restricted unless for biological reasons.

The main objective of the Plan is to increase the competitiveness of the US fishermen in the world market, increase employment opportunities and investment , increase overall fishery productivity and promote US exports. There are no significant adverse effects in this area except on a very local level, those suppliers of goods and services located around the New York Harbor that supply foreign fishing vessels. How strongly they are impacted depends on what proportion of their business relies on foreign fishing vessels; this is unknown.

The Amendment would guarantee foreign nations at least a squid bycatch TALFF and would replace the squid Reserves with a procedure for inseason adjustments to OY, DAH, and TALFF, thus increasing management flexibility.

The Plan does not include a guaranteed bycatch TALFF. Without this provision, it is quite possible for the TALFFs to be zero, resulting in prohibited species designation, which means that foreign fishermen may catch but must discard the particular species. The Council's long term policy has been that such a situation wastes the resource and it is preferable to set aside a specific bycatch TALFF. This policy is incorporated in the provisions of the Plan for both mackerel and butterfish. This Amendment would extend the policy to the squids.

The Plan has flexibility in the setting of OY and DAH, but requires that the difference between initial OY and initial DAH be divided equally between TALFF and Reserve. The squid fisheries have developed to the point where the concept of Reserves is inadequate. The automatic division of the difference between initial OY and initial DAH equally between TALFF and Reserve can create initial TALFFs that are smaller than bycatch requirements while adjustments cannot be made until well into the fishing year. The concept also constrains adjustments to DAH and TALFF that might be necessary for joint ventures that involve direct harvest by foreign nations along with purchases from US vessels.

The Amendment would have an impact on foreign fisheries in that it may reduce foreign catch of the subject species. As a consequence, there would be a loss of revenue from foreign fishing fees to the US. However, the long-term economic benefits to the private and public sectors of successful US export, joint venture, and recreational fisheries would far outweigh any short-term losses.

The US fisheries for both Loligo and Illex also have begun to develop in response to foreign demand, and the Council has determined that protection of this growing US export industry is an important consideration for this Amendment. Support of US industry efforts to enter international squid markets will be especially important over the next few years, while the new US industry is still highly vulnerable to foreign competition.

The Amendment is responsive to squid stock conditions, whereas the Plan is not. The Plan does not specifically provide for the reduction of the annual squid OYs from the maximum values for

biological reasons, only for economic reasons. This Amendment, by introducing the concept of a ABC, which is the biologically acceptable upper catch limit for the squids for a particular year, explicitly accounts for stock assessment considerations prior to any adjustment to the OYs for economic reasons.

The primary difference between the Amendment and the Plan is the increased flexibility in the squid regime with Amendment relative to the Plan. The Amendment replaces the squid Reserves with a provision that the TALFF may be adjusted during a year from its initial value to a value that is judged to be in the best interests of the nation. This is important because, in the past, there have been indications that foreign nations did not purchase US harvested fish early in the year in order to keep US catch levels down and, thereby, improve the chances of the Reserve being allocated to TALFF. However, foreign nations are guaranteed a bycatch TALFF the same as with mackerel and butterfish. Also, the Plan sets specific values at the beginning of each year for DAH and DAP for the squids, which may be changed only by allocations from the Reserve. With the Amendment, DAH, DAP, and OY are all subject to adjustment during a year if events warrant. The resulting system for the squids can reflect the dynamic nature of the fishery during any year, the constraints on this flexibility being the biological one of ABC plus the guaranteed bycatch TALFF and the fact that TALFF, once actually allocated, cannot be taken away.

The mackerel regime is changed in the Amendment relative to the Plan. The mackerel spawning stock size above which a directed foreign mackerel fishery is possible was lowered from 600,000 mt to 400,000 mt. The equation used to estimate of the capacity of the recreational mackerel fishery was revised. These revisions were made to reflect the changed mackerel natural mortality rate estimate. They do not represent changes in management policy, but only revisions necessary so the Plan is based on the best and most recent scientific information.

In conclusion, there is a good chance that the Amendment will be successful in promoting exports. Potentially the Amendment will not only increase industry profits, management flexibility, income, and employment while reducing administrative cost and the national trade deficit, but will also hasten the attainment of the fishery development goals of the MFCMA.

VIII. Impacts of the Amendment Relative to the Regulatory Flexibility Act and the Paperwork Reduction Act of 1980

The RFA required the examination of the impacts on small businesses, small organizations, and small jurisdictions. A "small business" is one that is independently owned and operated and is not dominant in its field of operation. A "small organization" is any not-for-profit enterprise that is independently owned and operated and is not dominant in its field. A "small governmental jurisdiction" is a governmental jurisdiction with a population of less than 50,000. Foreign busineses, organizations, and governmental jurisdictions are not counted as "small entities" because the RFA was intended to protect small US entities.

The Plan and this Amendment do not adversely impact US fishermen and processors, but places the burden of regulation on foreign harvesters. Only through reductions in TALFF will there be a potential negative impact on US companies that supply foreign fishing vessels with fuel and supplies. Estimates of the annual value of foreign supply expenditures range from $1 to $5 million annually for all east coast foreign fisheries. It is not known whether these businesses are small or large; nor is the degree to which their profits depend on serving foreign fishing vessels known. Since most of the foreign vessels are supplied out of the Port of New York, the dependency is probably small for foreign fishing vessels are probably a small percentage of the total foreign vessel traffic in this harbor. Furthermore, foreign vessels may fish in the FCZ from mid-June through March and do not require servicing year round. The losses of these businesses may not be substantial since foreign vessels may increase their harvest of other species such as mackerel and, while reduced TALFFs may lead to lower foreign harvests, they may lead to increased joint ventures, where the foreign processing vessels will require supplies.

With respect to small entities, the Plan enhances the potential for increased profits by those companies involved in domestic harvesting, processing, joint ventures, and selling supplies to US vessels and processors. As of 30 June 1983, 1,047 US commercial vessels were licensed for squid,

711 for butterfish, and 1,262 for mackerel. Over the past few years, many of these vessels have gone from catching squid as a bycatch to fully directing on squid. There have been nine different US joint venture companies formed over the last three years, many of which have joint venture agreements with two different countries. Many of these joint ventures use three to twelve US fishing vessels. Based on comment letters received by the Council, there are approximately 20 known squid processors. The number of US companies that supply these vessels is large, for the US vessels fish out of ports that range from Maine to North Carolina. Supply purchases by US vessels should outweigh the range and level of purchases foreign vessels have been making (see RIR discussion). By reducing TALFF, exports and joint ventures should increase, the profit potential of all of these sectors should also increase. In conclusion, the Plan should not significantly impact "small" businesses in a negative way but actually provide conditions in which "small" businesses can expand and improve upon their profits.

Small governmental jurisdictions should be positively impacted to the extent that US fishing vessels and processors profit from the Plan. Most US fishing ports are small governmental jurisdictions, and to the extent that the economic condition of the fishing industry in those ports is improved, the overall economic condition of the ports should be improved.

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

The Plan decreased the paperwork burden from that of the previous individual plans for Atlantic mackerel, squid, and butterfish. This Amendment makes no change in the reporting requirements relative to the Plan currently in effect, which is the minimum level acceptable for sound management.

REFERENCES

Anders, N., V. Norton, and I. Strand. 1982. An evaluation of potential export markets for selected US fish products. Tech. Rpt. Maryland Sea Grant Prog. UM-SG-TS-82-03.

Anderson, L.G. and R.F. Settle. 1977. Benefit - cost analysis: a practical guide. Lexington Books. Toronto.

Anderson, E.D. 1982. Status of the northwest Atlantic mackerel stock - 1982. NMFS, NEFC, Lab. Ref. No. 82-44.

_____ 1981. Status of the northwest Atlantic mackerel stock - 1981. NMFS, NEFC, Lab. Ref. No. 81-38.

_____ 1980. Status of the northwest Atlantic mackerel stock - 1980. NMFS, NEFC, Lab. Ref. No. 80-29.

Beck, P.C., E.G. Dawe, and J. Drew. 1982. Breakdown of short-finned squid catches in NAFO subarea 3 and division 4R for 1980 and biological characteristics for Newfoundland inshore commercial samples and early season offshore samples. NAFO SCR Doc. 82/VI/27, Serial No. N515.

Canada. 1982. Imports (Nov. 1982), Vol. 4, No. 11; Exports (Nov. 1982), Vol. 4, No. 11; Landings (Oct. 1982), Vol. 4, No. 10. Reports prepared by Economic Policy Branch. Econ. Dev. Dir. Fish. Econ. Dev. and Marketing Fish. and Oceans. Government of Canada.

Combs, E.R., Inc. 1979. A study to determine the export and domestic markets for currently underutilized fish and shellfish. NMFS Contract No. MO-A01-79-00-4037.

Court, W. 1980. Japan's squid fishing industry. Mar. Fish. Rev., Vol. 42(7-8): 1-9.

_____. 1982. Japan's squid market. Proceedings of the International Squid Symposium, Aug. 9 - 12, 1981, Boston, MA. Ed. by New England Fish. Dev. Found., Inc. UNIPUB. New York.

Development Planning and Research Associates, Inc. 1983. Quarterly review European frozen fish markets, period Oct. - Dec. 1982. Prepared for Services Division, Utilization and Development Branch, Northeast Region, NMFS, NOAA, US Dept. of Comm.

DuPaul, W. and S. Baker. 1979. The economic impact and status of the offshore fishing industry in Virginia. VIMS, College of William and Mary. SCAMSOE No. 225.

Earl, P. 1977. Overseas squid marketing information, 1977. Unpublished memorandum to members of the Squid Industry dated 18 Mar. 1977. Fish. Dev. Ser. Branch, NMFS.

Fishing News International. 1983. Row as Mexico squid hopes are dashed. Fishing News International, Vol. 22, No. 2, Feb. 1983.

Food and Agriculture Organization of the United Nations. 1982. FAO commodity review and outlook 1981 - 1982. FAO Economic and Social Development Series No. 22 (Past issues as well). Rome, Italy.

_____. 1982. Yearbook of fishery statistics (past issues as well). Rome, Italy.

Georgianna, D., P. Greenwood, R. Bara, and R. Ward. 1981. Fish processing capacity in Massachusetts and New Hampshire. Unpublished manuscript prepared for: New England Fisheries Development Program, NMFS Contract 03-07-043-35632.

Holt, J. 1982. Personal communication. Atlantic Shelf Fisheries Company of Hampton, VA.

Hu, T., D.R. Whitaker, and D.L. Kaltreider. 1983. The New England groundfish industry, an economic profile for policy and regulatory analysts. Contracted by National Fisheries Institute in cooperation with NMFS. VA. NTIS.

International Commission for the Northwest Atlantic Fisheries. 1952-1979. Statistical bulletins for the years 1951-1977 (Vols. 1 - 27). NAFO. Dartmouth, Canada.

Japan. 1982. Monthly statistics of agriculture, forest and fisheries. Provided through personal communication with Dick Surdi. NMFS. Washington, DC.

Japan Deep Sea Trawlers. 1980. A program to assist the development of the US fisheries industry. Unpublished document presented to the Mid-Atlantic Council as a comment to Amendment #3 (then referred to as Amend. #2) to the Atlantic Mackerel, Squid and Butterfish FMPs. Sept. 1980.

Jarman, N. 1982. Development of a world resource (Squid): the New Zealand experience. Proceedings of the International Squid Symposium Aug. 9 - 12, 1981, Boston, MA. Edited by New England Fisheries Development Foundation, Inc. UNIPUB. New York.

Juanico, M. 1982. South American squid fisheries: some new aspects. Proceedings of the International Squid Symposium Aug. 9 - 12, 1981, Boston, MA. Edited by New England Fisheries Development Foundation, Inc. UNIPUB. New York.

Kindleberger, C.P. 1968. International economics (4th Edition). Richard D. Irwin, Inc. Homewood.

Lacerda, J. 1983. Personal communication. NMFS Utilization and Development Branch.

Lange, A. and K. Johnson. 1978. Dorsal mantle length - total weight relationship of squid (Loligo pealei and Illex illecebrosus) from the Northwest Atlantic, off the coast of the US. NMFS, NEFC, Lab. Ref. No. 78-51.

Lange, A.M.T. 1982. Status of the squid Loligo pealei and Illex illecebrosus) populations off the northeastern USA. NMFS, NEFC, Lab. Ref. No. 82-27. 20 p.

Mid-Atlantic Fishery Management Council. 1982a. Relationship between stock abundance and recreational mackerel catch.

_____. 1982b. Incidental catch relationships among the foreign fisheries for the squids, Atlantic mackerel, butterfish, and the hakes.

Milnes, J. 1982a. Perspective on the Spanish squid market. Proceedings of the International Squid Symposium Aug. 9 - 12, 1981, Boston, MA. Edited by New England Fisheries Development Foundation, Inc. UNIPUB. New York.

_____. 1982b. Marketing squid in Southern Europe. Proceedings of the international squid symposium Aug. 9 - 12, 1981, Boston, MA. Edited by New England Fisheries Development Foundation, Inc. UNIPUB. New York.

Murawski, S.A. and G.T. Waring. 1979. Biological and fisheries data on butterfish, Peprilus triacanthus, in the northwestern Atlantic Ocean. Trans. Am. Fish. Soc. 108(5): 427-439.

Northwest Atlantic Fisheries Organization. 1981. Provisional nominal catches in the northwest Atlantic, 1980. S:N366. Doc 81/VI/15.

_____. 1982a. Provisional nominal catches in the northwest Atlantic, 1981. S:N569. Doc 82/VI/7.

_____. 1982b. Provisional Catch Statistics. Oct., 1982.

Ohtagaki, I. 1983. Traders must keep a wary eye on imports. In: Fish. News Internat'l. Feb. 1983.

Organization for Economic Cooperation and Development. 1982a. International trade in fish products: effects of the 200 mile limit. Paris, France.

_____. 1982b. Statistics of foreign trade monthly bulletin. Dec. 1982. Paris, France.

_____. 1982c. Review of fisheries in OECD member countries (1981). Paris, France. (past issues as well.)

Peterson, S. and L. Smith. 1979. New England fishing, processing and distribution. WHOI, Woods Hole, MA. Tech. Rep. WHOI-79-52.

Raynes, G.W. 1982. The Canadian experience in marketing squid. Proceedings of the International Squid Symposium 9-12 Aug., 1981, Boston, MA. Edited by New England Fisheries Development Foundation, Inc. UNIPUB. New York.

Strand, I. 1980. An economic analysis of Atlantic squid (Loligo) allocations to Spain. Unpub. contract report to the National Fisheries Institute.

Taguchi, K. 1983. Japan world's number-one fishing nation. Fish. News Internat'l. Vol. 22(2).

Tax Foundation, Inc. 1981. Facts and figures on government finances. 21st Biennial Edition. Tax Foundation, Inc. US.

US Dept. of Comm. 1982. Status of the fishing resources off the Northeastern US for 1981. Resource Assessment Division, NEFC. NOAA Tech. Memo. NMFS-F/NEC-12, Woods Hole, MA.

_____. 1983a. The latest developments in Latin American fisheries. NMFS. IFR-83/84.

_____. 1983b. Fisheries of the United States. NMFS. 8300.

_____. 1983c. European frozen fish report. (Various issues). Utilization and Development Branch, NMFS. Boston, MA.

_____. 1983d. Boston market news reports. B-10, 24 Jan., 1983. NMFS. Gloucester, MA.

_____. 1983e. Foreign fishery developments. NOAA, NMFS, Marine Fisheries Review, Vol. 45, No. 1, Jan. 1983.

US Senate Comm. on Commerce, Science, and Transportation. 1982. Press Release, 1 Sept., 1982.

Unknown. 1977. Description of the Spanish squid fishery. Report submitted to the Mid-Atlantic Council, Feb. 1977.

Waring, G.T. 1980. Status of the northwestern Atlantic butterfish stock, July, 1980. NMFS, NEFC, Lab. Ref. No. 80-22.

Table 1. US Commercial, US Recreational, and Foreign Catches of Squid, Atlantic Mackerel, and Butterfish, Calendar Year 1965-1982 (metric tons)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Loligo		Illex		Squid	Atlantic Mackerel				Butterfish		
Year	US Comm.	Foreign in FCZ	US Comm.	Foreign in FCZ	Foreign outside FCZ	US Comm.	US Rec.	Foreign in FCZ	Foreign outside FCZ	US Comm.	Foreign in FCZ	Foreign outside FCZ
1965	709	99	444	78	8,000	1,998	4,292	2,540	11,590	3,340	749	-
1966	722	226	452	118	5,000	2,724	4,535	6,707	12,821	2,615	3,865	-
1967	547	1,130	707	285	7,000	3,891	4,498	18,985	11,243	2,452	2,316	-
1968	1,084	2,327	678	2,593	98	3,929	7,781	56,043	20,838	1,804	5,437	-
1969	899	8,643	562	975	-	4,364	13,050	108,811	18,636	2,438	15,378	15
1970	653	16,732	408	2,418	1,385	4,049	16,039	205,568	21,006	1,869	12,450	13
1971	727	17,442	455	159	8,906	2,406	16,426	346,338	24,496	1,570	8,913	3
1972	725	29,009	472	17,169	1,868	2,006	15,588	385,358	22,360	819	12,221	14
1973	1,105	36,508	530	18,625	9,877	1,336	10,723	379,829	38,550	1,557	31,679	-
1974	2,274	32,576	148	20,480	437	1,042	7,640	293,883	44,655	2,528	15,465	3
1975	1,621	32,180	107	17,819	17,744	1,974	5,190	249,005	36,258	2,088	12,764	119
1976	3,602	21,682	229	24,707	41,767	2,712	4,202	205,956	33,065	1,528	14,309	73
1977	1,088	15,586	1,024	23,771	83,480	1,377	522	53,664	22,765	1,447	2,846	-
1978	1,291	9,355	385	17,310	92,684	1,605	6,571	371	25,899	3,563	1,324	-
1979	4,252	13,068	1,780	15,742	162,091	1,990	3,315	63	30,612	2,707	835	-
1980	3,996	19,750	349	17,529	69,527	2,683	3,900	399	20,500	5,348	884	-
1981	2,316	13,566	631	14,723	29,666	2,951	4,000	5,282	19,319	4,801	681	-
1982	4,864	15,821	5,772#	12,965	*	3,382	*	2,280	*	8,036	819	*

- = zero.
* = data not available.
# = The 5,772 mt reported by NMFS may significantly understate 1982 Illex landings. Processors from only 2 ports have reported to the Council that they handled 9,400 mt.

1982 US Illex and Loligo commercial landings from NMFS Quota Report as of 31 December 1982.
1982 foreign landings and mackerel and butterfish from Fisheries of the US 1982. NMFS Current Fishery Statistics No. 8300.

Area and Sources:

1. NAFO/ICNAF SA 5 and 6. From Lange, 1982 (NEFC Lab. Ref. Doc. No. 82-27).
2. NAFO/ICNAF SA 5 and 6. From Lange, 1982 (NEFC Lab. Ref. Doc. No. 82-27).
3. NAFO/ICNAF SA 5 and 6. From Lange, 1982 (NEFC Lab. Ref. Doc. No. 82-27).
4. NAFO/ICNAF SA 5 and 6. From Lange, 1982 (NEFC Lab. Ref. Doc. No. 82-27).
5. NAFO/ICNAF SA 1-4 (includes Canada). From NAFO Statistical Bulletins.
6. NAFO/ICNAF SA 5 and 6. 1965-1981 from Anderson (1982).
7. NAFO/ICNAF SA 5 and 6. 1965-1981 from Anderson (1982).
8. NAFO/ICNAF SA 5 and 6. 1965-1980 from Anderson (1981). 1981 from provisional nominal catches in northwest Atlantic, 1981 (NAFO, Serial No. N569).
9. NAFO/ICNAF SA 1-4 (includes Canada). From NAFO Statistical Bulletins.
10. NAFO/ICNAF SA 5 and 6. 1965-1978 from Murawski and Waring (1979) and Waring (1980). 1979-1981 from NAFO Statistical Bulletins.
11. NAFO/ICNAF SA 5 and 6. From NMFS foreign fishing quota reports (NEREIS series).
12. NAFO/ICNAF SA 1-4 (includes Canada). From NAFO Statistical Bulletins.

Table 2. Loligo and Illex Ex-Vessel Prices ($/pound) by State, 1978-1982

	ME	NH	MA	RI	CT	NY	NJ	VA	NC
					Loligo				
1978	.15	N/A	.41	.51	N/A	N/A	.37	N/A	N/A
1979	.16	N/A	.39	.36	N/A	N/A	.38	N/A	N/A
1980	.15	N/A	.31	.38	N/A	.37	.34	.24	N/A
1981	.33	.28	.39	.49	.48	.50	.48	N/A	N/A
1982	N/A	N/A	.41	.07*	.38	.45	.34	.30	.32
					Illex				
1978	.12	N/A	.10	.10	N/A	N/A	N/A	N/A	.50
1979	.19	N/A	.20	.15	N/A	N/A	N/A	N/A	N/A
1980	.11	N/A	.10	N/A	N/A	.08	N/A	N/A	N/A
1981	.17	N/A	.12	N/A	.50	N/A	N/A	N/A	N/A
1982	.25	N/A	.12	N/A	N/A	N/A	.12	.12	N/A

* This price appears to be questionable.
N/A = Not available.
Source: unpublished NMFS Statistics.

Table 3. Average Ex-Vessel Price and Revenue, 1978-1982
(Ex-vessel price in $/pound, Revenue in thousands of dollars)
(Deflated using Consumer Price Index, 1967 = 100)

	Loligo				Illex			
	Ex-Vessel Price		Revenue		Ex-Vessel Price		Revenue	
	Nominal	Deflated	Nominal	Deflated	Nominal	Deflated	Nominal	Deflated
1978	.48	.25	1,366	699	.10	.05	85	44
1979	.38	.17	3,563	1,639	.20	.09	785	361
1980	.35	.14	3,085	1,250	.10	.04	77	31
1981	.47	.17	2,399	882	.12	.04	167	61
1982	.39	.13	4,182	1,394	.12	.04	1,527*	508*

	Total Revenue	
	Nominal	Deflated
1978	1,451	743
1979	4,348	2,000
1980	3,162	1,281
1981	2,566	943
1982	5,709*	1,093*

* These values could be substantially higher, see note "#" on Table 1.
Source: Calculated from data in Tables 1 and 2.

Table 4. US Exports (metric tons) of Squid from East Coast Ports

Nation	Form	1978	1979	1980	1981	1982	1982 Share
Belgium & Luxemburg	Frozen	-	-	-	-	2	*%
Bermuda	Canned	4	2	2	2	11	
	Frozen	-	-	-	3	1	
	Total	4	2	2	5	12	*%
Canada	Canned	34	-	-	39	93	
	Frozen	-	-	-	55	540	
	Total	34	-	-	94	634	23%
Canary Islands	Frozen	-	-	-	14	-	-
France	Canned	-	-	16	-	-	
	Frozen	-	-	-	51	-	
	Total	-	-	16	51	-	-
Greece	Canned	1,509	1,156	2,620	627	51	2%
Iceland	Frozen	-	-	-	-	755	27%
Italy	Canned	-	-	-	-	14	
	Frozen	-	-	-	28	110	
	Total	-	-	-	28	123	4%
Japan	Canned	-	-	-	-	36	
	Frozen	-	-	-	112	127	
	Total	-	-	-	112	164	6%
Israel	Frozen	-	-	-	-	*	*%
Netherlands	Frozen	-	-	-	30	-	-
Norway	Frozen	-	-	-	-	120	4%
Portugal	Frozen	-	-	-	142	212	8%
Rep. of South Africa	Frozen	-	-	-	46	10	*%
Spain	Canned	-	-	41	-	-	
	Frozen	-	-	-	11	573	
	Total	-	-	41	11	573	21%
Taiwan	Frozen	-	-	-	-	38	1%
United Kingdom	Frozen	-	-	-	47	74	3%
German Federal Rep.	Canned	-	15	-	-	-	
	Frozen	-	-	-	1	21	
	Total	-	15	-	1	21	1%
Total	Canned	1,546	1,173	2,678	668	205	
	Frozen	-	-	-	538	2,584	
	Total	1,546	1,173	2,678	1,204	2,786	

* = less than 0.5 mt or 0.5%; - = Zero
Source: Unpublished NMFS Statistics

Table 5. Value (thousands of $) of US Exports of Squid from East Coast Ports

Nation	Form	1978	1979	1980	1981	1982	1982 Share
Belgium & Luxemburg	Frozen	-	-	-	-	3	*%
Bermuda	Canned	6	3	3	3	46	
	Frozen	-	-	-	5	2	
	Total	6	3	3	8	47	*
Canada	Canned	10	-	-	91	70	
	Frozen	-	-	-	160	1,292	
	Total	10	-	-	251	1,362	23%
Canary Islands	Frozen	-	-	-	30	-	
France	Canned	-	-	58	-	-	
	Frozen	-	-	-	75	-	
	Total	-	-	58	75	-	-%
Greece	Canned	1,233	618	1,310	592	57	2%
Iceland	Frozen	-	-	-	-	730	27%
Italy	Canned	-	-	-	-	14	
	Frozen	-	-	-	62	168	
	Total	-	-	-	62	183	4%
Japan	Canned	-	-	-	-	32	
	Frozen	-	-	-	185	162	
	Total	-	-	-	185	194	6%
Israel	Frozen	-	-	-	-	1	*%
Netherlands	Frozen	-	-	-	37	-	-%
Norway	Frozen	-	-	-	-	180	4%
Portugal	Frozen	-	-	-	273	112	8%
Rep. of South Africa	Frozen	-	-	-	53	14	*%
Spain	Canned	-	-	10	-	-	
	Frozen	-	-	-	13	1,068	
	Total	-	-	10	13	1,068	21%
Taiwan	Frozen	-	-	-	-	146	1%
United Kingdom	Frozen	-	-	-	84	172	3%
German Federal Rep.	Canned	-	12	-	-	-	
	Frozen	-	-	-	2	38	
	Total	-	12	-	2	38	1%
Total	Canned	1,546	1,173	1,380	686	219	
	Frozen	-	-	-	978	4,087	
	Total	1,546	1,173	1,380	1,664	4,301	

* = Less that $500 or less than 1%; - = Zero
Source: Unpublished NMFS Statistics

Table 6. Summary of Joint Venture Activities in the Northwest Atlantic Ocean

Year	Flag State	US Partner	Species	Tonnage	Permit Status
1981	Japan	Lund's Fisheries	Loligo	1,000	issued
1982	Bulgaria	Joint Trawlers	A. mackerel	6,000	issued
			Loligo	2,000	issued
			Illex	1,000	issued
	Italy	Fass Brothers	Loligo	800	issued
			Illex	800	issued
	Japan	Lund's Fisheries	Loligo	1,000	issued
	Poland	Oceanside Fisheries	A. herring	4,000	issued
	Portugal	Lund's Fisheries	Illex	400	issued
		Lund's Fisheries & Joint Trawlers	Illex	1,400	issued
	USSR	Mid-Atlantic Fishery Export Corporation	A. mackerel	6,500	withdrawn
			Silver hake	13,000	withdrawn
			Red hake	4,000	withdrawn
	GDR	Joint Trawlers	Loligo	2,500	issued
			A. mackerel	5,000	issued
1983	GDR	Joint Trawlers	Loligo	2,500	approved*
			A. mackerel	5,000	issued
	Italy	Sea Harvest, Inc. (Intn'l Seafoods)	Illex	5,950	issued
			Loligo	6,000	issued
	Japan	Charles Stinson	Loligo	300	denied
			A. mackerel	300	denied
			Butterfish	1,000	denied
		Lund's Fisheries (1)	Illex	850	issued
			Loligo	1,000	issued
		Lunds's Fisheries (2)	Butterfish	1,000	pending
			A. mackerel	300	pending
			Loligo	300	pending
	Portugal	Lund's Fisheries	Illex	8,500	issued
		Joint Trawlers	Illex	2,550	issued
		Scan Ocean, Inc.	Illex	4,250	issued
			Loligo	3,000	issued
		Robert Metafora	Loligo	1,500	issued
	Spain	Sea Harvest, Inc. (1)	Illex	2,800	denied
			Loligo	1,300	issued
		Sea Harvest, Inc. (2)	Illex	1,400	denied
			Loligo	1,400	issued
		Stonavar	Loligo	2,000	issued
		Shoreside Co.	Loligo	2,500	issued
	USSR	Scan Ocean, Inc.	Illex	12,000	denied
			Loligo	200	approved*
			A. mackerel	500	pending

* joint venture approved, permit pending.

Table 7. Estimated Annual Squid Receipts (lbs.) and Wholesale Prices ($/lb.) from Fulton Fish Market, 1978-1982

	Landings	Nominal	Deflated
1978	1,600,000	$ .87	$ .45
1979	2,100,000	.71	.33
1980	2,300,000	.68	.28
1981	2,200,000	.81	.30
1982	2,500,000	.71	.25

Prices based on Tuesday and Thursday price quotes.
NMFS Market News Reports 1978-1982 (New York).
Deflated using Consumer Price Index, 1967 = 100.

Table 8. Foreign Catch (metric tons) by Species by Country by Fishing Year

		1981-82			1982-83
	Species	Total	As of 2/6/82	Between 2/6 & 3/31/82	As of 2/5/83#
Italy	Mackerel	1,869	*	100%	66
	Butterfish	67	60	10	215
	Loligo	3,265	2,434	25	3,535
	Illex	3,214	2,903	10	5,651
Japan	Mackerel	159	*	100	99
	Butterfish	303	145	52	210
	Loligo	1,930	1,336	31	2,088
	Illex	4,197	4,161	1	2,676
Spain	Mackerel	77	1	99	116
	Butterfish	147	49	67	88
	Loligo	8,260	5,292	36	3,358
	Illex	7,572	6,919	9	3,669
Total	Mackerel	2,104	1	100	281
	Butterfish	516	254	51	514
	Loligo	13,454	9,061	33	8,981
	Illex	14,982	13,983	7	12,003

= last month for which species by nation data are available.
* = less than 0.5 mt.
Source: Unpublished NMFS statistics.

Table 9. Squid Landings (thousands of metric tons) by Major Harvesting Nations

Nation	Species	1975	1976	1977	1978	1979	1980
Argentina	**Illex illecebrosus**	**4**	**7**	**2**	**59**	**87**	**9**
Canada	**Illex illecebrosus**	**3**	**11**	**31**	**36**	**90**	**30**
China	**Squids not elsewhere included**	**-**	**36**	**40**	**62**	**42**	**43**
Indonesia	**Loligo spp.**	**10**	**8**	**7**	**9**	**13**	**11**
Italy	Loligo pealei	3	3	2	1	2	1
	Loligo spp.	5	4	6	4	6	7
	Todarodes saggittatus	3	3	4	3	3	3
	Squids not elsewhere included	-	-	2	-	1	3
	Total	**11**	**10**	**14**	**8**	**12**	**14**
Japan	Loligo pealei	11	5	8	3	3	6
	Illex illecebrosus	3	6	8	8	34	28
	Todarodes pacificus	358	281	218	216	213	312
	Nototodarus sloani	19	20	27	26	21	44
	Squids not elsewhere included	116	155	210	242	234	279
	Total	**507**	**467**	**471**	**495**	**505**	**669**
Korea	Todarodes pacificus	40	45	18	18	26	48
	Squids not elsewhere included	19	28	20	23	22	21
	Total	**59**	**73**	**38**	**41**	**48**	**69**
Mexico	Loligo devli	-	-	-	1	4	-
	Illex illecebrosus	-	-	-	3	4	1
	Loligo spp.	-	1	1	3	11	19
	Total	**-**	**1**	**1**	**7**	**19**	**20**
New Zealand	**Nototodarus sloani**	**-**	**-**	**1**	**2**	**7**	**-**
Phillipines	**Loligo spp.**	**30**	**24**	**25**	**26**	**25**	**27**
Poland	Illex illecebrosus	7	8	4	2	11	1
	Squids not elsewhere included	-	-	-	4	15	13
	Total	**7**	**8**	**4**	**6**	**26**	**14**
Portugal	Illex illecebrosus	-	-	-	1	2	2
	Squids not elsewhere included	1	1	1	1	1	3
	Total	**1**	**1**	**1**	**2**	**3**	**5**
Spain	Loligo pealei	8	9	5	5	5	8
	Loligo spp.	22	12	6	20	13	16
	Illex illecebrosus	4	7	13	18	13	17
	Todarodes saggittatus	2	2	-	-	-	-
	Total	**36**	**30**	**24**	**33**	**31**	**51**
Thailand	**Loligo spp.**	**38**	**36**	**52**	**52**	**42**	**33**
US	Loligo pealei	-	1	1	1	4	4
	Loligo spp.	11	9	9	17	16	-
	Illex illecebrosus	-	1	-	2	-	-
	Squids not elsewhere included	2	2	1	1	1	12
	Total	**13**	**13**	**11**	**21**	**21**	**16**
USSR	Loligo pealei	-	1	-	-	-	-
	Illex illecebrosus	14	24	27	9	9	7
	Squids not elsewhere included	26	17	48	12	47	44
	Total	**40**	**42**	**75**	**21**	**56**	**51**
All Nations	Loligo pealei	25	21	16	11	17	19
	Loligo spp.	124	103	115	139	133	121
	Illex illecebrosus	40	78	108	153	275	108
	Nototodarus sloani	19	20	27	27	28	44
	Todarodes pacificus	399	326	226	234	239	360
	Todarodes saggittatus	4	5	4	3	5	5
	Squids not elsewhere included	192	274	348	371	415	462
	Total	**803**	**827**	**844**	**938**	**1,112**	**1,119**

Loligo spp. = L. vulgaris (European common squid), L. patagonica (Falkland Islands squid), L. opalescens (California squid), and L. indicus (Asian common squid).
Source: FAO Yearbook of Fishery Statistics, 1975-1980.

Table 10. Japanese Squid and Cuttlefish Imports (metric tons), 1978-1980

	Cuttlefish	Squid	Total	Squid as % of total
1978	42,897	75,245	118,142	62.7%
1979	48,206	107,662	155,868	69.1
1980	39,139	55,236	94,375	58.5

Source: Court, 1982.

Table 11. Japanese Annual Imports (metric tons) of Squid and Cuttlefish, 1967-1982

Year	Imports	Year	Imports	Year	Imports	Year	Imports
1967	5,000	1971	22,000	1975	59,000	1979	156
1968	9,000	1972	28,000	1976	69,000	1980	94
1969	9,000	1973	29,000	1977	75,000	1981	71,000
1970	15,000	1974	45,000	1978	118,000	1982	83,000*

* As of October 1982.
1967-76 - Combs (1978); 1977-79 - Japan Deep Sea Trawlers Assoc. (1980); 1980 - OECD (1981); 1981-82 -Japan (1981-82).

Table 12. Japanese Imports (thousands of mt) of Cuttlefish and Squid, by Nation, 1977-1982

	1977	1978	1979	1980	1981	1982*
Korea (1)	20	27	32	18	24	14
Taiwan	2	4	4	1	1	-
Thailand (2)	8	10	11	8	11	9
Yemen	5	2	2	5	2	-
Iceland	3	2	3	-	-	-
France	2	2	2	1	-	1
Spain (2)	8	14	15	10	12	11
Italy	-	2	2	-	-	-
Canada	7	27	15	17	3	1
US	2	2	3	2	2	3
Panama	1	2	2	-	3	2
Argentina	-	10	22	5	-	9
Morroco	1	3	4	4	7	9
Singapore (1)	3	1	5	-	-	2
Poland	-	-	8	4	-	7
New Zealand	-	-	7	-	-	3
Total (3)	75	118	156	94	71	83

(1) including cuttlefish.
(2) the majority is cuttlefish.
(3) includes other countries.
* = as of October 1982.
- = less than 1,000 mt

Adapted from 1980 Japanese Deep Sea Trawlers presentation to the Mid-Atlantic Council, and updated via Japan (1982).

Table 13. 1979 Japanese Squid Supply (metric tons)

Inventory	93,900
Japanese Catch	
Jigging	
Japanese common squid	161,000
Flying squid	125,000
New Zealand squid	18,200
New Zealand squid joint venture	5,600
Australian squid	3,600
Canadian Illex	7,000
Sub-total	320,400
Trawling	
New Zealand squid	4,000
US Atlantic and Pacific	12,000
Canadian coast	4,500
Argentine squid	25,000
Sub-total	45,500
Canadian Developmental Charter	19,000
Imports	90,000
Total Supply	568,800

Source: Japanese Deep Sea Trawlers Association, 1980

Table 14. 1976 Spanish Squid Supply (metric tons)

		Loligo	Illex	Total
Landings				
Frozen:	US waters	8,900	4,700	13,600
	Canadian waters	-	3,220	3,220
	Sahara Bank	12,000	-	12,000
	South Africa	-	4,000	4,000
	Total	20,900	11,920	32,820
Fresh:	Spanish coast, Portugal, Sahara, & NE Atlantic	7,000	4,000	11,000
Total:		27,900	15,920	43,820
Imports (as of Jan. - Sept. 1976)				
Japan	(Loligo from US waters, Illex origin unknown)	2,760	55	2,815
US	(from US waters)	871	-	871
Italy	(from US waters)	864	-	864
USSR	(Loligo from US waters, Illex origin unknown)	1,447	1,549	2,996
Canada	(origin unknown)	-	52	52
Poland	(origin unknown)	-	2,115	2,115
Total		11,036	5,546	16,582
Total		38,936	21,466	60,402

Source: Description of the Spanish squid fishery, Feb., 1977, unknown author.

Table 15. Spanish Squid Imports 1978 - 1980 (metric tons)

	1978	1979	1980
Loligo	5,700	9,000	12,300
Illex	22,900	17,600	27,000
Total	28,600	26,600	39,000
	Loligo		
Panama	1,600	2,100	900
Mexico	400	1,700	3,200
Japan	-	1,600	700
India	500	1,350	-
Morocco	800	850	2,000
US	-	400	1,500
Others	2,400	1,000	4,000
Total	5,700	9,000	12,300
	Illex		
Argentina	11,400	7,600	5,600
Poland	3,900	3,100	500
Mexico	2,300	2,300	5,600
Canada	1,000	1,500	6,000
New Zealand	600	1,200	5,000
USSR	2,000	-	2,400
Others	1,700	1,900	1,900
Total	22,900	17,600	27,000

Source: Milnes, 1982.

Table 16. Prices of Spanish Caught Loligo pealei and Illex illecebrosus ($/lb., whole ex-cold storage, Vigo; market sizes in cm)

Loligo pealei

Market Size:	Under 7	7-10	11-14	15-18	19-22	23-27
4/1/81	.88	.94	1.75	2.46	3.04	3.39
Market size:	Under 6	6-10	10-13	14-17	18-21	22-27
6/23/82	1.49	1.62	2.16	2.52	3.06	3.50
Market Size:	7	9	13	16	20	23-28
2/2/83	2.31	2.70	3.08	3.35	3.47	3.66
2/9/83	2.34	2.73	3.12	3.39	3.51	3.71-3.90
2/16/83	2.34	2.73	3.12	3.39	3.51	3.71-3.90
3/2/83	2.34	2.73	3.20	3.39	3.51	3.82
3/9/83	2.28	2.66	3.12	3.31	3.42	3.72

Illex illecebrosus

Market Size:	Average Price	15	17	18	19	20	22	26
4/1/81	.99							
5/13/81	.93-1.04							
8/26/81	.90							
11/25/81	1.00							
5/12/82	-	-	-	-	-	-	-	1.18
12/1/82	-	-	-	-	1.19	-	-	-
12/15/82	-	-	-	-	1.19	-	-	-
2/3/83	-	1.12	-	-	-	1.27	-	-
2/9/83	-	1.13	-	-	-	1.29		
2/16/83	-	-	1.13	-	-	-	1.25	-
3/2/83	-	-	-	1.13	-	-	1.29	-

Source: European Weekly Frozen Fish Reports.

Table 17. South American Squid Catch 1976-1980 (metric tons)

		1976	1977	1978	1979	1980
Argentina	Short-finned squid	7,493	1,986	59,001	86,869	9,110
	Common squid	128	255	238	349	185
Brazil	Common squid	848	556	598	641	350*
Chile	Squids	-	-	66	136	unk
Colombia	Squids	24	155	155*	78	unk
Peru	Squids	1,092	272	-	-	unk
Uruguay	Short-finned squid	773	362	2,182	4,668	2,300*
Venezula	Common squids	1,202	1,937	1,160	900*	700*

* = quantity estimated.

- = nil or negligible.

unk = unknown.

Ecuador, Guyana, Surinam, and Mexico squid catches unavailable.

Source: Juanico, 1982.

Table 18. Squid Exports from Uraguay and Argentina 1978-1980 (metric tons)

	Uraguay			Argentina	Uraguay & Argentina
	1978	1979	1980	1980	1980
Japan	672	2,103	-	138	138
South Korea	261	-	-	390	390
Hong Kong	7	-	-	-	-
Taiwan	-	-	-	4,818	4,818
Spain	285	54	518	3,865	4,383
Italy	26	-	-	219	219
France	30	-	-	-	-
Portugal	-	-	7	5	12
West Germany	-	32	-	70	70
England	-	2	-	11	11
US	12	-	-	-	-
Saudi Arabia	-	15	27	70	97
Kuwait	-	-	267	40	307
South Africa	-	-	-	44	44
Brazil	21	136	65	-	65
Argentina	-	9	-	-	-
Holland	-	-	-	62	62
Sweden	-	-	-	4	4
Total	1,314	2,351	884	7,397	8,281

Source: Juanico, 1982

Table 19. Spanish Frozen Loligo Prices ($/lb.)

Market Size (cm)	Madrid, Dec. 1982, whole L. pealei, Boston Area, sea frozen, Spanish vessels, wholesale	Madrid, Dec. 1982, whole L. vulgaris, Sahara Bank, Korean vessels, FOB Canary I.
13	1.35	1.27
17	1.47	-
18	-	1.57
20	1.54	-
23	-	1.77

Market Size (cm)	Madrid, Jan.-Feb. 1983, whole L. pealei, Boston Area, sea frozen, ex-cold store Vigo	Madrid, Jan.-Feb. 1983, whole L. vulgaris, Sahara Bank, Korean vessels, FOB Canary I.	Madrid, Jan.-Feb. 1983, whole L. vulgaris, Spanish vessels, ex-cold store Vigo
8	1.05-1.08	0.82-0.86	0.86
10	1.22-1.26	-	-
13	1.34-1.42	0.79-1.31	0.99-1.17
17	1.43-1.54	-	-
18	-	1.59-1.68	1.34-1.45
20	1.57-1.59	-	-
23	-	1.77-1.86	1.49-1.56
26	1.52-1.68	-	-
28	1.75-1.79	1.81	1.51-1.59

Market Size (g)	Barcelona, May-June 1983, whole L. pealei sea frozen, Spanish vessels, wholesale	Barcelona, May-June 1983, whole L. vulgaris, Canary I., Japanese vessels, wholesale	Barcelona, May-June 1983, whole L. vulgaris Spanish vessels, wholesale
less than 23	81	-	-
23-54	0.88-0.98	-	-
less than 50	-	1.26	1.28
50-100	-	-	1.71-1.91
54-100	1.38-1.41	-	-
less than 100	-	2.00-2.04	-
100-162	1.43-1.49	-	-
100-200	-	-	1.99-2.03
162-262	1.46-1.58	-	-
less than 262	1.61-1.65	-	-
200-400	-	2.10	2.06-2.08
400-600	-	-	2.08

Market Size (g)	Barcelona, Dec.-Jan. - 1982-83 whole L. pealei, sea frozen, Spanish vessels, wholesale	Barcelona, Dec.-Jan. - 1982-83 whole L. pealei, land frozen, Spanish vessels, wholesale
less than 23	0.77-1.15	-
23-54	1.22	-
54-100	1.35-1.43	1.00
100-162	1.58	1.12
162-262	1.79	1.23
less than 262	1.79	1.29-1.35

L. pealei market categories originally reported in cms. These categories convert to grams by the equation weight = 0.25662 X (length)$^{2.15182}$ (Lange and Johnson, 1978).
Source: US Dept. Comm., 1983c.

Table 20. Nice, France, Frozen Squid Prices ($/lb.), Dec. 1982 - Jan. 1983

	Size (g)	Price	Shipping Category
L. pealei, Boston, sea frozen	87-162	1.32	CIF
	162	1.54	CIF
L. vulgaris, Morroco, land frozen	500-1,000	1.57	CIF
L. reynaudi, South Africa, sea frozen	150-300	.95	CIF
Loligo spp., Ireland	400-600	1.30	CIF
L. indica., India, land frozen	100-167	.79	CIF
Loligo spp., Thailand	25-50	.77*	CIF
Illex, Canada, land frozen		.50-.57	ex-cold storage
L. opalescens., California, land frozen	50-65	.51-.52	CIF

* = March 1983.
Source: European Weekly Frozen Fish Report.

Table 21. Milan, Italy, Frozen Loligo Prices ($/lb.), Jan. 1983

Market Size (g)	Whole L. pealei sea frozen, Boston, Japanese vessels, CIF	Whole L. reynaudi, sea frozen, S. Africa, Japanese vessels, CIF	Whole L. vulgaris, sea frozen, Japanese vessels, CIF	L. vulgaris, North Atlantic, CIF
Mixed	-	.91	-	-
50-90	-	-	1.02	-
100	.79	.73	-	-
90-150	-	-	1.29	-
100-150	-	.98	-	-
100-250	1.20	-	-	-
150-210	-	-	.48*	-
150-250	-	1.11	-	-
200-500	-	-	-	1.27
250-350	-	1.27	-	-
250-500	1.56	-	-	-
350-450	-	1.41	-	-
500-1,000	-	-	-	1.44
500 & up	1.84	-	-	-
1,000 & up	-	-	-	1.49

* = probably a misquote, could be $1.48.
Source: European Weekly Frozen Fish Report.

Table 22. Spanish Frozen Illex Prices ($/lb.), 1982

Market/Species	Form	Origin (vessels, waters)	Shipping Class	Month	Price
Madrid					
I. illecebrosus	Whole	Spanish, NW Atlantic	ex-cold store, Vigo	May	.64
I. argentinus	Whole	Polish, Argentine	ex-cold store, Vigo	June	.50
I. argentinus	Whole	Spanish, Argentine	ex-cold store, Vigo	May	.53
Barcelona					
I. illecebrosus	Whole	Spanish, NW Atlantic	wholesale	May	.75-.79
I. argentinus	Whole	Spanish, Argentine	wholesale	July	.65
I. argentinus	unk	Spanish, Uruguay	wholesale	July	.50

Source: European Weekly Frozen Fish Report.

Table 23. Exchange Rates (national units per US $) of Selected Countries, 1978-1982

	Canada (dollar)	Japan (yen)	Italy (lira)	Portugal (escudo)	Spain (peseta)
1978	1.14	212.2	848.7	43.9	76.7
1979	1.17	219.2	830.9	48.9	67.1
1980	1.17	226.7	856.5	50.1	71.7
1981	1.20	220.5	1,136.8	61.6	92.3
October 1980	1.17	209.1	873.4	50.6	74.4
October 1981	1.20	231.4	1,191.5	64.5	95.8
October 1982	1.23	271.4	1,438.1	89.4	115.2

Source: Statistics of Foreign Trade, OECD, Dec. 1982.

Table 24. Costs and Percentage Share of Cost Components for Squid Processing

	% of Total Cost	Estimated Costs: Loligo $/lb.	Loligo $/mt	Illex $/lb.	Illex $/mt
Operating Costs					
Labor	43.5	.096	212	.078	172
Packaging	18.1	.022	49	.018	40
Utilities	10.1	.022	49	.018	40
Maintenance & repairs	1.4	.003	7	.003	7
Marketing	4.3	.010	22	.008	18
Fixed Costs					
Depreciation & rent	14.5	.032	71	.026	57
Interest	2.9	.006	13	.005	11
Administrative costs	10.1	.002	4	.018	40
Other	2.9	.006	13	.005	11
Total Cost of Processing (1)	100.0	.220	485	.180	397
Average Fish Cost (ex-vessel value) (2)		.450	992	.120	265
Processor Mark-up & Shipping (3)		.100	220	.100	220
Exported Price FOB (4)		.770	1,698	.400	882

Sources:
1. Based on processing costs of small manual plants assuming labor cost = .30 (Table 24, Hu, et al., 1983).
2. Average ex-vessel price, New York.
3. Assumption based on Hu, et al (1983).
4. Personal communication with a New Jersey processor, 1983.

Table 25. Impacts, Benefits, and Costs of the Plan*

	Estimate ($/mt)	
	Loligo	Illex
Impacts		
A. PURCHASES OF SUPPLIES BY:		
1. Foreign Fishermen	-176	-149
2. Domestic Fishermen and Processors	+325	+171
B. GOVERNMENT REVENUES FROM:		
1. Foreign Fishing Fees	-165	-44
2. Taxes collected from harvesting and processing revenues	+?	+?
C. FOREIGN EXCHANGE		
1. Foreign Fishing Fees and Supply Purchases	-349	-179
2. Export**/Joint Venture Sales	+3,527/992	+1,774/265
D. DOMESTIC FISHERY REVENUES		
1. Foreign Fishing	0	0
2. Export***/Joint Venture Sales	+1,698/992	+882/265
Benefits and Costs		
A. BENEFITS		
1. Ex-vessel	+49	+13
a. Increased profits		
b. Use of unemployed or redundant resources		
c. Reduction in harvesting costs of alternative species		
2. Processing	+38	+26
a. Increased profits		
b. Use of unemployed resources		
3. Administrative Cost Savings	+1/3 current management costs	
a. Management		
b. Foreign catch monitoring and Coast Guard enforcement		
4. Technological and market expansion	substantial	
B. COSTS		
1. Loss of foreign fees	-165	-44
2. Loss of State Department benefits	not substantial	
3. Loss of "fish and chips" flexibility	not substantial	
4. Increased administrative and enforcement costs from US fishery development	not substantial	
C. NET BENEFITS (BENEFITS - COSTS)	positive and potentially very substantial	

* Only minimum positive impacts, minimum benefits, maximum negative impacts, and maximum costs shown.
** Export prices F.O.B. Europe.
*** Export prices F.O.B. United States.

Table 26. TALFF, Foreign Allocation, and Foreign Catch of Atlantic Mackerel, Butterfish, Loligo, and Illex in the Northwest Atlantic FCZ (metric tons)

Fishing Year	Species	Final TALFF	Final Allocation	Catch	% TALFF Allocated	% TALFF Caught	% Allocation Caught
1979-80	Loligo	35,500	30,570	19,238	86	54	63
	Illex	24,730	23,165	15,966	94	65	69
	Mackerel	1,200	1,104	394	92	33	36
	Butterfish	4,000	3,338	1,247	83	31	37
1980-81	Loligo	37,000	35,075	20,194	95	55	58
	Illex	25,000	25,000	18,641	100	75	75
	Mackerel	10,000	9,950	5,312	100	53	53
	Butterfish	4,000	3,685	1,115	92	28	30
1981-82	Loligo	36,668	35,789	13,454	98	37	38
	Illex	25,000	24,429	14,982	98	60	61
	Mackerel	10,000	7,688	2,104	77	21	27
	Butterfish	1,418*	1,200	516	85	36	43
1982-83	Loligo	37,000	20,350	12,734	55	34	63
	Illex	22,777	21,100	12,940	93	57	61
	Mackerel	9,000	8,700	1,192	97	13	14
	Butterfish	6,582*	1,133	803	17	12	71

* The TALFF in both 1981-82 and 1982-83 was 4,000 mt. However, in 1981-82 the Council certified an Annual Fishing Level (AFL) for butterfish that resulted in the effective TALFF for that year being 1,418 mt. The portion of the TALFF withheld by the AFL not harvested by US fishermen may be made available to foreign fishermen the subsequent year. In 1981-82, 2,582 mt of butterfish were withheld from TALFF through the AFL but not harvested by US fishermen, so the effective 1982-83 TALFF was 6,582 mt.

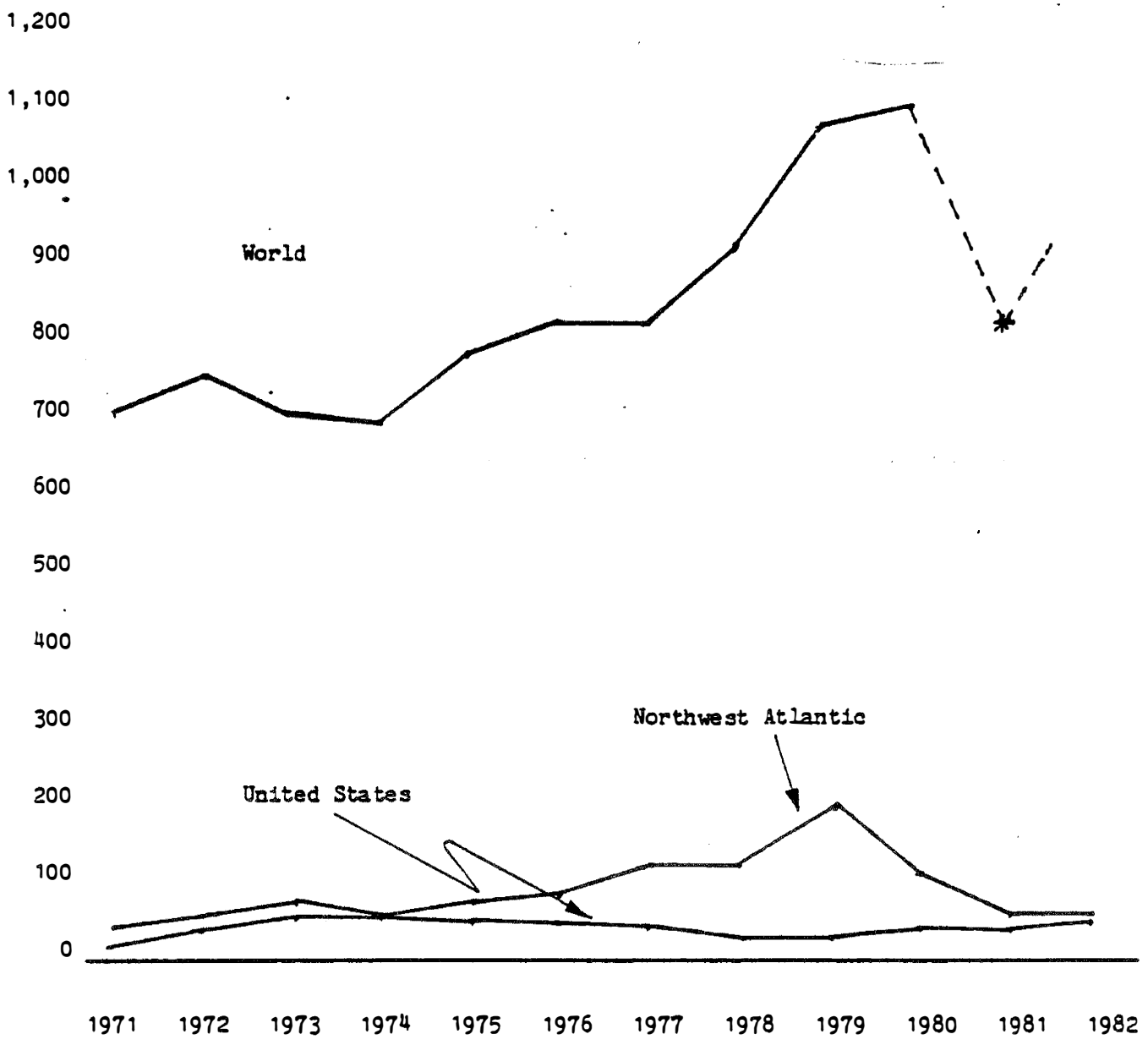


Figure 1.
Total World Squid Landings*, Total Northwest Atlantic Squid Landings, and Total Squid Landings from US Waters, 1971-1982
(thousands of metric tons)

* = 1981 world squid landings estimated.
Source: FAO statistics and Table 1.

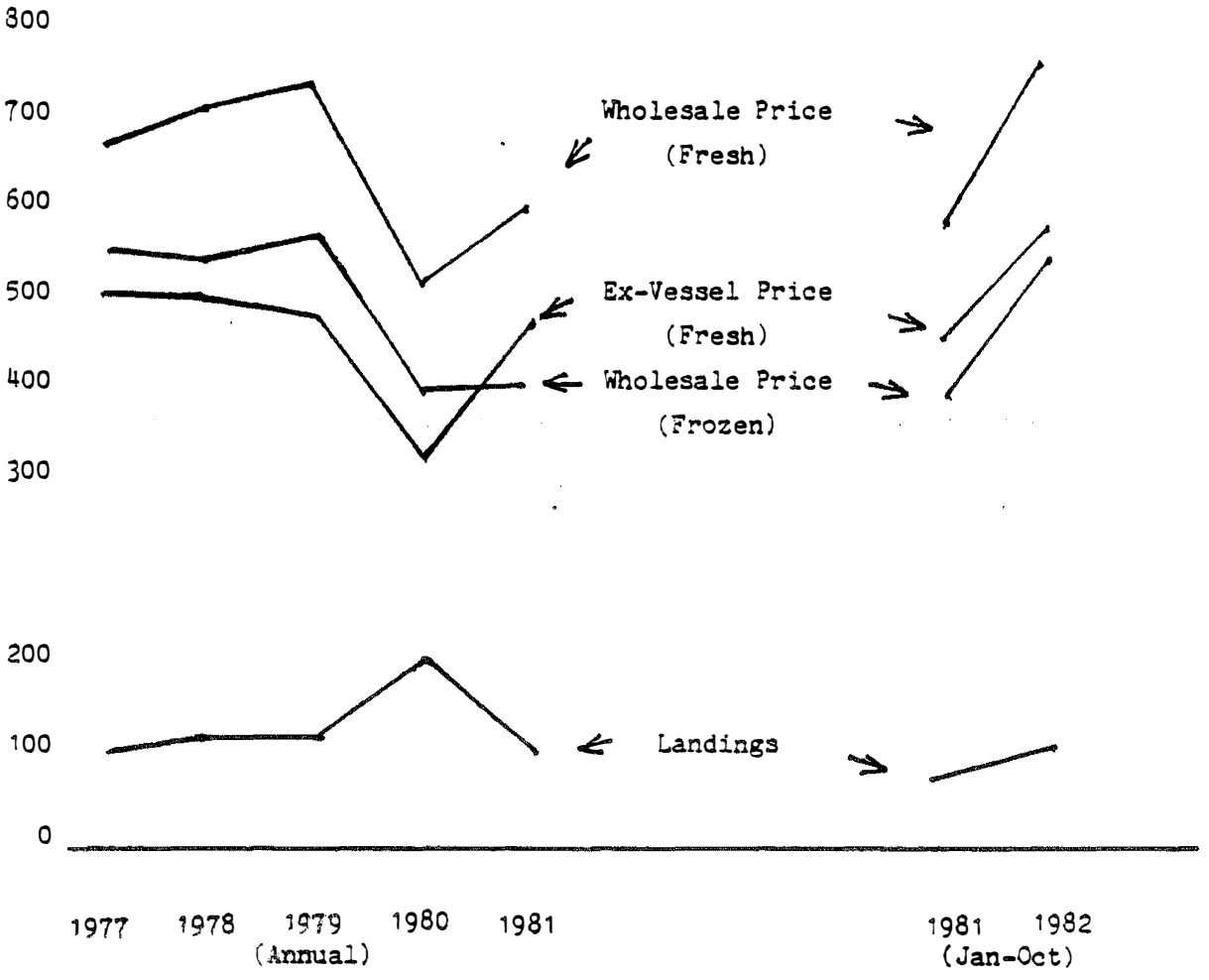
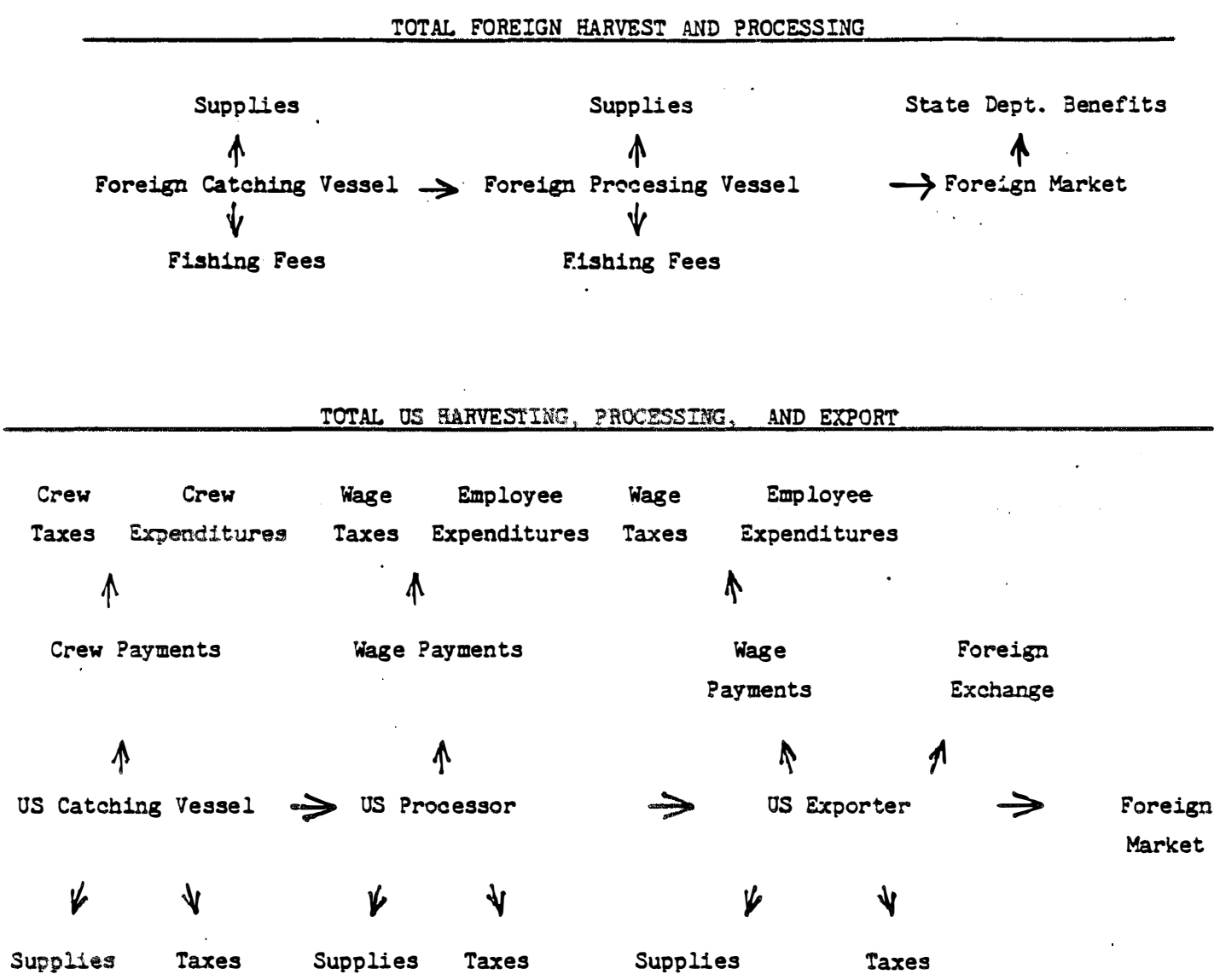


Figure 2. Japanese Domestic Market for Squid*
(prices in yen/kg, landings in thousands of metric tons)

* = Ex-vessel prices and landings are an average over 66 fishing ports except Tokyo, wholesale prices are average prices at the Tokyo wholesale market.

Source: Japan, 1982.

Figure 3. Expenditure Patterns for Foreign Harvest and US Export of Squid



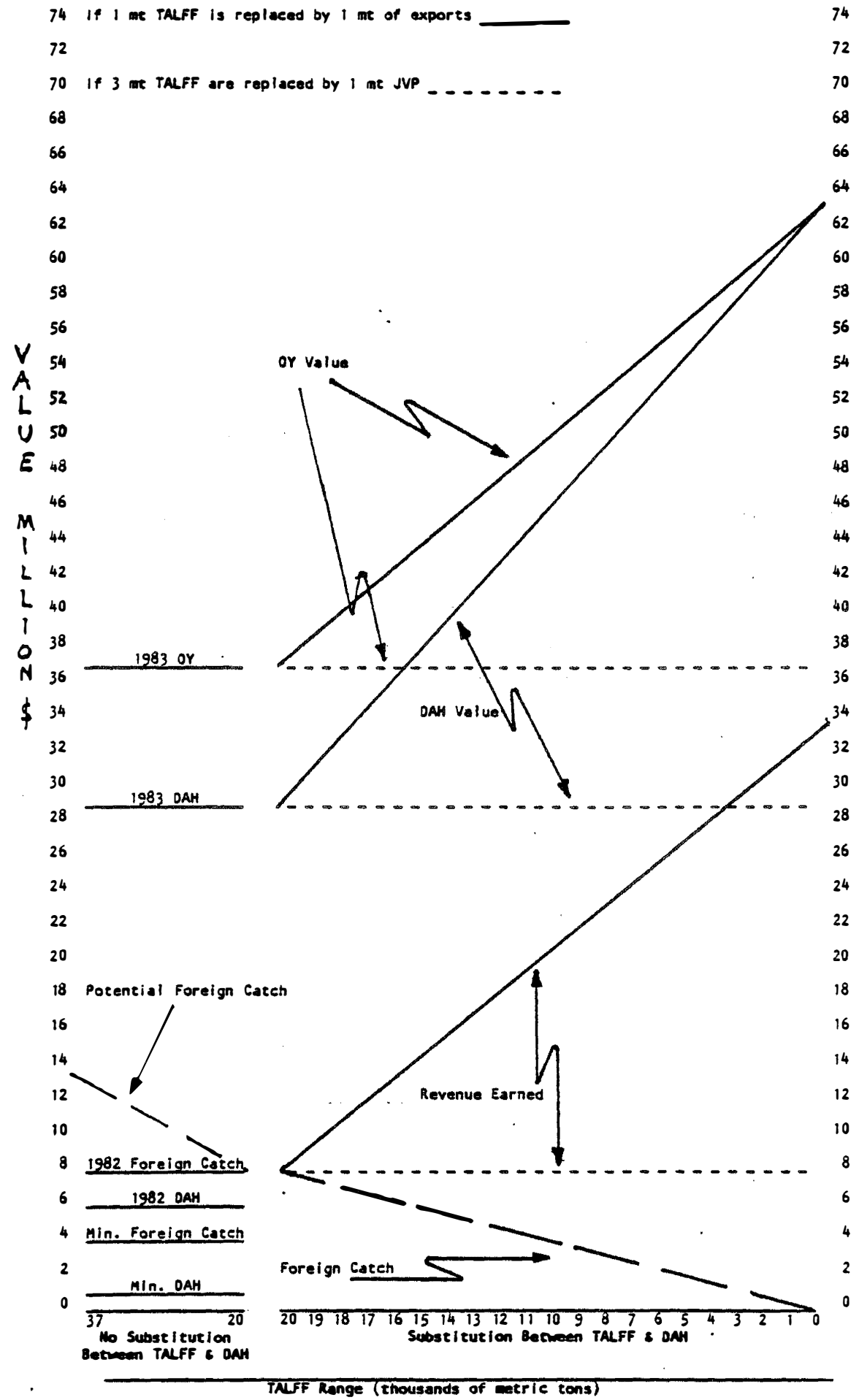


Figure 4. Trade-Off Relationships Between Loligo TALFF and DAH

APPENDIX III. REGULATIONS

Subpart A - General Provisions

Subpart B - Management Measures

AUTHORITY: 16 U.S.C. 1801 et seq.

Subpart A - General Provisions

§655.1 Purpose and scope.

(a) The regulations in this part govern fishing for Atlantic mackerel, Illex, Loligo, and butterfish by fishing vessels of the United States in the fishery conservation zone off the coasts of the Atlantic States.

(b) The regulations governing fishing for Atlantic mackerel, Illex, Loligo, and butterfish by vessels other than vessels of the United States are contained in 50 CFR Part 611.

(c) This part implements the Fishery Management Plan for the Atlantic Mackerel, Squid, and Butterfish Fisheries of the Northwest Atlantic Ocean.

§655.2 Definitions. In addition to the definitions in the Magnuson Act, the terms used in this part have the following meanings:

Area of custody means any vessel, building, vehicle, pier, or dock facility where Atlantic mackerel, squid, or butterfish may be found.

Assistant Administrator means the Assistant Administrator for Fisheries, National Oceanic and Atmospheric Administration (NOAA), Department of Commerce, or the individual to whom appropriate authority has been delegated.

Atlantic butterfish or butterfish means the species Peprilus triacanthus.

Atlantic mackerel or mackerel means the species Scomber scombrus.

Authorized officer means:

(a) Any commissioned, warrant, or petty officer of the United States Coast Guard;

(b) Any certified enforcement officer or special agent of the National Marine Fisheries Service;

(c) Any officer designated by the head of any Federal or State agency which has entered into an

agreement with the Secretary of Commerce and the Commandant of the United States Coast Guard to enforce the provisions of the Magnuson Act; or

(d) Any United States Coast Guard personnel accompanying, and acting under the direction of, any person described in paragraph (a) of this definition.

Catch, take, or harvest includes, but is not limited to, any activity which results in the killing of any Atlantic mackerel, squid, or butterfish or bringing any Atlantic mackerel, squid, or butterfish on board a vessel.

Charter or party boat means any vessel which carries passengers for hire to engage in fishing.

Fish includes Atlantic mackerel (Scomber scombrus), squid (Loligo pealei and Illex illecebrosus), and Atlantic butterfish (Peprilus triacanthus).

Fishery conservation zone (FCZ) means that area adjacent to the United States which, except where modified to accommodate international boundaries, encompasses all waters from the seaward boundary of each of the coastal States to a line on which each point is 200 nautical miles from the baseline used to measure the territorial sea.

Fishery Management Plan (FMP) means the Fishery Management Plans for the Atlantic Mackerel, Squid, and Butterfish Fisheries of the Northwest Atlantic Ocean, as consolidated by amendment 3 and revised by subsequent amendments.

Fishing means any activity, other than scientific research activity conducted by a scientific research vessel, which involves:

(a) The catching, taking, or harvesting of fish;

(b) The attempted catching, taking, or harvesting of fish;

(c) Any other activity which can reasonably be expected to result in the catching, taking, or harvesting of fish; or

(d) Any operations at sea in support of, or in preparation for, any activity described in paragraphs (a), (b), or (c) of this definition.

Fishing Trip or Trip means a period of time during which fishing is conducted, beginning when the vessel leaves port and ending when the vessel returns to port.

Fishing vessel means any vessel, boat, ship, or other craft which is used for, equipped to be used for, or of a type which is normally used for: (a) fishing; or (b) aiding or assisting one or more vessels at sea in the performance of any activity relating to fishing, including, but not limited to, preparation, supply, storage, refrigeration, transportation, or processing.

Illex means the species Illex illecebrosus (short-finned or summer squid).

Joint venture harvest means U.S. harvested Atlantic mackerel, squid, or butterfish transferred to foreign vessels in the FCZ or in the internal waters of a State. Transfers to foreign vessels in the internal waters of a State are governed under section 306(c) of the Magnuson Act.

Loligo means the species Loligo pealei (long-finned or bone squid).

Magnuson Act means the Magnuson Fishery Conservation and Management Act, 16 U.S.C. 1801 et seq.

Metric ton (mt) means 1,000 kilograms; or 2,204.6 pounds.

Official number means the documentation number issued by the United States Coast Guard for

documented vessels or the registration number issued by a State or the United States Coast Guard for undocumented vessels.

Operator, with respect to any vessel, means the master or other individual on board and in charge of that vessel.

Owner, with respect to any vessel, means:

(a) Any person who owns that vessel in whole or in part;

(b) Any charterer of the vessel, whether bareboat, time, or voyage;

(c) Any person who acts in the capacity of a charterer, including but not limited to parties to a management agreement, operating agreement, or any similar agreement that bestows control over the destination, function, or operation of the vessel; or

(d) Any agent designated as such by a person described in paragraphs (a), (b) or (c) of this definition.

Person means any individual (whether or not a citizen or national of the United States), corporation, partnership, association, or other entity (whether or not organized or existing under the laws of any State), and any Federal, State, local or foreign government or any entity of any such government.

Regional Director means the Regional Director, Northeast Region, National Marine Fisheries Service, Federal Building, 14 Elm Street, Gloucester, MA, or a designee.

Secretary means the Secretary of Commerce, or a designee.

Squid means Loligo pealei and Illex illecebrosus.

United States harvested fish means fish caught, taken, or harvested by vessels of the United States within any fishery regulated under the Magnuson Act.

Vessel of the United States means:

(a) Any vessel documented or numbered by the United States Coast Guard under United States law; or

(b) Any vessel under five net tons which is registered under the laws of any State.

Vessel length means that length set forth in United States Coast Guard or State records.

§655.3 Relation to other laws.

(a) Persons affected by these regulations should be aware that other Federal and State statutes and regulations may apply to their activities.

(b) All fishing activity, regardless of species sought, is prohibited under 15 CFR Part 924, on the U.S.S. Monitor Marine Sanctuary, which is located approximately 15 miles off the coast of North Carolina (35o00'23"N. latitude, 75o24'32"W. longitude).

(c) Fishing vessel operators shall exercise due care in the conduct of fishing activities near submarine cables. Damage to submarine cables resulting from intentional acts or from the failure to exercise due care in the conduct of fishing operations subjects the fishing vessel operator to the criminal penalties prescribed by the Submarine Cable Act (47 U.S.C. 21) which implements the international convention for the Protection of Submarine Cables. Fishing vessel operators also should be aware that fishing operations may not be conducted at a distance of less than one nautical mile from a vessel engaged in laying or repairing a

submarine cable; or at a distance of less than one-quarter nautical mile from a buoy intended to mark the position of a cable when being laid or when out or order or broken.

§655.4 Vessel permits.

(a) General. Any vessel of the United States which catches 100 pounds or more each of Atlantic mackerel, Illex, Loligo, or butterfish per trip must have a permit issued under this section.

(b) Application.

(1) An application for a permit under this part must be submitted to the Regional Director and signed by the owner or operator of the vessel, on an appropriate form obtained from the Regional Director, at least 30 days before the date on which the applicant desires to have the permit made effective.

(2) Applicants shall provide all the following information (approved by the Office of Management and Budget under OMB control number 0648-0097):

(i) the name, mailing address including zip code; and telephone number of the owner of the vessel;

(ii) the name of the vessel;

(iii) the vessel's United States Coast Guard documentation number, or the vessel's State registration number for vessels not required to be documented under provisions of Title 46 of the United States Code;

(iv) the home port or principal port of landing, gross tonnage, radio call sign, and length of the vessel;

(v) the engine horsepower of the vessel and the year the vessel was built;

(vi) the type of construction, type of propulsion, and the type of echo sounder of the vessel;

(vii) the permit number of any current or previous Federal fishing permit issued to the vessel;

(viii) the approximate fish hold capacity of the vessel;

(ix) the type and quantity of fishing gear used by the vessel;

(x) the average size of the crew, which may be stated in terms of a range; and

(xi) any other information concerning vessel and gear characteristics requested by the Regional Director.

(3) Any change in the information specified in paragraph (b)(2) of this section must be reported by the applicant in writing to the Regional Director within 15 days of the change.

(c) Issuance. The Regional Director will issue a permit to the applicant no later than 30 days from the receipt of a completed application.

(d) Expiration. A permit will expire upon any change in vessel ownership, registration, name, length, gross tonnage, fish hold capacity, home port, or the regulated fisheries in which the vessel is engaged.

(e) Duration. A permit will continue in effect until it expires or is revoked, suspended, or

modified under 50 CFR Part 621.

(f) Alteration. Any permit which has been altered, erased, or mutilated is invalid.

(g) Replacement. Replacement permits may be issued by the Regional Director when requested in writing by the owner or operator stating the need for replacement, the name of the vessel, and the fishing permit number assigned. An application for a replacement permit will not be considered a new application.

(h) Transfer. Permits issued under this part are not transferable or assignable. A permit is valid only for the fishing vessel and owner for which it is issued.

(i) Display. Any permit issued under this part must be carried on board the fishing vessel at all times. The operator of a fishing vessel shall present the permit for inspection upon request by any Authorized Officer.

(j) Sanctions. Subpart D of 50 CFR Part 621 governs the imposition of sanctions against a permit issued under this part. A permit may be revoked, modified, or suspended if the fishing vessel for which the permit is issued is used in the commission of an offense prohibited by the Magnuson Act or these regulations; or if a civil penalty or criminal fine imposed under the Magnuson Act is not paid.

(k) Fees. No fee is required for any permit issued under this part.

§655.5 Recordkeeping and reporting requirements. (Reserved)

§655.6 Vessel identification.

(a) Official number. Each fishing vessel subject to this part over 25 feet in length must display its official number on the port and starboard sides of the deckhouse or hull, and on an appropriate weather deck so as to be visible from above.

(b) Numerals. The official numbers must contrast with the background and be in block Arabic numerals at least 18 inches in height for vessels equal to or over 65 feet, and at least 10 inches in height for all other vessels over 25 feet in length.

(c) The official number must be permanently affixed to or painted on the vessel. However, charter or party boats may use non-permanent markings to display the official number whenever the vessel is fishing for Atlantic mackerel, squid, or butterfish.

(d) Duties of operator. The operator of each vessel subject to this part shall:

(1) Keep the vessel name and official number clearly legible and in good repair; and

(2) Ensure that no part of the vessel, its rigging, its fishing gear, or any other object obstructs the view of the official number from an enforcement vessel or aircraft.

§655.7 General prohibitions. It is unlawful for any person to:

(a) To possess, have custody or control of, ship or transport, offer for sale, sell, purchase, import, or export, any Atlantic mackerel, squid, or butterfish taken, retained, or landed in violation of the Magnuson Act, this part, or any other regulation under the Magnuson Act;

(b) To refuse to allow an authorized officer to board a fishing vessel or to enter an area of custody subject to such person's control, for purposes of conducting any search or inspection in connection with the enforcement of the Magnuson Act, this part, or any other regulation or permit under the Magnuson Act;

(c) To forcibly assault, resist, oppose, impede, intimidate, or interfere with any authorized officer

in the conduct of any inspection or search described in paragraph (b) of this section;

(d) To make any false statements, written or oral, to an Authorized Officer, concerning the taking, catching, landing, purchase, sale, or transfer of any mackerel, squid, or butterfish.

(e) To resist a lawful arrest for any act prohibited by this Part;

(f) To interfere with, delay, or prevent by any means the apprehension or arrest of another person with the knowledge that such other person has committed any act prohibited by this part;

(g) To interfere with, obstruct, delay, or prevent by any means the lawful investigation or search conducted in the process of enforcing this part;

(h) To transfer, or attempt to transfer, directly or indirectly, any United States harvested fish to any foreign fishing vessel within the FCZ, unless the foreign vessel has been issued a permit which authorizes the receipt of United States harvested fish of the species being transferred;

(i) To use any vessel for taking, catching, harvesting, or landing of any Atlantic mackerel, squid, or butterfish (except as provided in §655.4(a)) unless the vessel has on board a valid permit issued under §655.4;

(j) To fail to report to the Regional Director within 15 days any change in the information contained in the permit application for a vessel, as specified in §655.4(b);

(k) To falsify or fail to affix and maintain vessel markings as required by §655.6;

(l) To fail to comply immediately with enforcement and boarding procedures specified in §655.8;

(m) To take and retain, or land more Atlantic mackerel, squid, or butterfish than specified under a notice issued under §655.24;

(n) To violate any other provision of this part, the Magnuson Act, any notice issued under Subpart B of this part, or any other regulation or permit promulgated under the Magnuson Act.

§655.8 Enforcement

(a) General. The operator of any fishing vessel subject to this part shall immediately comply with instructions issued by an authorized officer to facilitate safe boarding and inspection of the vessel, its gear, equipment, and catch for the purposes of enforcing the Magnuson Act and this part.

(b) Signals. Upon being approached by a United States Coast Guard vessel or aircraft, or other vessel or aircraft authorized to enforce the Magnuson Act, the operator of the fishing vessel shall be alert for signals conveying enforcement instructions. The VHF-FM radiotelephone is the normal method of communicating between vessels. Listen to VHF-FM channel 16 (emergency channel) for instructions to shift to another VHF-FM channel and to receive boarding instructions. Visual methods or loudhailer may also be used to communicate. The following signals, extracted from United States Hydrographic Office publication H.O. 102 International Code of Signals, may be communicated by flashing light or signal flags:

(1) "L" meaning "You should stop your vessel instantly."

(2) "SQ3" meaning "You should stop or heave to; I am going to board you."

(3) "AA AA AA etc.", is the call to an unknown station or general call. The operator should respond by identifying his vessel by radio, visual signs, or illuminating the vessel's official number.

(4) "RY - CY", meaning "You should proceed at slow speed. A boat is coming to you."

(c) Boarding. The operator of a vessel signaled to stop or heave to for boarding shall:

(1) Stop immediately and lay to or maneuver in such a way as to allow the authorized officer and boarding party to come aboard;

(2) Provide a safe ladder, illumination, and a safety line when necessary or requested by the authorized officer to facilitate boarding and inspection; and

(3) Take such actions as the authorized officer deems necessary to facilitate and to ensure the safety of the authorized officer and the boarding party.

§655.9 Penalties. Any person or fishing vessel found to be in violation of this part will be subject to the civil and criminal penalty provisions and forfeiture provisions prescribed in the Magnuson Act, and 50 CFR Part 620 (Citations), 50 CFR Part 621, 15 CFR Part 904 (Civil Procedures), and other applicable laws.

Subpart B - Management Measures

§655.20 Fishing year. The fishing year is the 12-month period beginning on April 1 and ending on March 31 of the following year.

§655.21 Allowable levels of harvest.

(a) Maximum optimum yields.

(1) The optimum yields (OYs) during a fishing year may not exceed the following amounts:

Illex	30,000 mt
Loligo	44,000 mt
Butterfish	16,000 mt

(2) For Atlantic mackerel, the OY may not exceed 30,000 mt if the spawning stock at the end of the upcoming year is estimated, under the procedures specified in the FMP, to be less than or equal to 400,000 mt. If the spawning stock at the end of the upcoming year is estimated to exceed 400,000 mt, the maximum OY is determined in accordance with paragraph (b)(2)(ii) of this section.

(b) Annual specifications. Total allowable biological catch (ABC), initial optimum yield (IOY), and amounts for domestic annual harvest (DAH), domestic annual processing (DAP), joint venture processing (JVP), and total allowable level of foreign fishing (TALFF) for each species will be determined annually by the Regional Director, in consultation with the Mid-Atlantic Fishery Management Council (Council), under the procedures specified in §655.22, consistent with the following:

(1) Squid.

(i) Total allowable biological catch (ABC) for any fishing year is either the maximum OY specified in paragraph (a)(1) of this section, or a lower amount determined by the Regional Director, in consultation with the Council, if stock assessments or other ecological data indicate that the potential yield is less than the maximum OY level.

(ii) The IOY consists of an initial DAH and initial TALFF and represents a modification of ABC, based on economic factors. These factors must include the following:

(A) Total world export potential by squid-producing countries;

(B) Total world import demand by squid-consuming countries;

(C) U.S. export potential based on expected U.S. harvests, expected U.S.

consumption, relative prices, exchange rates, and foreign trade barriers;

(D) Increased or decreased revenues to the U.S. from foreign fishing fees;

(E) Increased or decreased revenues to U.S. harvesters (with or without joint ventures);

(F) Increased or decreased revenues to U.S. processors and exporters;

(G) Increases or decreases in U.S. harvesting productivity due to decrease or increase in foreign harvest;

(H) Increases or decreases in U.S. processing productivity; and

(I) Potential impact of increased or decreased TALFF on foreign purchases of U.S. products and services and U.S. caught fish, changes in trade barriers, technology transfer, and other considerations.

(iii) The DAH, DAP, and JVP must be based on data from sources specified in §655.22(e) and other relevant data including past domestic landings, the capacity and intent of U.S. processors to process U.S. harvested squid and projected amounts of squid necessary for joint ventures during the fishing year.

(iv) IOY must be set at a level that will produce the greatest overall net benefit to the United States. In determining this amount, the Regional Director, in consultation with the Council, will provide for a TALFF of at least a minimum incidental catch in other directed fisheries. TALFF may be greater than an incidental catch level, if the IOY determined to produce the greatest overall benefit to the U.S. is sufficiently greater than DAH.

(A) Loligo: The incidental catch level is one percent of the allocated portion of Illex, mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs.

(B) Illex: The incidental catch level is ten percent of the allocated portion of Loligo, and one percent of the allocated portion of mackerel (if a directed fishery is allowed), silver hake, and red hake TALFFs.

(v) The IOY may be adjusted by the Regional Director, in consultation with the Council, at any time during the fishing year, under §655.22(f). The basis for any adjustment may be that new information or changed circumstances indicate that U.S. fishermen will exceed the initial DAH, or that the IOY should be increased to produce maximum net benefits to the United States based upon an application of the factors above. The IOY may be increased by the amount that DAH or TALFF, or both, are increased, but IOY may not exceed ABC. An adjustment to IOY may not result in TALFF being reduced to a quantity less than that allocated to and accepted by foreign nations or to a quantity less than the incidental catch levels specified in paragraph (b) of this section.

(2) Atlantic mackerel. In all cases, initial DAP is the estimated amount of initial DAH that domestic processors will process. In estimating the DAH in the cases set forth below, the recreational catch will be predicted by the formula: $Y = (0.01)(X) + (180)$, where "X" is equal to the current spawning stock size, and "Y" is the estimated recreational catch in metric tons.

(i) Case 1. If the spawning stock size at the end of the upcoming fishing year, estimated in accordance with the procedures specified in the FMP, is less than or equal to 400,000 mt, then:

(A) TALFF is a fixed percentage of the amount of other species allocated to foreign fishing vessels, as follows: two percent of the silver hake allocation and one percent each of the allocations for red hake, Illex, and Loligo.

(B) DAH is the amount of estimated domestic annual harvest.

(C) Optimum yield equals DAH plus TALFF.

(ii) Case 2. If the spawning stock size at the end of the upcoming fishing year, estimated under the procedures specified in the FMP, is more than 400,000 mt, then OY during that fishing year may not exceed the acceptable catch (AC). AC is that amount which, when taken in addition to the predicted catch in the Canadian fishery, would result in a spawning stock size of 400,000 mt at the end of the upcoming fishing year. AC plus the predicted Canadian catch may not exceed a fishing mortality rate greater than F0.1.

(A) If AC is less than 30,000 mt, then:

(1) TALFF equals the fixed percentages specified in paragraph (b)(2)(i)(A) of this section.

(2) DAH equals AC minus TALFF.

(3) OY equals DAH plus TALFF.

(B) If AC is greater than or equal to 30,000 mt, and DAH is less than 30,000 mt, then:

(1) TALFF equals the fixed percentages specified in paragraph (b)(2)(i)(A) of this section.

(2) OY equals 30,000 mt plus TALFF.

(C) If AC is greater than or equal to 30,000 mt, and DAH is greater than or equal to 30,000 mt, then:

(1) OY equals AC.

(2) Initial DAH is the estimated domestic annual harvest.

(3) TALFF plus Reserve. If OY minus DAH is less than 10,000 mt, then TALFF equals OY minus DAH (but no less than the fixed percentages specified in paragraph (b)(2)(i)(A) of this section), and there is no reserve. If OY minus initial DAH is greater than or equal to 10,000 mt, then the difference between OY and initial DAH is divided evenly between TALFF and reserve.

(3) Butterfish.

(i) DAH is the estimated domestic annual harvest.

(ii) DAP is the estimated amount of DAH that domestic processors will process.

(iii) TALFF is a fixed percentage of the amount of other species allocated to foreign fishing vessels, as follows: 6 percent of the Loligo allocation, and 1 percent each of the allocations for Illex, Atlantic mackerel (when a directed fishery is allowed), silver hake, and red hake.

(iv) OY is the sum of DAH plus TALFF.

(c) Allowable domestic harvest. Fish taken within State jurisdiction will be counted against the domestic harvests specified under this section. The allowable domestic harvest for each species is the OY (including OY as increased under paragraph (b)(1)(v) of this section) minus TALFF.

§655.22 Procedures for determining initial annual amounts and adjustments.

(a) On or about January 15 of each year, the Mid-Atlantic Council will prepare and submit recommendations to the Regional Director of the initial annual amounts for the fishing year beginning April 1, based on information gathered from sources specified in paragraph (e) of this section.

(b) By February 1 of each year, the Secretary will publish a notice in the Federal Register that specifies preliminary initial amounts of OY, DAH, DAP, JVP, TALFF, and reserve (if any) for each species. The amounts will be based on information submitted by the Council and from the sources specified in paragraph (e) of this section; in the absence of a Council report, the amounts will be based on information gathered from sources specified in paragraph (e) of this section and other information considered appropriate by the Regional Director. The Federal Register notice will provide for a 30-day comment period.

(c) The Council's recommendation and all relevant data will be available in aggregate form for inspection at the office of the Regional Director during the public comment period.

(d) On or about March 15 of each year, the Secretary will make a final determination of the initial amounts for each species, considering all relevant data and any public comments, and will publish a notice of the final determination and response to public comments in the Federal Register.

(e) Sources used to establish initial annual specifications include:

(1) Results of a survey of domestic processors and joint venture operators of estimated processing capacity and intent to use that capacity (approved by the Office of Management and Budget under OMB control number 0648-0114);

(2) Results of a survey of fishermen's trade associations of estimated fish harvesting capacity and intent to use that capacity (approved by the Office of Management and Budget under OMB control number 0648-0114);

(3) Landings and catch statistics;

(4) Stock assessments; and

(5) Relevant scientific information.

(f) Any adjustments to the IOY for squid must be published in the Federal Register with the reasons for such adjustment. Any notice of adjustment may provide for a public comment period.

§655.23 Reserve release. All or part of the Atlantic mackerel reserve may be allocated to TALFF following the procedures of this section.

(a) Projections.

(1) Atlantic mackerel. If there is a Reserve, the Regional Director during October will project the total amount of mackerel that will be harvested by United States fishermen during the entire fishing year, based on United States landings through September and on the results of a survey of the intent of domestic fishermen to harvest mackerel during the remainder of the year. If the projected amount of mackerel to be harvested by United States fishermen exceeds the initial DAH specified in §655.21(b)(2)(ii)(C), the Secretary

will leave the necessary amount in Reserve. The Secretary will allocate all of the remainder of the Reserve to TALFF. If the projected amount of mackerel to be harvested by United States fishermen does not exceed the initial DAH, the Secretary will allocate the entire Reserve to TALFF.

(b) Notice of allocation.

(1) Atlantic mackerel.

(i) If there is a Reserve, the Secretary, on or about November 1, will publish a notice in the Federal Register stating the amount of mackerel proposed to be allocated from Reserve to TALFF. The notice will contain the latest catch statistics available. The public may comment on the proposed allocation for 15 days after the date of publication.

(ii) The Secretary will publish a final notice of the Reserve allocation in the Federal Register. The notice will contain a summary of all comments and relevant information received during the comment period.

(c) Subsequent Reserve allocation. After the first Reserve allocation, the Secretary may allocate any remaining portion of the Reserve to TALFF, if he determines that the domestic harvest will not attain the level projected under paragraph (a) of this section. The Secretary will notify the Executive Directors of the Councils of any subsequent allocations, and will publish a notice in the Federal Register.

§655.24 Closure of fishery.

(a) General. The Secretary shall close any domestic fishery in the FCZ for any species when United States fishermen have harvested 80 percent of the allowable domestic harvest (see §655.21(c)), if such closure is necessary to prevent the allowable domestic harvest from being exceeded. The closure will be in effect for the remainder of the fishing year.

(b) Notice. If the Secretary determines that a closure is necessary, he will:

(1) Notify in advance the Executive Directors of the Mid-Atlantic, New England, and South Atlantic Councils;

(2) Mail notifications of the closure to all holders of permits issued under §655.5 at least 72 hours before the effective date of the closure;

(3) Provide for adequate notice of the closure to recreational fishermen in the fishery; and

(4) Publish a notice of closure in the Federal Register.

(c) Incidental catches. During a period of closure, the trip limit for the species for which the fishery is closed is 10 percent by weight of the total amount of fish on board.

AMENDMENT #2 TO THE

FISHERY MANAGEMENT PLAN

FOR THE

ATLANTIC MACKEREL, SQUID, AND BUTTERFISH FISHERIES

June 1985

Mid-Atlantic Fishery Management Council

in cooperation with the

National Marine Fisheries Service

New England Fishery Management Council

and the

South Atlantic Fishery Management Council

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