PART 7: MANAGEMENT PROGRAM DEVELOPMENT

SUBPART A: IDENTIFICATION AND ANALYSIS OF MANAGEMEMT PROGRAM ALTERNATIVES

§7A1 Alternative Strategies For Achieving Objectives

The No Action Alternative

This management program differs both conceptually and substantively from its predecessor, the Interim Groundfish FMP. These differences are manifest in the multi-species fishery scope of the management program, the policy underlying the design of the program, the specificity of the management objectives, the range of stocks directly regulated, and the commitment to continuing management. The decision to embark on such an expansive management program represents, in part, a recognition that the management entity is the highly complex multi-species fishery that exists in the region, and that this fishery relies on fish stocks that, in many cases, are heavily exploited and in danger of being lost as productive, revenue-producing components of the fishery.

The purpose and need for management have been clearly established in §1.1 of this FMP. The Council has rejected the "no action" alternative as being inappropriate to the condition of the fishery, vis-a-vis the mandates of the MFCMA. Further, given that the Interim Groundfish FMP is scheduled to expire in April, 1985 (unless extended by the Secretary), failure to take action at this time would result in an unacceptable hiatus in the regulation of three economically important groundfish stocks that are key to the welfare of the multi-species fishery. Therefore, the major strategy alternatives considered in this FMP are those that relate to the achievement of the management objectives in the context of the management policy.

Alternative Strategies to Achieve Objectives

As discussed in §§5.1-5.4, the intent of the overall management program is to focus on the spawning potential of the stocks within the overall multi-species fishery so as to preserve within them the biological capacity to replace themselves over the long term, and thus be able to recover from adverse conditions of environment or exploitation. This biological capacity is understoood as the maintenance of adequate spawning potential. The objectives of this FMP refer to specific target levels of spawning potential for key groundfish species, which have been determined by the Council to be consistent with the long-term average replacement of year classes in the stock.

Section 5.4 identifies the major parameters affecting spawning potential as age-at-entry (age at 50% selection) and fishing mortality. In effect, the management program must employ a strategy (or method) that effectively manipulates these two parameters in such a way as to result in the simultaneous achievement of the management objectives stated in §6.2. In reality, the management policy adopted for the multi-species FMP serves as a constraint on the management method employed, requiring compatibility with the dynamics of the fishery and minimization of inadvertent and unnecessary regulation. Major strategies are defined in terms of the methods used to achieve the objectives. Because two parameters are involved, the strategies must relate to either control on age-at-entry or control on fishing mortality (or both). Three alternative strategies are defined below.

A. Operational Control

This general strategy has been employed by the Council in the management of groundfish, sea scallops and American lobster. This strategy focuses on how the fishery operates, employing methods that either selectively or generally reduce the vulnerability of the stocks within the multi-species fishery. Methods which are appropriate to this strategy include gear restrictions, area/time restrictions, and retention restrictions. The strategy does not directly limit the volume of fleet or vessel landings, nor does it directly limit effective fishing effort.

In relation to the maintenance of adequate spawning potential, as reflected in the objectives, this strategy is particularly effective for either direct or indirect control on age-at-entry. The methods that might be employed with this strategy to minimize the exploitation on certain age classes (e.g., immature fish) include specifying the legal minimum size that may be retained, or requiring various gear selectivity measures, such as mesh size. Minimum size has been used effectively in managing both lobsters and scallops, and mesh size has been used extensively over the past 15 years in management programs for cod, haddock, and yellowtail flounder. In addition to age-at-entry considerations, this strategy can be effective for enhancing spawning activities through area/season closures, thereby contributing to achievement of the objectives.

In relation to the parameter of fishing mortality, this strategy may be implemented through methods which limit discard mortality, close areas at times when stocks are particularly vulnerable, or limit fishing to areas where by-catch mortality is minimized. With respect to the overall exploitation of the stocks within the multi-species fishery resource, this strategy employs indirect methods (e.g., area closures to act as refugia) which are typically gross in their effect because effort can be physically displaced with uncertain results. However, in some specific situations, such as the recruitment of a new year class to the fishing grounds, closed areas/seasons may be very effective in minimizing mortality on juvenile fish.

In general, the methods appropriate to the strategy of operational control are well suited to the simultaneous achievement of the management objectives. They can be tailored to deal directly with the need to control age-at-entry over the range of stocks addressed in the objectives, with minimum disruption of the joint harvesting relationships that characterize the fishery. Coupled with a mechanism that allows the management program to respond to changes in effort, the general strategy satisfies the intent of the policy and is meaningful as the basis for a multi-species management program.

B. Effort Control

This general strategy has not yet been employed by the New England Council in the management of the FCZ fisheries. It has been used by the Mid-Atlantic Council in the management of the surf clam/ocean quahog fishery. The strategy focuses on the direct control of those factors in the fishery (e.g., vessels or days fished) that relate to fishing mortality. This strategy is distinguished here from the operational strategy which can be employed to have indirect control on fishing mortality. In effect, the effort control strategy

ranges in effectiveness, depending upon whether the capabilities of individual vessels within the fleet are taken into consideration, particularly those associated with vessel size or equipment.

The methods used in effort control range from limited entry to days fished, but they all have as their basis a calculated relationship between units of effort and units of fishing mortality. In most single-species fishery management situations where an identifiable fleet is dedicated to the harvest of a particular stock (or species), it is often possible to determine the level of fishing mortality desired and derive the amount of effort (vessels or days fished) that will generate that mortality. These fishing mortality determinations are either predicated upon physiological growth considerations (yield per recruit or spawning stock biomass per recruit), or they are predicated upon considerations for the rate of stock exploitation (extraction), which will lead in either case to a target level of fishing mortality.

In the case of the multi-species fishery, where participating vessels are characteristically opportunistic, the available fishing mortality rate guidance is calculated on a stock-by-stock basis, but must be interpreted on a fishery-wide basis, because the same vessels are responsible for exploiting a wide range of stocks. The major obstacle to employing the effort control strategy is precisely the nature of the multi-species fishery and the attendant difficulty of relating a unit of effort to a unit of fishing mortality. Only if the fishery is treated as a static system, where the value and range of species options are assumed to be known, and a composite fishing mortality target can be derived, is it possible to calculate a desirable level of fishing effort and specify an effort control method. Given the impracticality of such a treatment, notwithstanding the lack of meaningful data on effective effort in the fishery, adoption of the effort control strategy would inevitably lead to fine-tuning, as is the case for the operational control strategy, but in this case at the expense of lost flexibility and freedom of participation in the fishery. Further, as has been shown in §5.5, control on effort may well have to be combined with complementary control on age-at-entry in order to satisfy the spawning potential objectives of this FMP. Failure to simultaneously address the latter might render this strategy insufficient.

There are other motivations for adopting the strategy of direct effort control in the multi-species fishery, namely the efficient use of capital in and the realization of profits (or rents) from the fishery. Inasmuch as it is the policy of this FMP to allow the multi-species fishery to operate and evolve with a minimum of fishery regulation or restriction of fishery options, while at the same time preserving the viability of the fishery resources, the use of the effort control strategy to achieve economic efficiency policy objectives is premature.

C. Catch Control

This general strategy has been previously used by the New England Council in the management of cod, haddock and yellowtail flounder, and has been used by the Mid-Atlantic Council in the FMP for Atlantic mackerel, squid and butterfish. This strategy typically employs a quota on the landings of a

particular species. Quotas could be geared toward either: 1) achieving a desired harvest rate consistent with the long-term productivity of the species, or 2) achieving a desired stock level over time. In either case, quotas rely heavily on current stock assessment information in order to avoid unnecessary short-term costs to the industry; and in this way, quotas strain the limits of available, meaningful data and information.

Assuming that sufficient assessment data are available, the catch control strategy is most effective in the management of a single-species fishery. Where various species of fish are caught together or on the same trip, as in the multi-species fishery, species-specific quotas may artificially constrain the harvesting of associated species, keep other quotas from being reached, or prove to be ineffective in controlling species catch at any level. The New England Council found that quota management of cod, haddock and yellowtail flounder under the Atlantic Groundfish FMP produced undesirable results. For instance, the potential for fishery closures (as quotas are reached) encouraged vessels to "scramble" for shares. The scramble phenomenon resulted in operating inefficiencies, negative price effects and reduced revenues to the industry. Closures were characterized by product scarcity and elevated prices. In addition, concern for a pending closure lead to the misreporting of catch, discarding at sea and strained enforcement capabilities. The Council recognized that an individual vessel allocation system would mitigate some of the undesirable scramble effects of quota management, but the Council found that quota management at any level was not compatible with the mixed-trawl fishery of which cod, haddock and yellowtail flounder are a part.

In this FMP, the Council's concerns for quota management are magnified by the complexity of the fishery. Further, the catch control strategy would have to be combined with compatible age-at-entry control measures in order to be effective in achieving the spawning potential objectives discussed in §6.2. Finally, in consideration of the intent of the management policy, the catch control strategy does not appear appropriate for the development of the management program.

§7A2 Selection of Strategy for Detailed Specification

As discussed previously, the management strategy selected by the Council must be effective in manipulating the parameters of age-at-entry and fishing mortality in such a way as to result in the simultaneous achievement of the management objectives, while at the same time conforming to the intent of the management policy. The major strategy selected by the Council is that of operational control, because this strategy is judged to encompass methods which permit effective restraint without encumbering the flexibility and dynamics of the fishery.

In selecting this strategy alternative, the Council recognizes that operational control measures as a group may not be completely effective (in achieving the objectives) as they are initially specified and implemented, and that a feed-back process for making refinements in the management program must be an integral part of the strategy. Framework procedures, which enable the management program to respond to changing circumstances in the fishery or functional limitations on the effectiveness of the proposed management measures, are addressed in §7B4.

The Council has structured the management program around the methods of gear control, landed size and area control. In particular, the Council has selected minimum fish size and minimum mesh size as measures, which are effective in achieving age-at-entry control across the spectrum of stocks in the fishery (or geographic portion thereof), and time/area limitations, which can be used to partition the fishery in such a way as to provide opportunities for some species fisheries while minimizing the vulnerability of others. The Council believes that the current condition of the fishery is, in part, an artifact of a management system which has not been effectively implemented. Therefore, the Council is inclined to refine the application of these measures and is careful to avoid excessive application of these measures pending evidence of the need for it, which will come through the monitoring program (see §7B4, framework procedures).

The options for specifying the basic measures in the plan are identified in §7A3 and analyzed in §7A4. In all cases, the options are designed to achieve the same spawning potential levels cited in the objectives, and differ principally with respect to how the measures are applied. Further, the options reflect a component of subjectivity with respect to "what will work best" and "what is necessary", which is the prerogative of the Council and its advisors. Finally, the Council recognizes that selection of the operational control strategy implies a continued reliance on at-sea enforcement. The Council believes that effective at-sea enforcement can be achieved and has outlined a program to bring it about. The enforcement program is discussed below in §7B8.

§7A3 Strategy Options Within the Management Program

The major components of the management program, consistent with the adopted strategy of operational control, include the specification of minimum fish sizes, restrictions on the use of cod end and gillnet mesh by area and time, and spawning area closures. The management program is detailed below, including options for the specification of each control measure.

A. Minimum Fish Size Options

Minimum fish size is the principal management measure in the program. It is intended to direct the fishery away from immature fish and focus the catch on fish that have already contributed to the spawning potential of the stocks. In concert with other complementary measures, it is intended to ensure the long-term reproductive viability of the stocks. Justification for these minimum sizes is presented in §5.5. All minimum sizes would become effective upon implementation of the FMP and would be enforced on the basis of possession in or from the FCZ. In addition, no fish shorter than the prevailing commercial minimum size may be sold, and minimum sizes will apply to imported fish.

Commercial Fishery (total length)

	OPTION 1			OPTION 2	OPTION 3	
Species	Yr1	Yr2	Yr3	Yr 1+	Yr1	Yr2
cod, haddock, pollock:	19"	"	"	19"	17"	19"
witch flounder:	14"	"	"	14"	14"	14"
yellowtail, Am. plaice:	12"	"	"	12"	12"	12"
winter flounder:	11"	"	"	11"	11"	11"
redfish:	12"	13"	14"	none	none	

Recreational Fishery (total length)

Three options for minimum sizes in the recreational fishery are:

Option 1: The minimum sizes in the recreational fishery will be the same as for the commercial fishery (above), except that a total of 2 undersized fish per fisherman per day would be allowed.

Option 2: Minimum sizes will be established for cod and haddock only, and they will lag the corresponding commercial size as follows: year 1, 15 inches; years 2 and 3, 17 inches; year four and beyond, 19 inches.

Option 3: Same as option 2 except that, in addition, a total of 2 undersized fish per fisherman per day would be allowed in all years.

B. Minimum Mesh Size, Cod End and Gillnet Options

Gulf of Maine (area north of 42°20'N within the EEZ, including Mass. Bay)

Throughout the Gulf of Maine, the minimum cod end and bottom-tending gillnet mesh size will be 5-1/2 inches, with one exception, unless a vessel is participating in an exempted fishery where the use of smaller mesh is allowed (see part D, Exempted Fisheries, below). The singular exception to the general applicability of 5-1/2 inch mesh is within that portion of the area designated as the "redfish area", defined below, where the minimum cod end mesh requirement will not apply during the months of March through July or until the point in that time interval when 3500 mt of redfish have been landed within the calendar year. The "redfish area" is bounded by a line drawn from the intersection of 42°20'N latitude with 69°40'N longitude, northward along 69°40'W longitude to the intersection with line LORAN C 9960-X-25600; then northeastward along LORAN C line 9960-X-25600 to the intersection with 43°00'N latitude; then eastward along 43°00'N latitude to the seaward boundary of U.S. EEZ; then southward along the seaward boundary of the U.S. EEZ to the intersection with 42°20'N latitude; then westward along 42°20'N latitude to the point of origin.

Georges Bank (the area bounded on the north by 42°20'N, on the south by LORAN C lines 9960-Y-43500 and 5930-Y-30750, and on the west by the territorial sea above 41°35'N and by 69°40'W below 41°35'N)

Throughout Georges Bank, the minimum cod end and bottom-tending gillnet mesh size may be established in accordance with one of the three options below, unless a vessel is participating in an exempted fishery where the use of smaller mesh is allowed (see part D, Exempted Fisheries, below). The three cod end and gillnet mesh options are roughly equivalent in their long-term effectiveness for achieving the FMP objective.

Option 1: 6 inch mesh.

Option 2: 5-1/2 inch mesh when accompanied by an area/period closure to increase the spawning potential of haddock, cod and yellowtail flounder. Possibilities for such a closure are illustrated in Figure 7A1(a-c).

Option 3: 5-1/2 inch mesh in the first and second years of FMP implementation, followed by implementation of 6 inch mesh in the third year of FMP implementation.

In those parts of the Georges Bank area south of 42°20'N and east of 69°40'W not otherwise regulated for mesh, the mesh in bottom-tending gillnets would be equivalent to that in the regulated mesh area during the months of November through February when cod are prevalent in the catch.

Southern New England (west of 69°40'W within the New England Area)

In the Southern New England area indicated, two options for specifying cod end mesh are:

Option 1: No regulated mesh for mobile trawl gear.

Option 2: Regulated cod end mesh in the part of the Southern New England area east of 71°00'W, west of 69°40'W, and north of LORAN C 43500, consistent with the condition of the stocks and the character of the fishery in that area. However, exempted fishing would be permitted in accordance with part D, Exempted Fisheries, below.

The minimum mesh size for bottom-tending gillnets in an established regulated mesh area in Southern New England will be equivalent to that selected for cod end mesh (option 2). Where no minimum cod end mesh is established in Southern New England (option 1), or in portions of the Southern New England area outside of the regulated mesh area defined in option 2, bottom-tending gillnet gear will be regulated during the months of November through February in accordance with the Georges Bank area standard.

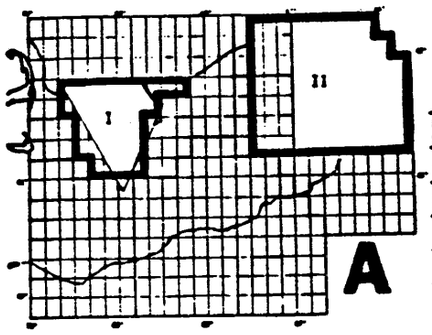
Figure 7A1 Three Georges Bank area/period closure options with impact analyses to complement 5-1/2 inch mesh.

AREA I
Closed February through June

AREA II
Closed February through June

POTENTIAL ANNUAL REDUCTION
in CATCH from GEORGES BANK

Cod - 18.3%
Haddock - 29.8%
Yellowtail - 9.9%
Blackback - 10.8%
Pollock - 20.9%
Babs - 16.0%



PORT IMPACT

PERCENT REDUCTION IN ANNUAL LANDINGS

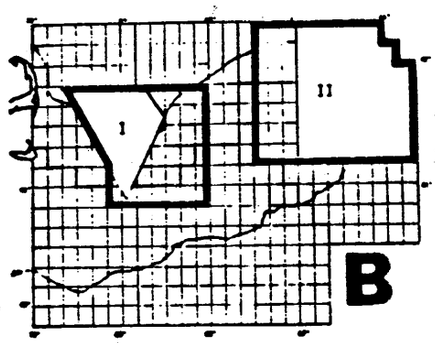
	COD	HAD	YT	BB	POL	BABS
POINT JUDITH	4	46	1	0	24	0
PROVINCETOWN	14	34	0	7	5	18
NEW BEDFORD	25	49	0	9	27	27
BOSTON	21	26	16	36	21	11
GLOUCESTER	18	22	6	6	12	7
PORTLAND	4	12	3	0	4	0

AREA I
Closed February through May

AREA II
Closed February through June

POTENTIAL ANNUAL REDUCTION
in CATCH from GEORGES BANK

Cod - 19.6%
Haddock - 31.3%
Yellowtail - 12.4%
Blackback - 16.0%
Pollock - 22.9%
Babs - 17.5%



PORT IMPACT

PERCENT REDUCTION IN ANNUAL LANDINGS

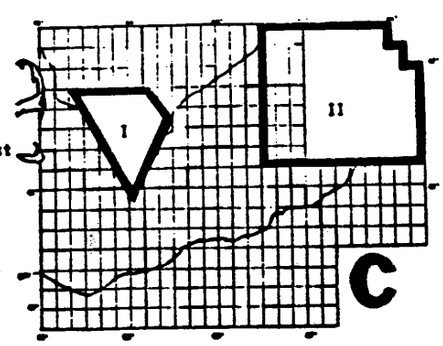
	COD	HAD	YT	BB	POL	BABS
POINT JUDITH	4	67	2	0	90	27
PROVINCETOWN	13	35	10	9	5	15
NEW BEDFORD	24	49	9	15	22	17
BOSTON	16	25	20	39	16	11
GLOUCESTER	15	21	7	15	10	7
PORTLAND	3	11	5	0	3	0

AREA I
Closed February through May

AREA II
Closed February through August

POTENTIAL ANNUAL REDUCTION
in CATCH from GEORGES BANK

Cod - 19.7%
Haddock - 33.0%
Yellowtail - 25.0%
Blackback - 13.2%
Pollock - 22.0%
Babs - 10.0%



PORT IMPACT

PERCENT REDUCTION IN ANNUAL LANDINGS

	COD	HAD	YT	BB	POL	BABS
POINT JUDITH	4	46	4	0	21	0
PROVINCETOWN	14	37	9	9	7	14
NEW BEDFORD	27	60	21	14	30	18
BOSTON	21	31	26	45	22	19
GLOUCESTER	17	25	9	11	24	6
PORTLAND	4	12	11	0	3	1

C. Minimum Mesh Size, Body of Net

In all areas where cod end mesh is regulated, minimum mesh size may also be established for the body of the net as follows:

Option 1: Equivalent to the cod end as regulated.

Option 2: Some other minimum size.

Option 3: No regulated minimum mesh in the body of the net.

D. Exempted Fisheries

Exempted fisheries are limited opportunities to fish with mesh smaller than the established minimum size in the regulated mesh area for the purpose of harvesting species such as butterfish, dogfish, herring, mackerel, red hake, scup, shrimp, squid and whiting. Exempted fisheries are constrained to minimize the mortality of key groundfish species.

Because the purpose of exempted fisheries is to allow small mesh fisheries to take place in large mesh areas, if the prinicple management measure for regulated species is a closed area rather than a regulated mesh size, exempted fisheries are unecessary. Given that exempted fisheries may be put in place in either the northern or southern areas, or both, there are a number of options about how the exempted fisheries might be managed.

Area

Three options for specifying the area for exempted fisheries are:

Option 1: Vessels fishing in the exempted fisheries must fish within 25 miles from the territorial sea baseline.

Option 2: Vessels fishing in an exempted fishery must fish in the Gulf of Maine/Georges Bank areas illustrated in Figure 7A2 in order to reduce the by-catch impact on regulated species.

Option 3: Vessels fishing in an exempted fishery must fish in the Gulf of Maine/Georges Bank areas as well as in a Council-specified area in Southern New England shown in Figure 7A2.

Reporting Period

For a vessel participating in any exempted fishery, the landed weight of species directly regulated under this FMP may not exceed 10% of the landed weight of the species for which the exemption is granted (exempt species) over some reporting period. Two alternative reporting periods for NMFS verification of the 10% criterion are:

Option 1: Not to exceed 30 days.

Option 2: The length of the fishing trip, or one week, whichever is longer.

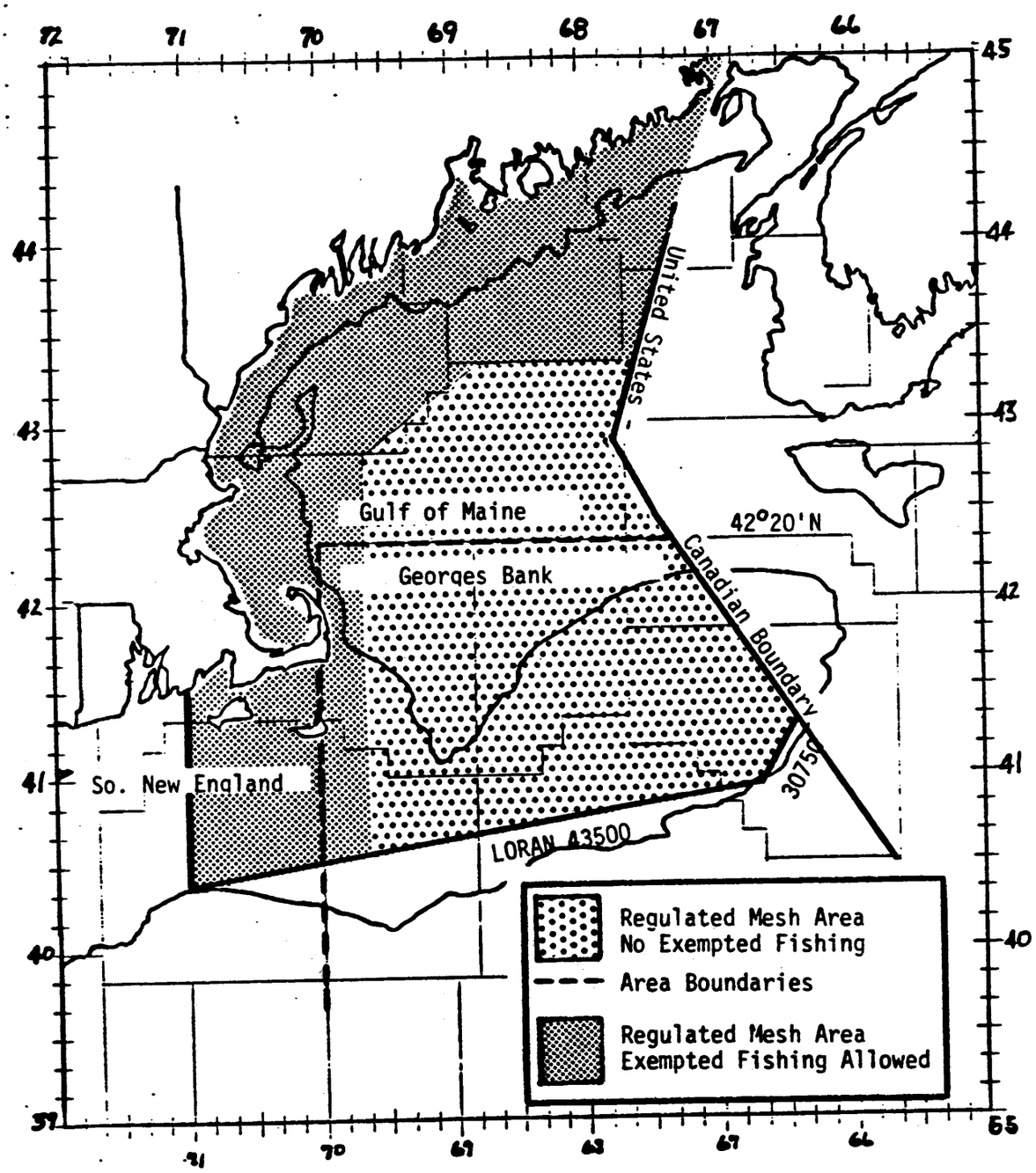


Figure 7A2. Proposed regulated large mesh area showing the part where exempted fishing can occur. Note that the Southern New England area east of 71 00'W remains an option for cod end mesh regulation.

Catch Reporting

Vessels participating in any exempted fishery must provide NMFS with catch records of sufficient detail to demonstrate that they have complied with the regulations for these fisheries. Two alternative methods for keeping these records are:

Option 1: A trip logbook must be kept and submitted by fishermen.

Option 2: An exempted fisheries reporting form, reflecting the aggregate catch over the period of participation, must be submitted by fishermen, and individual trip records must be maintained by fishermen for one year to corroborate the aggregate catch report.

Species Options for the Exempted Fisheries

Option 1 - Specific List

butterfish
dogfish
herring
mackerel
red hake
scup
shrimp
squid
whiting

Option 2 - Open List

Open, unrestricted to specific small mesh species

Seasonal Restrictions (Options) for Exempted Fisheries:

Period	Exempt Species	Comment
Northern area- June-November	Option 1 Species List	Regulated species may not exceed 10% of the total landings of all exempted species over the reporting period.
Southern area*- Mar 15 - Jan 15	Option 2 Open List	Regulated species (excluding winter flounder) may not exceed 10% of the total landings of all species (excluding winter flounder) over the reporting period.
Northern area- January-April or as specified by ASMFC	shrimp	Regulated species may not exceed 10% of the amount of shrimp landed over the reporting period.
Northern area- December-January	whiting	Regulated species may not exceed 10% of the amount of whiting landed over the reporting period; fishery will be subject to monitoring by sea sampling.

Southern area*- Jan 15 - Mar 15	whiting butterfish red hake squid	Regulated species may not exceed 10% of the total amount of whiting, butterfish, red hake and squid landed over the reporting period.
Northern area- Dec - May Southern area*- Jan 15 - Mar 15	herring mackerel	Regulated species may not exceed 10% of the amount of herring plus mackerel landed over the reporting period.

Pelagic Trawl Option

A fishery for herring, mackerel and/or squid may be conducted in the regulated mesh areas of Georges Bank and Southern New England throughout the year using small mesh cod ends subject to the stipulation that pelagic trawl gear be used and the by-catch of regulated species plus redfish be held to 1%.

E. Area Closures

Georges Bank

The spawning areas under the Interim Groundfish FMP will continue in force (see Figure 7A3a). In the event that one of the area/period closure options (shown in Figure 7A1 (a-c)) is selected for mesh regulation on Georges Bank, then the spawning area closures as currently defined (Figure 7A3a) will be effectively incorporated within the boundaries of those areas, and there would no longer be separate spawning closures.

The closure periods for both Spawning Areas I and II will be modified in order to protect fish during the time prior to spawning in addition to protecting them during the period of actual spawning. Three closure period options are:

Option 1: February 1 through May 31.

Option 2: February 1 through May 31 with an option for an opening after April 30, based upon the recommendation of the Regional Director.

Option 3: March through May (current) subject to later Council revision.

Southern New England/Mid-Atlantic

A portion of the New England/Mid-Atlantic area west of 69°40', illustrated in Figure 7A3b, could be seasonally closed to provide reduced mortality and enhanced spawning opportunity for yellowtail flounder. Various possibilities exist for establishing the starting and ending dates of the closure period within the area illustrated in Figure 7A3b.

*Contingent upon Council selection of the large mesh option for Southern New England.

Figure 7A3a Options for Closed Spawning Areas I and II

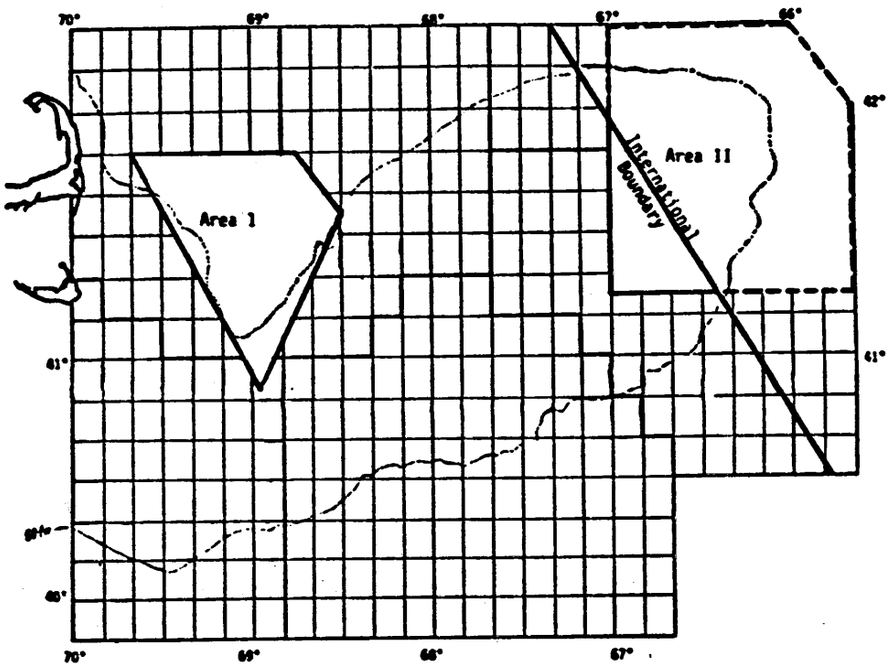
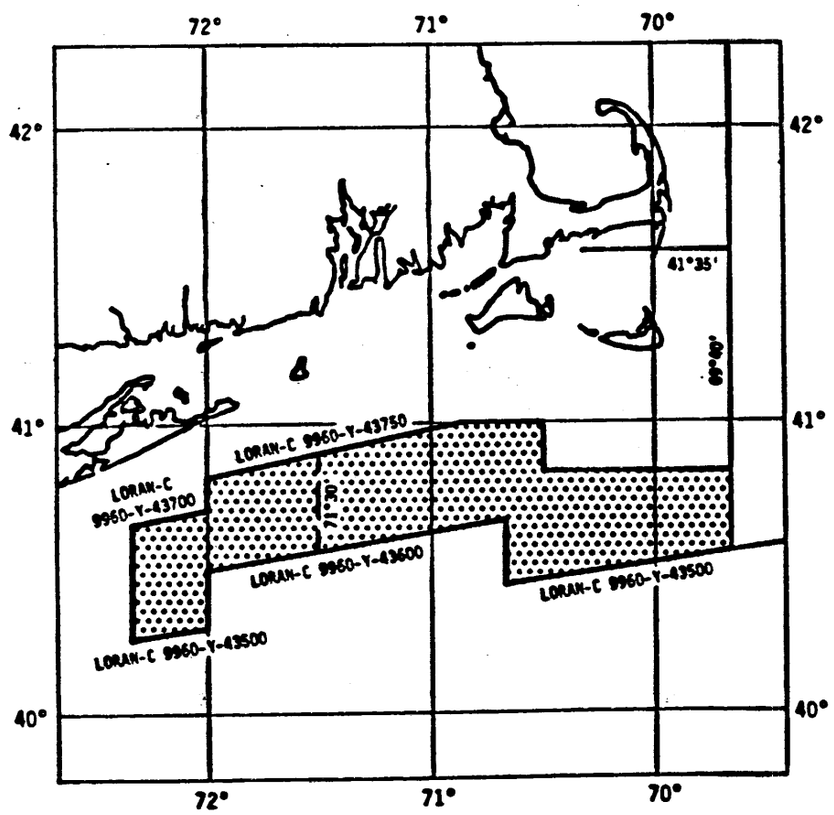


Figure 7A3b Southern New England Closed Spawning Area Option



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F. Additional Measures

Additional measures may be adopted by the Council after the FMP has been in effect for a period of time if the initial measures above are not effective in achieving the management objective.

In the Gulf of Maine and the Georges Bank areas, if fishing mortality for haddock or other key species is determined to exceed that which is necessary to meet the objectives of the plan, or if the escapement of a new year class of haddock is jeopardized by factors in the fishery, then four possible options to further control fishing mortality will be considered for Council action using the regulatory amendment process:

Option 1: Make regulatory modifications promoting the effectiveness of existing measures.

Option 2: Establish further time/area restrictions on the fishery.

Option 3: Increase minimum fish size.

Option 4: Increase the mesh size in all or part of these sectors.

In the Southern New England area, if fishing mortality for yellowtail flounder, with the 12 inch minimum size (and mesh regulation as may be determined) in place, remains above that necessary to maintain adequate spawning potential, then three additional options to further curtail fishing mortality will be considered for Council action using the regulatory amendment process.

Option 1: Close key yellowtail grounds for limited periods of time until conditions change.

Option 2: Increase minimum fish size.

Option 3: Establish a minimum mesh size for all or part of the area on a seasonal basis.

Other options for further reducing fishing mortality in all areas, such as direct effort control, would require a formal FMP amendment.

G. Gear Marking Requirements

Since 1977, the New England Council has been involved in efforts to develop management measures to address or lessen specific gear conflict problems and incidents which occur in the fishery conservation zone and which are caused, in part, by poorly or inconsistently marked fixed gear.

The Council has decided to address gear conflict issues on an individual FMP basis; and, therefore, marking requirements are proposed for demersal finfish fixed gear deployed within the geographic area of New England Council jurisdiction. In all fishery areas, demersal finfish fixed gear apparatus must have the name of the owner or vessel, or the official number of that vessel permanently affixed. This includes affixing such markings to any buoys, gillnets and longlines employed to catch demersal finfish. The

official number may be the vessel's federal fishery permit number or the vessel's state registration or Coast Guard documentation number. All identification markings must be in the Roman alphabet and in Arabic numerals and must be maintained to be clearly visible and legible.

Three alternative marking provisions are detailed below.

Option 1: Simple marking consistent with lobster gear:

In the Gulf of Maine, Georges Bank and Southern New England fishery areas, the marking requirement for gillnet and bottom-tending longline gear shall be as follows: the westernmost end (meaning the half compass circle from magnetic south through west to and including north) of a fixed gear trawl must display a radar reflector and flag (i.e., to make a double shape). The easternmost end (meaning the half compass circle from magnetic north through east to and including south) of a fixed gear trawl must display a single radar reflector.

Option 2: Simple marking with color coding for gillnets:

Same marking requirement as Option 1 except that the following further size specifications will be required:

1. The radar reflector on gillnets and longline gear shall consist of at least 100 square inches of reflective area and will be positioned on the staff at least 6 feet above the buoy.

2. The flag or pennant on gillnet gear only shall be of the color international orange.

Option 3: Option 3 is the same as option 2 with some or all of the following additional measures:

1. The distance between surface markers of continuous longline and gillnets shall not exceed 6,000 feet (note that intermediate markers must be uniquely identifiable).

2. The maximum length of continuous longline and gillnet sets shall not exceed 6,000 feet.

3. In the Gulf of Maine, sets of gillnet gear which are of an irregular pattern (non-linear and non-contour) or which deviate more than 30 degrees from the original course of the set would be marked at the extremity of the deviation with an additional marker which may be either independent or attached to the gear. Such marker would display a number of highly visible streamers sufficient to be distinguished from the flags or pennants of the end buoys.

H. Additional Options For Addressing Gear Conflicts

The Council has identified the following options to reduce the conflicts between groundfish gillnetters and recreational fishermen seeking cod, haddock, pollock and other groundfish:

Option 1: Appoint a Task Force to investigate the nature, causes and extent of conflicts which occur among fishery sectors, and to develop recommendations for measures to mitigate those conflicts. This Task Force will begin its investigation immediately and will report to the Council as soon as practicable. The Council will evaluate the recommendations and take appropriate action to amend the FMP, requesting use of the emergency authority of the Secretary as deemed necessary.

Option 2: Require gillnet fishermen to continually attend their gear in selected high recreational use fishing areas from April through October in the Gulf of Maine and from March through November in Southern New England.

Option 3: Require a minimum spacing of 3000 feet between sets of gillnet gear.

Option 4: In the Georges Bank and Southern New England areas, establish setting patterns for all fixed gear.

§7A4 Impact Analysis of Alternative Measures

§7A4.1 Introduction

The full range of management options which were considered as candidate management measures for the Northeast multi-species fishery are elaborated in §7A3. In support of the decision-making process leading to the choice of the preferred alternative management program, the candidate measures were subjected to a quantitative bio-economic impact analysis.

The parameters of the bio-economic analysis are initially defined in a biological frame of reference. The overall resource in support of the multi-species fishery is comprised of a series of separate fish stocks constituting the primary entities in the analytical framework. Analytical techniques of resource assessment and prediction, applied to each fish stock, are used to evaluate the effects of the alternative management measures on the stock and the fishery supported by that stock. The economic analysis then integrates the output from the biological analysis, casting it in terms of revenue accruing to the industry operating within the fishery management areas described in §7A3.

§7A4.2 Biological Impact Analysis of the Commercial Fishery

The biological analysis focuses upon those aspects of the proposed management program that incorporate options dealing with cod end mesh size, minimum fish size, and area/period closures in their application to the commercial fishery for the more important component species within the overall resource complex. The general approach taken in the analysis is to construct

fishery simulations (again on a stock-by-stock basis) which are sensitive to changes in the specification of mesh size, fish size, and closures through modification of the operative parameters. Thus, major simulations of stock by area reflect differing assumptions of mesh sizes: current conditions, 5-1/2 inch mesh (with closures), 6 inch mesh and delayed implementation of 6 inch mesh.

Alternative mesh sizes, in conjunction with minimum fish size, are examined through appropriate changes in the selection coefficients at age. Three optional area/period closures (operating in conjunction with 5-1/2 inch cod end mesh in the large mesh area on Georges Bank) are identified in §7A3. Closure Option A, having been identified in the plan development process (including public hearings) as being the least objectionable to the industry, is analyzed as a generic example of the area/period closure concept. All three closure options were designed to achieve equal restrictions in the catch of haddock on Georges Bank, but also incorporate variable restrictions in the catch of other species taken in joint harvesting relationships. Consequently, from the standpoint of the major thrust of the management objectives, all three options are equivalent. Closure Option A (in conjunction with a 5-1/2 inch cod end mesh and the proposed minimum fish sizes) was analyzed through appropriate simulated reductions in the fishing mortality rates.

The types of general information necessary to develop the simulations include a knowledge of the current stock structure (numbers at age), recent levels of fishing mortality, the record of historic catch levels by stock, and the relative strengths of recently recruiting year classes with an indication of the likely trend in recruitment levels in the near future. Given that the simulation period commences in 1985, initialization of each simulation requires 1984 catch levels.

The methodology employed in the fishery simulations is not made sensitive to changes in recruitment levels which may result from increased or reduced spawning stock. Since recruitment and fishing mortality are held constant through the simulation period, the stocks are driven to equilibria. This allows an evaluation of the relative impacts on expected catch and total revenues over time which are associated with alternative management programs, but it does not provide a true evaluation of the expected benefits in terms of spawning potential. The results of the simulations typically show that with increased mesh size, the spawning stocks may be expected to exhibit significant increases even under the constraint of constant recruitment. Recruitment estimates are reflective of recent conditions which in some cases (notably haddock) is well below the historic average. If the analysis could be made sensitive to the expected augmentation in recruitment as spawning stocks increase, this would allow a true evaluation of the expected increased spawning potential. Such a refinement to the analytical approach, however, will require significant additional research of the recruiting behavior of the fish stocks which comprise the resource. Therefore, the results of the simulation must be considered to be conservative, particularly in the years beyond 1987. Figure 7A4(b) illustrates the kind of stock response that would typically be associated with a positive stock/recruitment relationship. This type of analysis is not realistic for most stocks, although the results can be generalized to most stocks.

In the case of haddock and pollock, recent stock assessments included estimates of numbers of fish at age based upon virtual population analysis. These assessment data are discounted using appropriate mortality rates to provide observed and projected catch levels through 1984 and updated with recent average recruitment levels to derive the beginning stock structure for 1985. Thereafter, through the duration of the simulation, levels of recruitment and fishing mortality are held constant. The alternative cod end mesh sizes are simulated through the use of symmetrical sigmoid mesh selection curves appropriate for each mesh size. Examples of symmetrical sigmoid selection curves are depicted in Figure 5.18. For most of the simulations, the beginning stock structure (numbers at age) was based upon relative numbers at age from survey data appropriately scaled to explain observed catch levels in the commercial fishery. In all cases, the resulting estimates of numbers of fish at age in the beginning 1985 stocks should not be construed as true stock assessments. They are, however, as reasonably accurate estimates of those stocks as is possible to derive given incomplete information.

Projected Catches Streams

The output from the fishery simulations are presented in Tables 7A1-7A10 as annual landings, by fish stock, with alternative cod end mesh sizes. Simulated landings, total stock sizes, and discard levels are depicted in Figures 7A4(a) and 7A5-7A10.

In all cases, only the U.S. commercial fishery for the specified stock has been simulated. The simulated option featuring delayed implementation of the 6 inch cod end mesh is not included in Figures 7A4(a) and 7A5-7A10 for reasons of clarity. Estimates of discard consist entirely of those expected catches (based upon a symmetrical selection curve) which are comprised of fish smaller than the existing and/or proposed minimum fish sizes. Of course, under actual operational conditions, the amount of discard will be affected by differences in fish behavior, the degree of loading of the trawl net (assuming that the cod end is of conventional diamond mesh), the relative size of the recruiting year class, as well as a number of other factors. But, this approach to the estimation of discards evaluates the relative effects of alternative mesh sizes in conjunction with proposed minimum fish sizes in a manner which is independent of these other considerations (which are beyond the scope of the proposed management program).

Given the (conservative) assumption that fishing mortality rates remain at or below current levels, implementation of a regulated cod end mesh of 5-1/2 or 6 inches will result in significant increases in total stock size relative to that under the current operative mesh. But in all cases, with constant fishing mortalities, an increase in the mesh size may be expected to result in a short-term reduction in landings.

As shown in Tables 7A1-7A10, the landed catch from Georges Bank with a regulated 5-1/2 inch mesh in combination with the proposed minimum fish sizes but without the proposed area/season closure may exhibit a persistent deficit with respect to current conditions. For cod, haddock, and yellowtail flounder, under this management option, the magnitude of the discard (up to about 17% of the landed weight of yellowtail) dissipates the benefits to the

landed catch which should accrue with increased stock sizes. The proposed minimum fish sizes have biological significance in terms of the size at sexual maturity. That is, with minimum fish sizes at or near the size at 50% sexual maturity, spawning stock sizes will be enhanced, promoting adequate spawning potential to assure year-class replacement. Thus, from a biological perspective, long-term efforts to alleviate the disparity in the landed catches should focus on the mesh size.

The same management option (a 5-1/2 inch mesh with minimum fish sizes) but combined with the proposed area/season closure (i.e., reduced fishing mortality rates) may be expected to result in consistently reduced landings in the case of Georges Bank haddock, redfish, pollock, and Georges Bank yellowtail flounder. Moreover, the initial negative impact on landings immediately following implementation is expected to be the greatest among all options considered.

An additional option which was considered for management of the multi-species fishery in the Gulf of Maine stock concerned the provision for a limited, small mesh fishery for redfish within the large mesh (5-1/2 inch) area in the central Gulf of Maine between 42°20'N Lat and 43°00'N Lat during the months of March through July. NMFS interview catch information indicates that an average of 29.7% of the total annual U.S. catch of redfish is taken from the described area during the indicated period. Two simulations of the proposed mesh program in the Gulf of Maine, vis a vis redfish, are presented in Table 7A5. Alternative b assumes that 29.7% of the current catch taken with the currently used mesh would be taken in this exempted fishery. For the remainder of the year, the indicated area would revert to being part of the large mesh (5-1/2" mesh) area. It was also assumed that the remainder of redfish catches (i.e., excepting that taken under the time/area restrictions of the exempted fishery) would be taken with 5-1/2" mesh. Given these assumptions, it is seen from Table 7A5.b that a reduction of some 50% in total redfish catches may be expected with implementation of the exempted redfish fishery in combination with the large mesh (5-1/2") area in the central Gulf of Maine.

In all cases, simulated catches of groundfish were run assuming no increase in the current level of the fishing mortality rate. To the extent that Fs exhibit increases, perhaps as a result of increased effort in response to decreased catch rates which may, in turn, result from increased mesh sizes, then short-term losses may be minimized, but at the expense of projected long-term benefits. Conversely, recruitment was held constant despite long-term increased levels of stock size (in all cases except haddock) which may be expected to enhance average recruitment. These two assumptions, therefore, tend to be mutually counteractive in terms of the overall effect on the estimates of long-term average catches.

Table 7A1: GEORGES BANK COD

FISHERY SIMULATIONS: IMPACTS OF MESH CHANGES ON EXPECTED LANDINGS (mt) INCLUDING ESTIMATES OF DISCARDS RESULTING FROM PROPOSED MINIMUM SIZES

Numbers in Brackets Indicate Percent Change From Landings With Current Operative Mesh

YEAR	CURRENT 1/		5-1/2" 2/ MESH		5-1/2" 3/ (CLOSURE)		6" MESH		DELAYED 6" MESH	
	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD
1985	23444	187	19729 (-15.8)	2250	16193 (-30.9)	1764	18642 (-20.5)	1024	19729 (-15.8)	2250
1986	22451	"	19727 (-12.1)	"	18078 (-19.5)	"	19519 (-13.1)	"	18082 (-19.5)	1024
1987	22753	"	21080 (-7.4)	"	20649 (-9.2)	"	22446 (-1.3)	"	21143 (-7.1)	"
1988	22908	"	21854 (-4.6)	"	22294 (-2.7)	"	24278 (+6.0)	"	23490 (+2.5)	"
1989	23073	"	22359 (-3.1)	"	23405 (+1.4)	"	25358 (+9.9)	"	24932 (+8.1)	"
1990	23206	"	22667 (-2.3)	"	24126 (+4.0)	"	25962 (+11.9)	"	25744 (+10.9)	"
1991	23287	"	22835 (-1.9)	"	24555 (+5.4)	"	26277 (+12.8)	"	26169 (+12.4)	"
1992	23331	"	22920 (-1.8)	"	24787 (+6.2)	"	26431 (+13.3)	"	26381 (+13.1)	"
1993	23366	"	22973 (-1.7)	"	24935 (+6.7)	"	26512 (+13.5)	"	26493 (+13.4)	"
1994	23366	"	22973 (-1.7)	"	24935 (+6.7)	"	26512 (+13.5)	"	26512 (+13.5)	"

1/ Current mesh scenario assumes a cod end mesh of approx. 5-1/8 inches and a 17 inch minimum size. All other scenarios assume a 19 inch minimum size to take effect upon plan implementation.

2/ Assumes that 5-1/2 inch mesh applies to all areas and times on Georges Bank except during the existing spawning closures.

3/ Assumes the 5-1/2 inch mesh option but with the proposed area closures on Georges Bank.

Table 7A2: GULF OF MAINE COD

YEAR	CURRENT		5-1/2" MESH		6" MESH		DELAYED 6" MESH	
	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD
1985	12525	258	10905 (-12.9)	962	9842 (-21.4)	477	10905 (-12.9)	962
1986	12056	"	10838 (-10.1)	1174	10808 (-10.3)	498	9890 (-18.0)	494
1987	11891	"	11194 (-5.9)	"	11997 (+0.9)	"	11175 (-5.9)	498
1988	11680	"	11325 (-3.0)	"	12680 (+8.6)	"	12170 (+4.2)	"
1989	11708	"	11544 (-1.4)	"	13207 (+12.8)	"	12930 (+10.4)	"
1990	11760	"	11697 (-0.5)	"	13518 (+14.9)	"	13376 (+13.7)	"
1991	11779	"	11766 (-0.1)	"	13665 (+16.0)	"	13596 (+15.4)	"
1992	11769	"	11775 (0.0)	"	13699 (+16.4)	"	13677 (+16.2)	"
1993	11769	"	11780 (+0.1)	"	13707 (+16.5)	"	13706 (+16.5)	"
1994	11769	"	11780 (+0.1)	"	13707 (+16.5)	"	13707 (+16.5)	"

Note: Current mesh scenario assumes a cod end mesh of approx. 5-1/8 inches and a 17 inch minimum size. All other scenarios assume a 19 inch minimum size to take effect upon plan implementation.

Table 7A3: GEORGES BANK HADDOCK

FISHERY SIMULATIONS: IMPACTS OF MESH CHANGES ON EXPECTED LANDINGS (mt) INCLUDING ESTIMATES OF DISCARDS RESULTING FROM PROPOSED MINIMUM SIZES

Numbers in Brackets Indicate Percent Change From Landings With Current Operative Mesh

YEAR	CURRENT [1]		5-1/2" [2] MESH		5-1/2" [3] (CLOSURE)		6" MESH		DELAYED 6" MESH	
	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD
1985	3689	Not Est.	3340 (-9.5)	134	2303 (-37.6)	84	3168 (-14.1)	25	3340 (-9.5)	134
1986	2435	"	2221 (-8.8)	"	1866 (-23.4)	"	2168 (-11.0)	"	2021 (-17.0)	25
1987	1965	"	1837 (-6.5)	"	1717 (-12.6)	"	1904 (-3.1)	"	1797 (-8.6)	"
1988	1703	"	1618 (-5.0)	"	1543 (-9.4)	"	1747 (+2.6)	"	1693 (-0.6)	"
1989	1654	"	1588 (-4.0)	"	1538 (-7.0)	"	1746 (+5.6)	"	1722 (+4.1)	"
1990	1641	"	1583 (-3.5)	"	1548 (-5.7)	"	1754 (+6.9)	"	1744 (+6.3)	"
1991	1640	"	1587 (-3.3)	"	1564 (-4.6)	"	1763 (+7.5)	"	1758 (+7.2)	"
1992	1640	"	1588 (-3.2)	"	1570 (-4.3)	"	1766 (+7.7)	"	1765 (+7.6)	"
1993	1640	"	1588 (-3.2)	"	1570 (-4.3)	"	1766 (+7.7)	"	1766 (+7.7)	"

Note: Footnotes same as in Table 7A1.

Table 7A4: GULF OF MAINE HADDOCK

YEAR	CURRENT		5-1/2" MESH		6" MESH		DELAYED 6" MESH	
	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD
1985	5498	785	4305 (-21.7)	614	3161 (-42.5)	263	4305 (-21.7)	614
1986	5430	"	5428 (0.0)	475	5094 (-6.2)	199	4321 (-20.4)	194
1987	5133	"	5565 (+8.4)	"	5794 (+12.9)	"	5253 (+2.3)	199
1988	4953	"	5600 (+13.1)	"	5989 (+20.9)	"	5722 (+15.5)	"
1989	4860	"	5607 (+15.4)	"	6064 (+24.8)	"	5943 (+22.3)	"
1990	4810	"	5602 (+16.5)	"	6088 (+26.6)	"	6035 (+25.5)	"
1991	4801	"	5612 (+16.9)	"	6110 (+27.3)	"	6088 (+26.8)	"
1992	4781	"	5597 (+17.1)	"	6089 (+27.4)	"	6088 (+27.3)	"
1993	4781	"	5597 (+17.1)	"	6089 (+27.4)	"	6089 (+27.4)	"

Note: Current mesh scenario assumes a cod end mesh of approx. 5-1/8 inches and a 17 inch minimum size. All other scenarios assume a 19 inch minimum size to take effect upon plan implementation.

Table 7A5.a REDFISH

FISHERY SIMULATIONS: IMPACTS OF MESH CHANGES ON EXPECTED LANDINGS (mt)
IN THE TOTAL U.S. FISHERY FOR REDFISH
INCLUDING ESTIMATES RESULTING FROM PROPOSED AREA CLOSURES ON GEORGES BANK

YEAR	CURRENT MESH (mt)	5 1/2" MESH (mt)	PERCENT CHANGE	5 1/2" MESH (w/CLOSURES) (mt)	PERCENT CHANGE
1985	4477	1201	-73.2	1112	-75.2
1986	4203	1178	-72.0	1100	-73.8
1987	4093	1255	-69.3	1177	-71.2
1988	4121	1221	-70.4	1150	-72.1
1989	4175	1276	-69.4	1206	-71.1
1990	4330	1306	-69.8	1238	-71.4
1991	4479	1351	-69.8	1283	-71.4
1992	4656	1456	-68.7	1386	-70.2
1993	4838	1605	-66.8	1537	-68.2
1994	5011	1814	-63.8	1744	-65.2

Table 7A5.b REDFISH

FISHERY SIMULATIONS: IMPACTS OF PROPOSED EXEMPTED FISHERY
IN THE CENTRAL GULF OF MAINE IN COMBINATION WITH INCREASED MESH SIZE
FOR THE REMAINDER OF THE TOTAL U.S. FISHERY FOR REDFISH (mt)

YEAR	CURRENT MESH (mt)	EXEMPTED FISHERY + 5 1/2" MESH	PERCENT CHANGE
1985	4477	2174	-51.4
1986	4203	2076	-50.6
1987	4093	2098	-48.7
1988	4121	2082	-49.5
1989	4175	2137	-48.8
1990	4330	2204	-49.1
1991	4479	2280	-49.1
1992	4656	2406	-48.3
1993	4838	2565	-47.0
1994	5011	2764	-44.9

Table 7A6: POLLOCK

FISHERY SIMULATIONS: IMPACTS OF MESH CHANGES ON EXPECTED LANDINGS (mt)
INCLUDING ESTIMATES OF DISCARDS RESULTING FROM PROPOSED MINIMUM SIZES

Numbers in Brackets Indicate Percent Change
From Landings With Current Operative Mesh

YEAR	CURRENT 1/		5-1/2" 2/ MESH		5-1/2" 3/ (CLOSURE)		6" MESH		DELAYED 6" MESH	
	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD
1985	16267	Not Est.	14825 (-8.9)	159	11729 (-27.9)	123	13797 (-15.2)	39	14825 (-8.9)	159
1986	17176	"	16152 (-6.0)	157	13412 (-21.9)	122	15493 (-9.8)	"	15139 (-11.9)	39
1987	18337	"	17792 (-3.0)	"	15277 (-16.7)	"	17561 (-4.2)	"	17129 (-6.6)	"
1988	19197	"	18998 (-1.0)	"	16706 (-13.0)	"	19059 (-0.7)	"	18760 (-2.3)	"
1989	20088	"	20122 (+0.2)	"	18050 (-10.1)	"	20380 (+1.5)	"	20180 (+0.5)	"
1990	20608	"	20811 (+1.0)	"	18940 (-8.1)	"	21213 (+2.9)	"	21066 (+2.2)	"
1991	20806	"	21128 (+1.5)	"	19389 (-6.8)	"	21631 (+4.0)	"	21528 (+3.5)	"
1992	21131	"	21534 (+1.9)	"	19935 (-5.7)	"	22107 (+4.6)	"	22036 (+4.3)	"
1993	21241	"	21699 (+2.1)	"	20167 (-5.1)	"	22317 (+5.1)	"	22270 (+4.8)	"
1994	21228	"	21691 (+2.2)	"	20157 (-5.0)	"	22310 (+5.1)	"	22308 (+5.1)	"
1995	21228	"	21691 (+2.2)	"	20157 (-5.0)	"	22310 (+5.1)	"	22310 (+5.1)	"

1/ Current mesh scenario (a simulation of the total US fishery for pollock) assumes a cod end mesh of approx. 5-1/8 inches with no minimum size. All other scenarios assume a 19 inch minimum size to take effect upon plan implementation.

2/ Assumes that 5-1/2 inch mesh applies to all areas and times in the total US fishery for pollock except during the existing Georges Bank spawning closures.

3/ Assumes the 5-1/2 inch mesh option but with the proposed area closures on Georges Bank.

Table 7A7: GEORGES BANK YELLOWTAIL FLOUNDER

FISHERY SIMULATIONS: IMPACTS OF MESH CHANGES ON EXPECTED LANDINGS (mt) INCLUDING ESTIMATES OF DISCARDS RESULTING FROM PROPOSED MINIMUM SIZES

Numbers in Brackets Indicate Percent Change From Landings With Current Operative Mesh

YEAR	CURRENT 1/		5-1/2" 2/ MESH		5-1/2" 3/ (CLOSURE)		6" MESH		DELAYED 6" MESH	
	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD
1985	9368	180	7236 (-22.8)	1209	6549 (-30.1)	1059	6688 (-28.6)	728	7236 (-22.8)	1209
1986	10026	"	8613 (-14.1)	1231	8313 (-17.1)	1083	8615 (-14.1)	756	7940 (-20.8)	742
1987	10396	"	9566 (-8.0)	"	9550 (-8.1)	"	10186 (-2.0)	"	9655 (-7.1)	756
1988	10536	"	9950 (-5.6)	"	10108 (-4.1)	"	10855 (+3.0)	"	10617 (+0.8)	"
1989	10580	"	10081 (-4.7)	"	10324 (-2.4)	"	11088 (+4.8)	"	11003 (+4.0)	"
1990	10594	"	10124 (-4.4)	"	10403 (-1.8)	"	11166 (+5.4)	"	11137 (+5.1)	"
1991	10600	"	10138 (-4.4)	"	10432 (-1.6)	"	11191 (+5.6)	"	11183 (+5.5)	"
1992	10600	"	10139 (-4.3)	"	10433 (-1.6)	"	11193 (+5.6)	"	11192 (+5.6)	"
1993	10600	"	10139 (-4.3)	"	10433 (-1.6)	"	11193 (+5.6)	"	11193 (+5.6)	"

1/ Current mesh scenario assumes a cod end mesh of approx. 5-1/8 inches and a 11 inch minimum size. All other scenarios assume a 12 inch minimum size to take effect upon plan implementation.

2/ Assumes that 5-1/2 inch mesh applies to all areas and times on Georges Bank except during the existing spawning closures.

3/ Assumes the 5-1/2 inch mesh option but with the proposed area closures on Georges Bank.

Table 7A8: SOUTHERN NEW ENGLAND YELLOWTAIL FLOUNDER

YEAR	CURRENT		5-1/2" MESH		6" MESH		DELAYED 6" MESH	
	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD
1985	9241	1205	5636 (-39.0)	758	5256 (-43.1)	444	5636 (-39.0)	758
1986	9452	"	7467 (-21.0)	978	7215 (-23.7)	587	6904 (-27.0)	580
1987	9582	"	9986 (+4.2)	"	10069 (+5.1)	"	9745 (+1.7)	"
1988	9579	"	11717 (+22.3)	"	12177 (+27.1)	"	11970 (+25.0)	"
1989	9628	"	12712 (+32.0)	"	13375 (+38.9)	"	13265 (+37.8)	"
1990	9699	"	13269 (+36.8)	"	14036 (+44.7)	"	13981 (+44.1)	"
1991	9700	"	13500 (+39.2)	"	14314 (+47.6)	"	14291 (+47.3)	"
1992	9700	"	13572 (+39.9)	"	14400 (+48.5)	"	14396 (+48.4)	"
1993	9700	"	13572 (+39.9)	"	14400 (+48.5)	"	14400 (+48.5)	"

Note: Current mesh scenario assumes a cod end mesh of approx. 4-1/2 inches and a 11 inch minimum size. All other scenarios assume a 12 inch minimum size to take effect upon plan implementation.

Table 7A9: AMERICAN PLAICE
FISHERY SIMULATIONS: IMPACTS OF MESH CHANGES ON EXPECTED LANDINGS (mt)
INCLUDING ESTIMATES OF DISCARDS RESULTING FROM PROPOSED MINIMUM SIZES

Numbers in Brackets Indicate Percent Change
From Landings With Current Operative Mesh

YEAR	CURRENT 1/		5-1/2" 2/ MESH		5-1/2" 3/ (CLOSURE)		6" MESH		DELAYED 6" MESH	
	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD
1985	8825	Not Est.	8023 (-9.1)	164	6742 (-23.6)	134	7138 (-19.1)	33	8023 (-9.1)	164
1986	9008	"	8313 (-7.7)	"	7317 (-18.8)	"	7521 (-16.5)	"	7238 (-19.7)	33
1987	9403	"	8951 (-4.8)	"	8139 (-13.4)	"	8399 (-10.7)	"	8068 (-14.2)	"
1988	9789	"	9595 (-2.0)	"	8933 (-8.7)	"	9406 (-3.9)	"	9115 (-6.9)	"
1989	10101	"	10101 (0.0)	"	9573 (-5.2)	"	10239 (+1.4)	"	10022 (-0.8)	"
1990	10332	"	10470 (+1.3)	"	10056 (-2.7)	"	10838 (+4.9)	"	10686 (+3.4)	"
1991	10496	"	10729 (+2.2)	"	10409 (-0.8)	"	11254 (+7.2)	"	11152 (+6.3)	"
1992	10607	"	10902 (+2.8)	"	10656 (+0.5)	"	11531 (+8.7)	"	11464 (+8.1)	"
1993	10687	"	11024 (+3.1)	"	10835 (+1.4)	"	11719 (+9.7)	"	11676 (+9.3)	"
1994	10739	"	11102 (+3.4)	"	10955 (+2.0)	"	11840 (+10.3)	"	11813 (+10.0)	"
1995	10772	"	11150 (+3.5)	"	11032 (+2.4)	"	11914 (+10.6)	"	11898 (+10.5)	"
1996	10792	"	11180 (+3.6)	"	11080 (+2.7)	"	11958 (+10.8)	"	11950 (+10.7)	"
1997	10804	"	11195 (+3.6)	"	11105 (+2.8)	"	11979 (+10.9)	"	11967 (+10.8)	"
1998	10804	"	11195 (+3.6)	"	11105 (+2.8)	"	11979 (+10.9)	"	11979 (+10.9)	"

1/ Current mesh scenario (a simulation of the total US fishery for American plaice) assumes a cod end mesh of approx. 5-1/8 inches with no minimum size. All other scenarios assume a 12 inch minimum size to take effect upon plan implementation.

2/ Assumes that 5-1/2 inch mesh applies to all areas and times in the total US fishery for American plaice except during the existing Georges Bank spawning closures.

3/ Assumes the 5-1/2 inch mesh option but with the proposed area closures on Georges Bank.

Table 7A10: GEORGES BANK WINTER FLOUNDER

FISHERY SIMULATIONS: IMPACTS OF MESH CHANGES ON EXPECTED LANDINGS (mt) INCLUDING ESTIMATES OF DISCARDS RESULTING FROM PROPOSED MINIMUM SIZES

Numbers in Brackets Indicate Percent Change From Landings With Current Operative Mesh

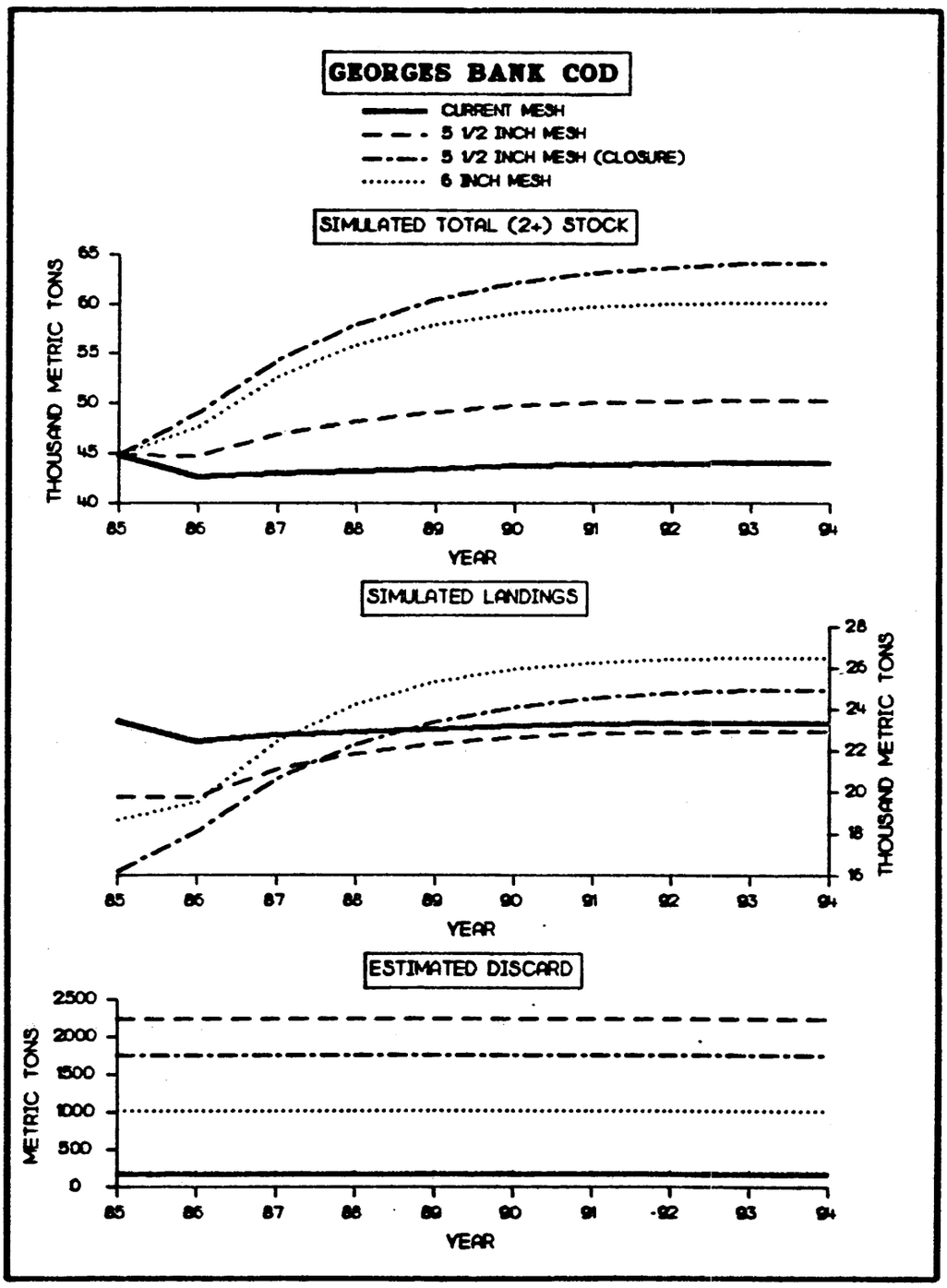
YEAR	CURRENT 1/		5-1/2" 2/ MESH		5-1/2" 3/ (CLOSURE)		6" MESH		DELAYED 6" MESH	
	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD	LAND-INGS	DIS-CARD
1985	10004	Not Est.	9581 (-4.2)	86	8547 (-14.6)	76	9110 (-8.9)	45	9581 (-4.2)	86
1986	10239	"	9889 (-3.4)	105	9079 (-11.3)	93	9539 (-6.8)	54	9331 (-8.9)	54
1987	10689	"	10533 (-1.5)	"	9861 (-7.7)	"	10390 (-2.8)	"	10201 (-4.6)	"
1988	11085	"	11087 (+0.01)	"	10523 (-5.1)	"	11134 (+0.4)	"	10988 (-0.9)	"
1989	11391	"	11509 (+1.0)	"	11032 (-3.2)	"	11694 (+2.7)	"	11591 (+1.8)	"
1990	11611	"	11809 (+1.7)	"	11399 (-1.8)	"	12088 (+4.1)	"	12019 (+3.5)	"
1991	11760	"	12012 (+2.1)	"	11652 (-0.9)	"	12355 (+5.1)	"	12309 (+4.7)	"
1992	11858	"	12145 (+2.4)	"	11820 (-0.3)	"	12528 (+5.6)	"	12498 (+5.4)	"
1993	11921	"	12230 (+2.6)	"	11930 (+0.1)	"	12638 (+6.0)	"	12620 (+5.9)	"
1994	11960	"	12284 (+2.7)	"	11999 (+0.3)	"	12708 (+6.3)	"	12696 (+6.2)	"
1995	11985	"	12311 (+2.8)	"	12042 (+0.5)	"	12750 (+6.4)	"	12744 (+6.3)	"
1996	12000	"	12334 (+2.8)	"	12064 (+0.5)	"	12769 (+6.4)	"	12769 (+6.4)	"
1997	12000	"	12334 (+2.8)	"	12064 (+0.5)	"	12769 (+6.4)	"	12769 (+6.4)	"

1/ Current mesh scenario assumes a cod end mesh of approx. 5-1/8 inches with no minimum size. All other scenarios assume an 11 inch minimum size to take effect upon plan implementation.

2/ Assumes that 5-1/2 inch mesh applies to all areas and times on Georges Bank except during the existing spawning closures.

3/ Assumes the 5-1/2 inch mesh option but with the proposed area closures on Georges Bank.

Figure 7A4 (a)


GEORGES BANK COD
CURRENT MESH
5 1/2 INCH MESH
5 1/2 INCH MESH (CLOSURE)
6 INCH MESH
SIMULATED TOTAL (2+) STOCK
THOUSAND METRIC TONS
65
60
55
50
45
85
86
87
88
89
90
91
92
93
94
YEAR
SIMULATED LANDINGS
THOUSAND METRIC TONS
28
26
24
22
20
18
16
YEAR
ESTIMATED DISCARD
METRIC TONS
2500
2000
1500
1000
500
0
YEAR

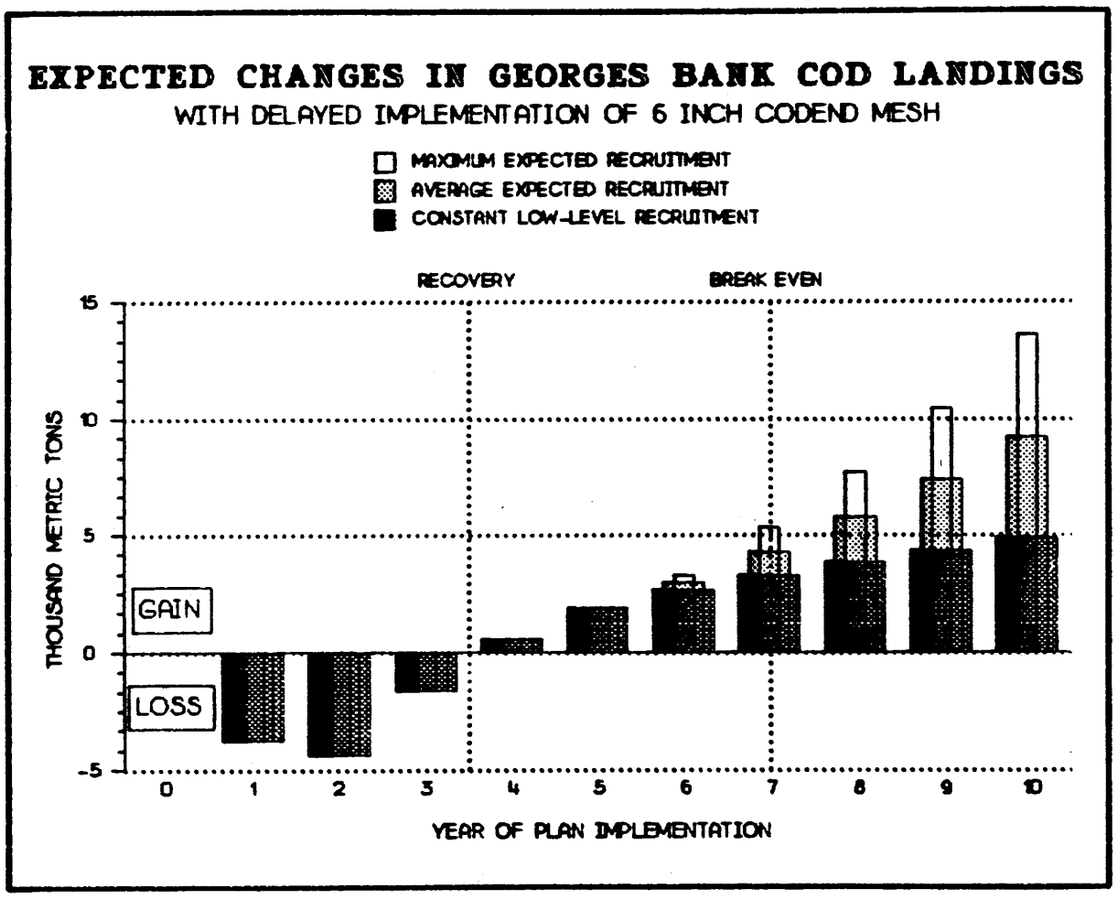


Figure 7A4(b). Expected short-term losses and long-term gains in Georges Bank cod landings. The potential long-term gains may be substantial given expected improvement in recruitment levels.

8/30/85

Figure 7A5

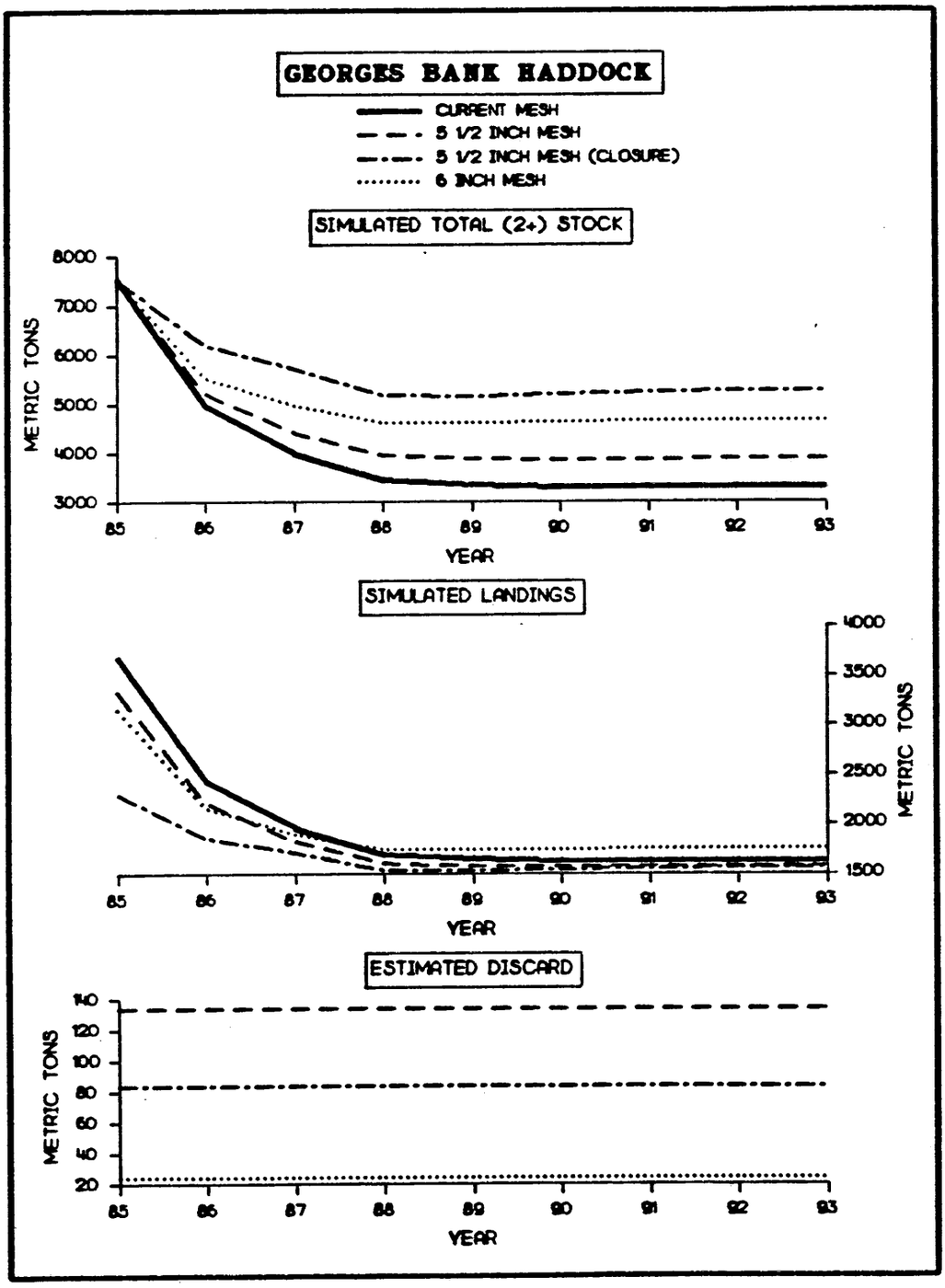

GEORGES BANK HADDOCK
CURRENT MESH
5 1/2 INCH MESH
5 1/2 INCH MESH (CLOSURE)
6 INCH MESH
SIMULATED TOTAL (2+) STOCK
METRIC TONS
8000
7000
6000
5000
4000
3000
85
86
87
88
89
90
91
92
93
YEAR
SIMULATED LANDINGS
METRIC TONS
4000
3500
3000
2500
2000
1500
YEAR
ESTIMATED DISCARD
METRIC TONS
140
120
100
80
60
40
20
YEAR

Figure 7A6

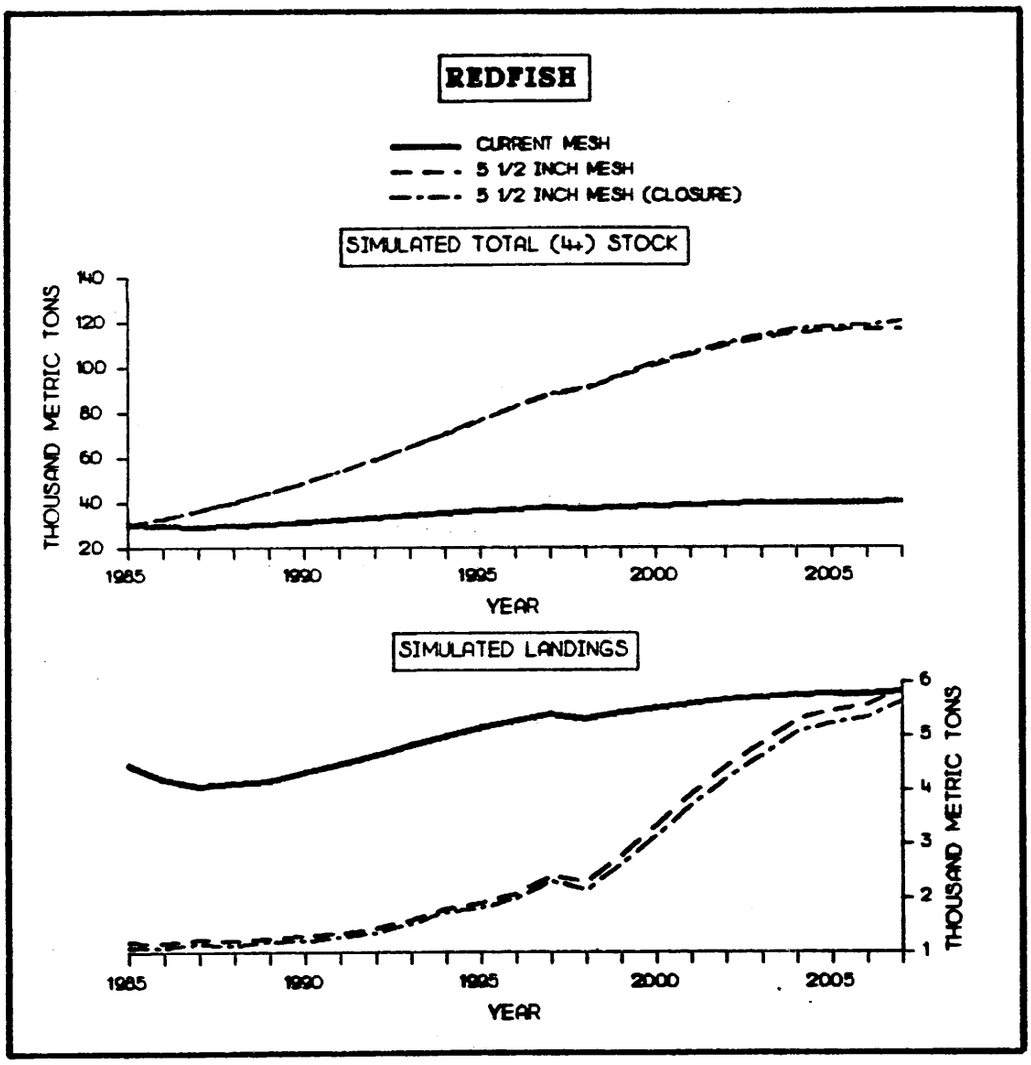

REDFISH
CURRENT MESH
5 1/2 INCH MESH
5 1/2 INCH MESH (CLOSURE)
SIMULATED TOTAL (4+) STOCK
THOUSAND METRIC TONS
140
120
100
80
60
40
20
1985
1990
1995
2000
2005
YEAR
SIMULATED LANDINGS
THOUSAND METRIC TONS
6
5
4
3
2
1
1985
1990
1995
2000
2005
YEAR

Figure 7A7

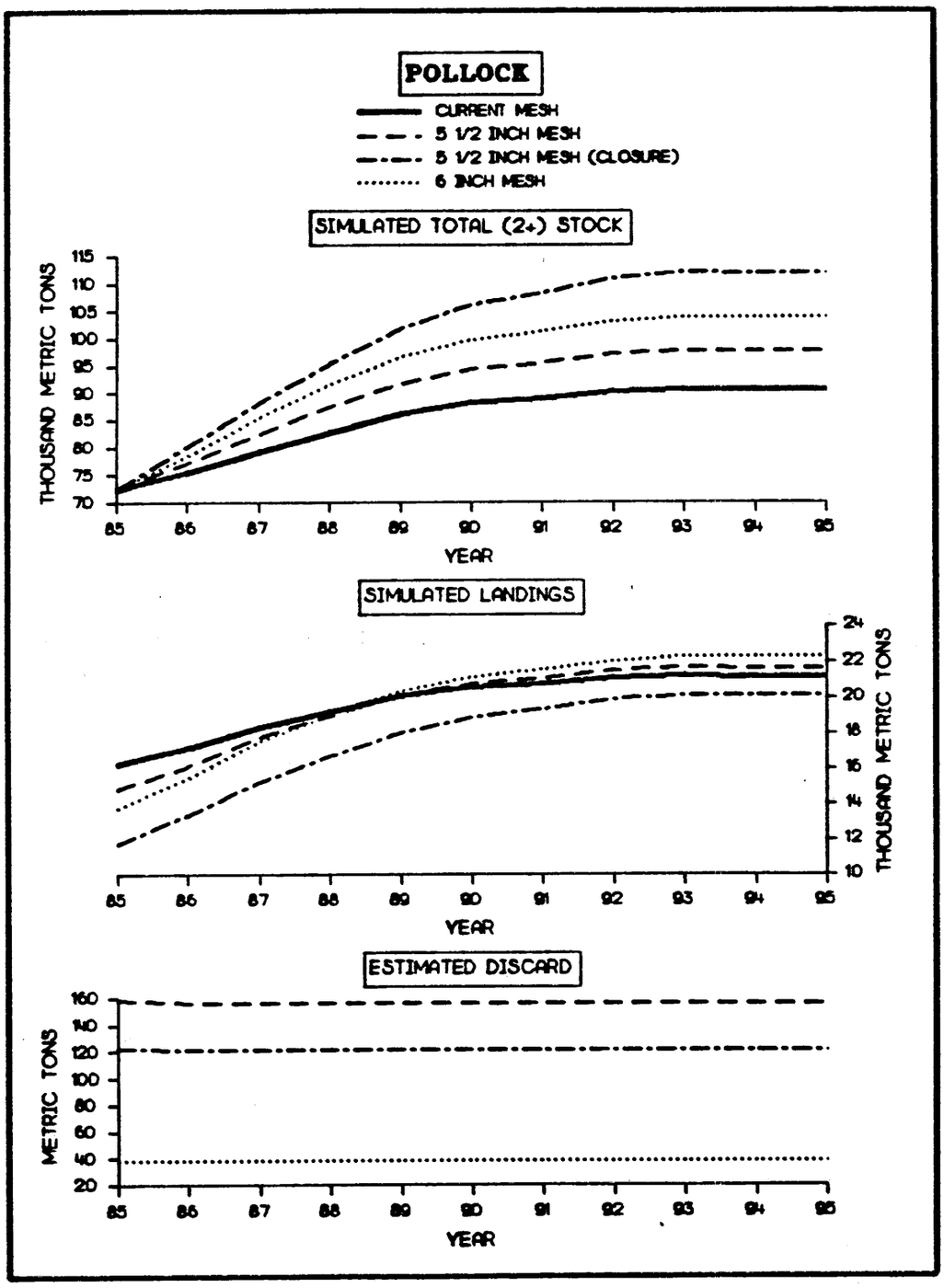

POLLOCK
CURRENT MESH
5 1/2 INCH MESH
5 1/2 INCH MESH (CLOSURE)
6 INCH MESH
SIMULATED TOTAL (2+) STOCK
THOUSAND METRIC TONS
YEAR
SIMULATED LANDINGS
THOUSAND METRIC TONS
YEAR
ESTIMATED DISCARD
METRIC TONS
YEAR

Figure 7A8

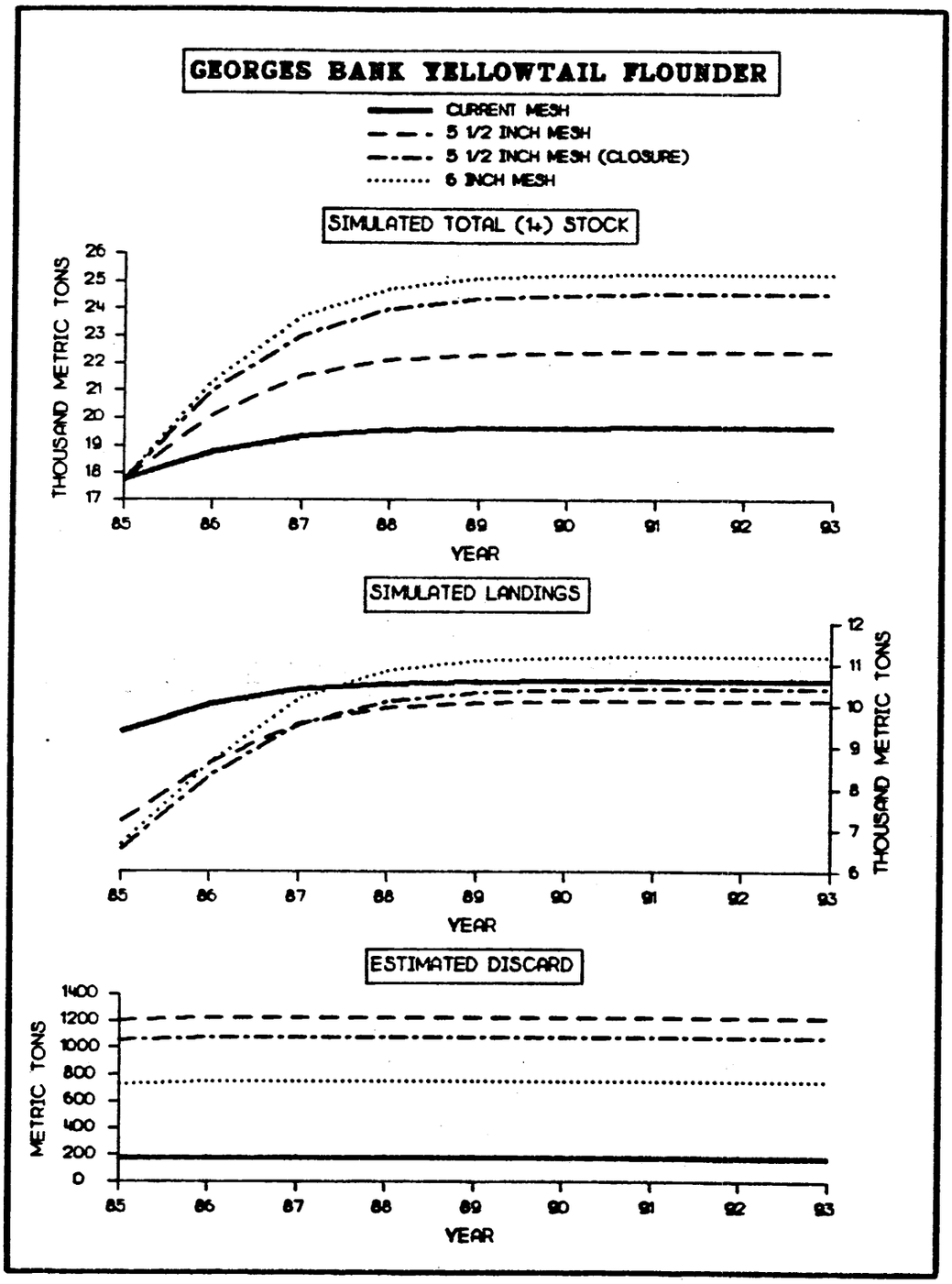

GEORGES BANK YELLOWTAIL FLOUNDER
CURRENT MESH
5 1/2 INCH MESH
5 1/2 INCH MESH (CLOSURE)
6 INCH MESH
SIMULATED TOTAL (1+) STOCK
THOUSAND METRIC TONS
26
25
24
23
22
21
20
19
18
17
85
86
87
88
89
90
91
92
93
YEAR
SIMULATED LANDINGS
THOUSAND METRIC TONS
12
11
10
9
8
7
6
YEAR
ESTIMATED DISCARD
METRIC TONS
1400
1200
1000
800
600
400
200
0
YEAR

Figure 7A9

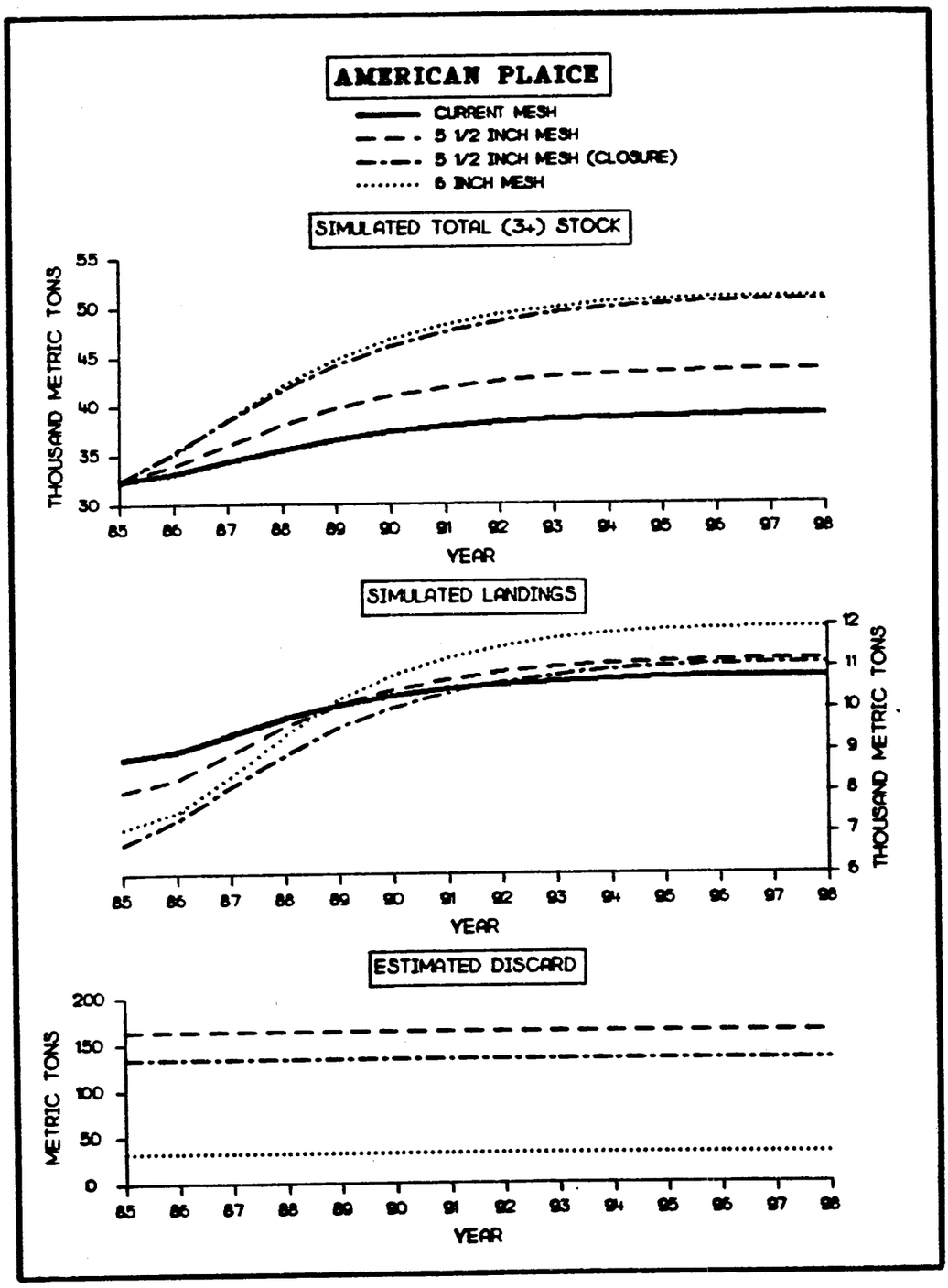
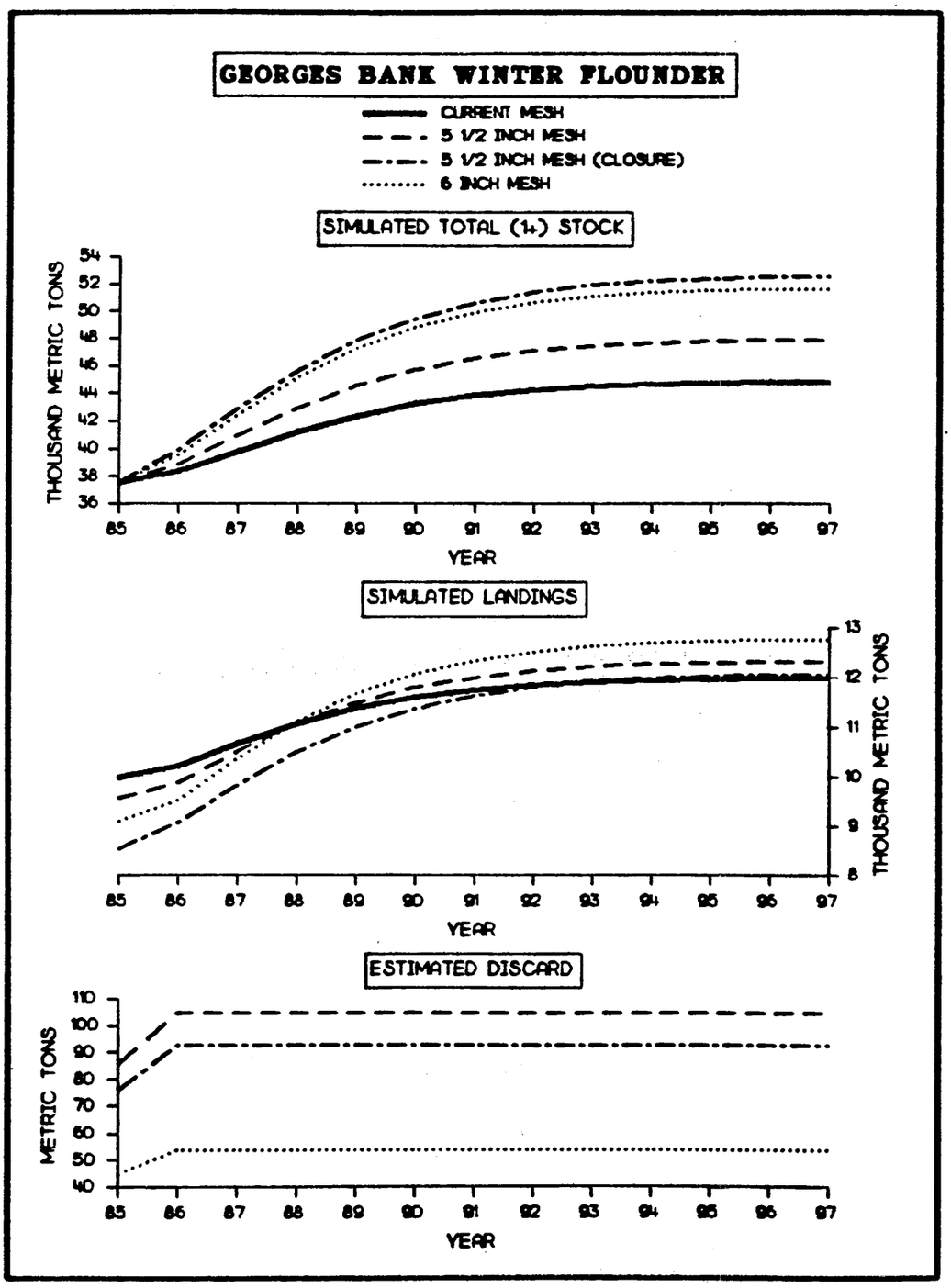

AMERICAN PLAICE
CURRENT MESH
5 1/2 INCH MESH
5 1/2 INCH MESH (CLOSURE)
6 INCH MESH
SIMULATED TOTAL (3+) STOCK
THOUSAND METRIC TONS
55
50
45
40
35
30
85 86 87 88 89 90 91 92 93 94 95 96 97 98
YEAR
SIMULATED LANDINGS
THOUSAND METRIC TONS
12
11
10
9
8
7
6
85 86 87 88 89 90 91 92 93 94 95 96 97 98
YEAR
ESTIMATED DISCARD
METRIC TONS
200
150
100
50
0
85 86 87 88 89 90 91 92 93 94 95 96 97 98
YEAR

Figure 7A10



8/30/85

Spawning Potential

The thrust of the management objectives of this FMP is in terms of promoting adequate spawning potential among the important species within the overall resource such that those important fish stocks may not be placed in serious jeopardy and that year classes may continue to replace themselves. As discussed in Part 5, the analytical basis for assessing the spawning potential of a fish stock is the relative spawning stock biomass under the conditions of the fishery as compared to that biomass in the virgin (unfished) stock. The fishery simulations provide estimates of the equilibrium stock sizes which may result under alternative mesh regimes. From data describing the relative proportion of fish which are sexually mature at age (W. L. Gabriel, et al, 1984), total equilibrium stock sizes are converted to equilibrium spawning stock sizes in weight. These data, presented in Table 7A11, have also been expressed in terms of the percentage of the maximum spawning stock biomass per recruit (%MSSB/R). It is important to recognize, however, that these are minimum estimates of the actual spawning potential which may ultimately be realized as enhanced spawning stocks generate increased recruitment leading, in turn, to even higher stock sizes. For the same reason, the calculated long-term benefits in term of yield to the fishery are probable underestimates of the actual benefits which may accrue.

Among the seven species analyzed, it is seen that only cod and yellowtail flounder may not be expected to achieve at least 20% MSSB/R under a regulated 5-1/2 inch cod end mesh at the current high fishing mortality rates or with the same mesh size at slightly reduced fishing mortalities associated with the proposed area/season closure. Noting that a 20% level is probably the minimum necessary for long-term year class replacement among most species, then a somewhat larger mesh may be appropriate from an analytical perspective, barring substantial reductions in fishing effort. The management objectives specifically identify Georges Bank haddock, targeting a 30% MSSB/R level. Such is achievable with a 6 inch mesh, provided that fishing mortality rates not exceed the current level. Alternatively, a 5-1/2 inch mesh in combination with the proposed area/season closure may be expected to result in at least a 30% level. A regulated 5-1/2 inch mesh, either with or without the area/season closure, is apparently adequate to assure about 50% MSSB/R for redfish.

Impacts on Sustainable Yield

The fishery simulations given in Tables 7A1-7A10 may be used to provide an approximation of the long-term changes in total sustainable yield which may be associated with alternative increased mesh sizes (relative to the current operative mesh). Each scenario was driven to an equilibrium such that the total yield (landings plus discard) represents the sustainable yield under the changed fishery conditions. The following tabulation gives the percent change in total yield associated with effective implementation of 5-1/2 inch and 6 inch cod end mesh relative to the current operative mesh size.

	5-1/2 inch	5-1/2 inch (CLOSURE)	6 inch
Georges Bank Cod	+7.1	+13.4	+16.9
Georges Bank Haddock	+5.0	+0.9	+9.2
Redfish	+0.9	-3.0	-
Pollock	+2.9	-4.5	+5.3
Georges Bank Yellowtail Fldr	+5.5	+6.8	+10.8
American Plaice	+5.1	+4.0	+11.2
Georges Bank Winter Flounder	+3.7	+1.3	+6.9

As noted previously, these long-term gains have likely been underestimated simply because recruitment was held constant for the analysis. Moreover, the analytical procedure used has probably underestimated the likely gains, especially in those cases where low fishing mortality rates were assumed (redfish, pollock, American plaice, and winter flounder). In particular, in the simulation of the redfish fishery, substantially fewer age classes were subject to the gear in the simulation of 5-1/2 inch mesh than was the case with the current mesh. Thus, the long-term gains in yield of redfish associated with a 5-1/2 inch mesh have probably been substantially underestimated. Nevertheless, discounting redfish, the 5-1/2 inch mesh may be expected to result in a weighted average long-term gain in yield for the overall resource of at least 5% either with or without the area/period closure while that associated with 6 inch mesh probably exceeds 11%. Gains of this magnitude are significant steps in the direction of achieving a maximum long-term average yield from the total resource. With reductions in the fishing mortality rates, particularly for cod, haddock, and yellowtail flounder, even greater gains may result.

Impacts on Marine Mammals

The following are descriptions of potential biological impacts that the proposed Multi-Species Fisheries Management Plan may have on the protected marine mammal and endangered species that are found in both the inshore and offshore waters of the western North Atlantic.

It is known that the marine mammals, including the endangered whales, that occur in the Northeast Region may consume as much marine biomass as man harvests in a year. The commercially and recreationally valuable fish species managed by this plan often consume the same prey species utilized by marine mammals and endangered species. Therefore it is possible that a certain degree of indirect competition exists between these two user groups (man & whales). This competition is unquantified at present but efforts are underway to describe its magnitude and thus understand the consequences of certain management measures.

Table 7A11: Simulated spawning stock size and relative spawning potential associated with alternative cod end mesh sizes.

MESH OPTION	1985 SPAWNING STOCK (mt)	EQUILIBRIUM SPAWNING STOCK (mt)	PERCENT[1/] MAXIMUM SSB/R
Georges Bank Cod			
Current	40,524	30,161	10
5-1/2"	40,524	35,494	12
6"	40,524	44,185	15
5-1/2"(CLOSURE)	40,524	48,660	17
Georges Bank Haddock			
Current	6,718	2,493	21
5-1/2"	6,718	3,021	26
6"	6,718	3,777	32
5-1/2"(CLOSURE)	6,718	4,390	37
Redfish			
Current	22,071	25,732	15
5-1/2"	22,071	102,131	57
5-1/2"(CLOSURE)	22,071	103,840	59
Pollock			
Current	56,370	73,275	32
5-1/2"	56,370	79,867	35
6"	56,370	85,622	37
5-1/2"(CLOSURE)	56,370	93,970	41
Georges Bank Yellowtail Flounder			
Current	11,481	12,978	13
5-1/2"	11,481	15,355	15
6"	11,481	17,855	18
5-1/2"(CLOSURE)	11,481	17,390	17
American Plaice			
Current	26,682	31,471	27
5-1/2"	26,682	35,683	31
6"	26,682	42,665	37
5-1/2"(CLOSURE)	26,682	42,575	37
Georges Bank Winter Flounder			
Current	33,180	39,817	34
5-1/2"	33,180	42,817	37
6"	33,180	46,554	40
5-1/2"(CLOSURE)	33,180	47,450	41

1/ Percent maximum spawning stock biomass per recruit, the variable describing relative spawning potential. As a rule, 20% MSSB/R should be adequate for year classes to replace themselves. However, the current seriously depressed condition of haddock and redfish indicate appropriate levels for these two species to be 30% and up to 50%, respectively.

Direct conflict between marine mammals and fishermen are known to occur within the region's waters. This conflict usually takes the form of accidental entanglement of a marine mammal in fishing gear during fishing operations. This is termed the incidental take of a marine mammal. The non-endangered marine mammal species most likely to be taken incidentally to commercial fishing operations are the harbor porpoise, Atlantic white-sided dolphin, pilot whale, and harbor seal. These species have the potential to be taken in gillnetting, trawling and fixed trap operations.

A 1981 amendment to the Marine Mammal Protection Act (MMPA) of 1972, allows exemptions to be granted for the incidental take of small numbers of non-depleted species or stocks of marine mammal during the course of commercial fishing operations. This exemption to the prohibition of take can be obtained only if the total number of each species taken will have a negligible impact on that species or stock involved, and if a reporting system has been established to monitor all taking. The NMFS published the final regulations in December 1983, governing the small take exemption for marine mammals taken incidentally to commercial fishing operations. In February 1984, a 5-year Letter of Exemption was issued to the New England groundfish gillnetters to take up to 180 harbor porpoise and 50 harbor seals during groundfish gillnetting operations in the Gulf of Maine. The letter of Exemption has recently been modified and now allows for a cumulative annual incidental take totalling no more than 50 individuals for the grey seal, Atlantic white-sided dolphin, common dolphin, white beaked dolphin, and pilot whale.

The Division of Wildlife at the University of Maine at Orono, Maine is the recipient of any reports of marine mammal taken under this exemption. Through this procedure the NMFS has determined that the taking of small numbers of the above mentioned species will not significantly affect the marine mammal populations or stocks involved. Therefore, even though marine mammals may be taken during fishing operations, the Letter of Exemption should preclude the proposed management plan from adversely impacting the marine mammal species involved in the Gulf of Maine.

The NMFS Northeast Fisheries Center is funding studies to determine the extent and impact of marine mammal fisheries interaction on both the mammal populations and the fisheries involved. These studies are examining the distribution, abundance, habitat use patterns and population characteristics of harbor seals and harbor porpoises, and the fisheries interaction problem for other marine mammal species in the area. Preliminary analyses of data suggests that the total take of marine mammals in gillnet fishing operations in the NER is not significant and does not seriously threaten the marine mammal populations involved.

The Endangered Species Act of 1973, as amended (ESA) does not provide for the taking of an endangered species incidental to commercial fishing operations. However, some conflict between the large whales that frequent the coastal and offshore fishing grounds waters is inevitable. The endangered species most likely to be involved in fisheries interactions are the humpback whale, fin whale and, very rarely, the right whale. Interactions are more likely to occur with fixed gillnet or trap gear than with mobile trawling gear. There have been no reported incidences of live endangered species being taken incidentally to trawling operations, although whale carcasses are

occasionally netted. However, incidental take of endangered species does occur in fixed gear. Since 1979, fourteen incidences of incidental take of endangered species have been reported. Of those, only a few involved gillnets. The majority of cases involved whales getting entangled in lobster gear. Attempts made to release the gear from some of the whales were often sucessful. A few mortalities have occurred, but their deaths have not been clearly shown to be caused by the fishing gear in which they were entangled.

In 1984, four incidents were reported involving humpback whales that were seen dragging gillnet gear. None of the whales involved have been reported dead, and two were later seen swimming free of the gear. In one case, an animal with gear on its body for over one month was released unharmed. The gear involved was recovered and identified as a bottom gillnet. These more recent reports may either be a result of increased gillnet effort or a result of an increased interest among scientists, naturalists, and the general public to investigate and report these entanglements. It is not known what effect that this take has on these species. However, it is probable that should larger numbers of endangered species (especially the right whale), become entangled in fishing gear, that the continued existence of some of these species may be jeopardized.

The FMP recommends a closure of an area in the Great South Channel (Area I) to mobile and fixed gear during the spring. This closure coincides, temporally and spatially, with the movement of right whales into the Great South Channel area. These severely depleted animals tend to aggregate in this area in the spring, presumably to feed, before continuing to northern waters. Therefore, with seasonal closures in this area it is unlikely that interactions will occur between this species and fishing gear. In addition, other management measures recommended by this FMP require the marking of gillnet gear, a measure that will allow for identification of gear and perhaps reduce the amount of lost gear in the area.

§7A4.3 Economic Impact Analysis

§7A4.31 Management Options for Analysis

The biological impact analysis above presents the expected changes in landings of seven of the eight regulated species, resulting from various mesh and minimum sizes (Tables 7A1-10). These expected landings reflect the initial losses and subsequent gains in the landed weight from restricting the catch to larger size fish, but do not include the expected increases from enhanced recruitment and the accompanying gain in stock biomass. Because the goal of the management measures is to improve or maintain spawning potential and the expected impact of improved spawning potential cannot be quantitatively assessed, the regulatory impact analysis uses the cost-effectiveness rather than the cost-benefit framework to identify the most efficient way of achieving the predetermined objective (NOAA Directive 21-24, page 24).

The expected landings above represent fish stocks which transcend the boundaries of fishery management sectors established in section 7A3 (see Figure 7A2). These fish stock landings have been apportioned into the appropriate sector: for instance, part of the Southern New England yellowtail flounder stock comes under Georges Bank management. Additionally, the spawning area closure has been extended into February for all options. Management options analyzed are as follows:

Table 7A12: Stock Streams Converted into Options for Analysis

Option	Spawning Closure	Gulf of Maine	Georges Bank	Southern New England	Minimum Size
OPTION 1 (base)	MAR-MAY	current	current	current	17-17-11
OPTION 2	FEB-MAY	5-1/2 ex. Redfish	5-1/2 Closure Option A	Closure 2	19-19-12
OPTION 3	FEB-MAY	5-1/2 ex. Redfish	6	Closure 2	19-19-12
OPTION 4	FEB-MAY	5-1/2 ex. Redfish	5-1/2 - 6	Closure 2	19-19-12
OPTION 5	FEB-MAY	5-1/2	5-1/2 Closure Option A	5-1/2	19-19-12
OPTION 6	FEB-MAY	5-1/2	6	6	19-19-12
OPTION 7	FEB-MAY	5-1/2	5-1/2 - 6	5-1/2 - 6	19-19-12

Option 1, the baseline from which all the other options are measured, is simply the continuation of the current situation. The minimum sizes shown in the last column are for cod, haddock, and yellowtail respectively. Minimum sizes for Options 2 through 7 also include minimums of 19 inches for pollock, 14 inches for witch flounder, 12 inches for American plaice, and 11 inches for winter flounder (not shown), and are to be implemented during the second year for all options except Options 3 and 6. Notice that the minimum sizes are consistent with Georges Bank mesh sizes. The mesh sizes associated with each option help to mitigate losses, from discarding of undersized fish, which differentiate the options. That is, the higher the mesh size the lower the amount of discarding expected, and the greater the benefits to spawning potential.

Mesh sizes proposed for the Gulf of Maine are 5-1/2 inches for all options other than the baseline (Option 1), except for the deep-water redfish area for Options 2-4. Also, these three options require a closed area rather than a minimum mesh size in part of the Southern New England sector. The last three options (Options 5 through 7) require a minimum mesh size in the Southern New England sector equivalent to that in the Georges Bank sector. The Georges Bank sector minimum mesh size drives the system with three basic options: a 5-1/2 inch minimum mesh with Closure Option A described in Section 7A3 (Options 2 & 5), a blanket 6 inch mesh size (Options 3 & 6), or a 5-1/2 inch minimum (without a closure) during the first two years of implementation followed by a 6 inch minimum thereafter (Options 4 & 7). Exempted fisheries described in §7A3(D) are associated with each mesh size option and are also reflected in the quantitative analysis of Options 1 through 7 below.

§7A4.32 Exempted Fisheries

The minimum fish and mesh size options are designed to achieve certain levels of spawning potential for key regulated species: cod, haddock, pollock, redfish, American plaice, witch flounder, winter flounder, and yellowtail flounder. These species are well suited to mesh size as a control; however, other small mesh species are generally caught in conjunction with the regulated species and these include butterfish, dogfish, herring, mackerel, scup, shrimp, squid, and whiting. Thus, restrictions on the use of small mesh nets may preclude some of these fisheries; and exempted fishery conditions have been defined in §7A3 to accommodate these small mesh fisheries while protecting the regulated species to the greatest extent possible.

For the regulated species seasonal exemptions from the large mesh measures may result in less protection and therefore less spawning potential than was planned. Exemptions are restricted to times and fishing areas which minimize these potential losses. The degree to which each of the regulated species is strictly protected, i.e., the amount of historical landings that come from areas and during times when no exemptions are allowed, is as follows:

COD	84.2%	AMERICAN PLAICE	68.9%
HADDOCK	95.1%	WITCH FLOUNDER	67.0%
POLLOCK	62.3-71.0%	WINTER FLOUNDER	64.1%
REDFISH	40.0-69.7%	YELLOWTAIL FLDR	72.9%

The two percentages for pollock and redfish represent no deep-water Gulf of Maine large mesh area (Options 2-4), and with the deep-water Gulf of Maine included in the large mesh area (Options 5-7). If redfish landings from Canadian waters are not included, then the amount of redfish that is strictly protected is 48-84%. In general, the minimum sizes for the regulated species will be enforced as a possession limitation (landings of regulated species from exempted fisheries are expected to be of at least minimum sized fish), and the quantitative impacts presented below are not adjusted for the above degrees of protection. Minimum fish and mesh size options are expected to impact 100% of the regulated species landings within the large mesh area, except for redfish where 70.3% of the stock is protected with Options 2 through 4.

Exempted fisheries species may be examined conversely, for example, to determine what amount of whiting landings cannot now be caught because of restrictive exemptions. Exempted fisheries are designed to allow for the maximum amount of small mesh species to be caught. The degree to which each of the exempted species is lost as potential landings, i.e., the amount of historical landings that come from areas and during times when no exemptions are allowed, is as follows:

BUTTERFISH	2.5-4.1%	SCUP	0.8-5.2%
HERRING	0.1%	SQUID	0.4-19.2%
MACKEREL	0.1%	WHITING	11.4-9.2%

The two percentages represent a closed area in Southern New England (Options 2-4) and with Southern New England included in the large mesh area (Options 5-7). The exempted fishery for shrimp is exactly the same as ASMFC regulations, thus the shrimp fishery is not affected by this FMP. Likewise,

the herring and mackerel fisheries are virtually unaffected. Insufficient data are available to assess the economic impacts on the dogfish fishery; however, dogfish are a very low-value species: at 7¢ per pound total landings were worth 1.1 million dollars in 1983. The squid fishery is also unaffected by Options 2-4 (a Southern New England closed area); however, it is quite heavily impacted by Options 5-7 (a Southern New England large mesh area) but demand models are unavailable for the economic impact analysis. At the 1983 price of 30¢ the 19.2% potential loss in squid landings for Options 5-7 is worth 1.9 million dollars; this may be mitigated by the special exemption for squid (and herring and mackerel) fishing with pelagic trawl gear. Butterfish, scup, and whiting are included in the economic impact analysis below and are adjusted with the percentages shown above to reduce landings for the three species. Red hake landings are also included but are not adjusted because they are not impacted by the large mesh restrictions (red hake are caught as a by-catch of other exempted species and the regulated species). All of the impacts on revenues and landings of the exempted species represent a worst case scenario: harvesters may be expected to continue to fish outside the spatial and time boundaries of the non-exempted large mesh area but with less efficiency.

§7A4.33 Spawning Areas

Spawning area closures are extended to include the month of February. Information available for six of the regulated species suggests that landings losses will not be very great except for cod. The percent of landings lost during February (percent of annual landings in parenthesis) is as follows:

COD	70.0% (4.9%)	AMERICAN PLAICE	12.0% (0.6%)
HADDOCK	18.8% (1.7%)	WINTER FLOUNDER	15.6% (0.6%)
POLLOCK	28.8% (1.4%)	YELLOWTAIL FLDR	7.2% (0.4%)

February landings are reduced by these percentages in the economic impact analysis below for Options 2 through 7.

§7A4.34 Gear Marking Alternative

Since 1977 the New England Council has examined with industry advisors, Coast Guard and NMFS officials various gear marking systems for fixed gear to reduce inadvertent gear conflicts which result in costly gear loss and lost fishing time. In 1979, an elaborate set of detailed gear marking measures were presented to the public at a series of hearings from North Carolina to Maine. During the Northeast Multi-Species Plan development process three gear marking alternatives were identified for public review and Council analysis. In essence, these three marking systems, although greatly simplified from the 1979 proposals, span a continuum from the most simplified and basic markings possible to more rigorous marking standards to serve additional management purposes. The estimated costs of three gear marking alternatives are provided below. The total cost estimates assume a "worst case scenario" of all fixed gear operators possessing none of the gear marking materials required under each of the alternatives. All three alternatives are examined using the information found in Table 7A14.

Table 7A14: Major Marking Gear Costs* (11/84)

15 foot pole/staff	9-inch radar reflector	12-inch radar reflector	buoys (8"/15")	flags/pennants
$13.25	$7.00	$9.25	$4.75	$1.75

	Number of Gillnet Tonnage Vessels	Potential Number of Gillnet Undertonnage Vessels	Average Total Length of Gear Employed**	Assumed Number of Strings Employed***
1983	130	137	10,314 feet	3.44

* Costs were provided by two major New England (Chatham, Gloucester) gillnet gear suppliers. Where prices for equivalent gear elements varied an approximate average of the two is used.

** Based on 1978 operating unit information for tonnage vessels.

*** Industry advisors report that a common practice is to employ 4 sets each of 10-50 fathom gillnets to a string (i.e., 3,000 foot sets). Costs of the marking requirements to individual fishermen will be lower or higher depending on whether they use longer (less sets) or shorter (more sets) sets respectively.

These estimates reflect an initial one-time cost to industry and do not include replacement cost resulting from losses due to weather or conflicts. Gillnet fishermen consistently report to the Council that little or no gear is lost due to weather. Most gear losses are attributed to conflicts, either deliberate or inadvertent, with mobile gear operations (i.e., incidents that these marking requirements are intended to prevent or reduce). Obviously, there will be some level of annual replacement costs which will probably vary among operators as is the current situation. The marking costs prescribed herein in no case amount to more than 5% of the total cost of rigging a set of gillnets in a typical gillnet industry manner. Should the trend of a declining number of gillnetters continue beyond 1983, the total cost estimates for all the alternatives will obviously be less.

Cost to Gillnet Vessels

Alternative A:

In the Gulf of Maine, Georges Bank and Southern New England fishery sectors, the marking requirement for gillnet and bottom-tending longline gear shall be as follows: the westernmost end (meaning the half compass circle from magnetic south through west to and including north) of a fixed gear trawl must display a radar reflector and flag (i.e., to make a double shape). The easternmost end (meaning the half compass circle from magnetic north through east to and including south) of a fixed gear trawl must display a single radar reflector.

This alternative would presumably require gillnet and longline fishermen to have two poles, two buoys, two radar reflectors (9 inch) and one flag per set of gear. With no further marking or size specifications, this alternative presents minimum guidance to industry; and for purposes of this analysis it is assumed that fishermen would meet the requirement by acquiring commercially available gear. It is understood that the cost estimates of all of the alternatives are likely to be high in instances where fishermen use non-standard or make-shift materials which would meet the specifications.

Tonnage gillnet vessel costs:	$51.75 x 3.44 =	$178.02 x 130 =	$23,142.60
Undertonnage gillnet vessel costs:	$51.75 x 3.44 =	$178.02 x 137 =	$24,388.74
		Total Cost	$47,531.34

Alternative B:

Same marking requirement as Alternative A except that the following further size specifications will be required:

1. The radar reflector on gillnets and longline gear shall be a standard 12 inch tetrahedral corner reflector or larger and will be positioned on the staff at least 6 feet above the buoy.

2. The flag or pennant on gillnet gear only shall be of the color international orange.

This alternative will require the use of a 12 inch radar reflector (which is the current preference of many fishermen using reflectors) which increases the cost of this alternative over Alternative A. In addition, with the use of a larger reflector many fishermen will double up on the standard 8"/15" buoy. Assuming this would be the common industry practice, the costs would be as follows:

Tonnage gillnet vessel costs:	$65.75 x 3.44 =	$226.18 x 130 =	$29,403.00
Undertonnage gillnet vessel costs:	$65.75 x 3.44 =	$226.18 x 137 =	$30,986.66
		Total Cost	$60,389.66

Alternative C:

1. The maximum length of continuous gillnet sets shall not exceed 6,600 feet.

2. In the Gulf of Maine, sets of gillnet gear which are of an irregular pattern (non-linear and non-contour) or which deviate more than 30 degrees from the original course of the set would be marked at the extremity of the deviation with an additional marker which may be either independent or attached to the gear. Such marker would display a number of highly visible streamers sufficient to be distinguished from the flags or pennants of the end buoys.

3. Radar reflectors on gillnets shall be of the color black.

Cost estimates for Alternatives A & B are based on the common industry practice of fishing 10-50 fathom gillnets to a string (i.e., 3,000 feet). For fishermen employing sets of 6,000 or 6,600 feet, the marking costs will approximate one-half those estimated under Alternative B, assuming the same average total length of gear is used.

Should all sets of gillnet gear require a mid-gear marker due to a 30 degree deviation marking requirement and assuming that this requires an additional buoy, staff and the equivalent costs of two flags in lieu of streamers, the following higher costs may be imposed:

Tonnage gillnet vessel costs:	$87.25 x 3.44 = $300.14 x 130 =		$39,018.20
Undertonnage gillnet vessel costs:	$87.25 x 3.44 = $300.14 x 137 =		$41,119.18
		Total Cost	$80,137.38

Cost to Longline Vessels

The Council is aware of four vessels (three vessels under construction for Maine-based Sea Bank Industries, one vessel (F/V CREST) belonging to High Seas Corporation, MA) currently under construction or conversion to fish groundfish using automated longline technology. Three of these vessels are 76 feet in length, while the fourth is 147 feet. It is reasonable to assume that the maximum amount of hooks employed by any of these vessels will be approximately 35,000 and that these would be distributed over a maximum of 10 sets of potentially varying lengths (personal communication with W. Whipple, High Seas Corporation). Another automated longline vessel of 54 feet (SEA DOG V), currently not involved in the groundfish fishery, fishes considerably less hooks but may employ as many sets as the larger vessels. Potential "worst case" marking costs, using the same gear price information found in Table 7A14, for these vessels under the alternatives is found below:

Alternative A: $51.75 x 10 = $517.50 x 4 = $2,070.00
Alternative B: $65.75 x 10 = $657.50 x 4 = $2,630.00
Alternative C is not applicable to longline gear.

Aside from the vessels which may be involved in automated longlining, the Council is aware that in 1983 a maximum of 33 vessels may at some time during the year use longline gear (tub trawls) from various ports throughout New England. It is not likely that any of these vessels would employ more than 8 sets - 6 is a more likely maximum (personal communication with Charles Sheldon) of longline gear at any given time. Therefore, the alternative marking requirements could have the potential costs illustrated below:

Alternative A: $51.75 x 8 = $414.00 x 33 = $13,662.
Alternative B: $65.75 x 8 = $526.00 x 33 = $17,358.

Gear Marking Impact Summary

The following summarizes the impacts of gear marking measures.

Gear Marking Impact Summary
$1000

Alternative	Gillnet	Line Trawl	Total
A	47.5	15.7	63.2
B	60.4	20.0	80.4
C	80.1	20.0	100.1

§7A4.35 Results of Analysis

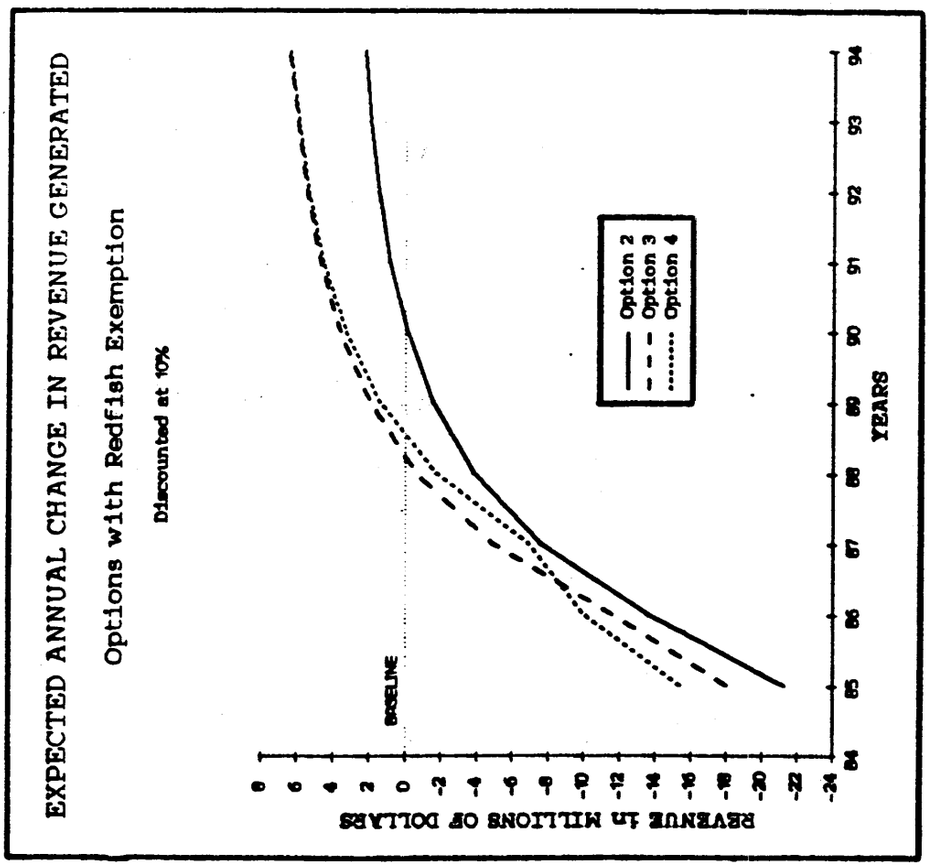
A bio-economic analysis is used to assess the impacts of seven management options on the commercial finfishing sector. A socio-cultural impact analysis (§7A4.4) follows immediately from this bio-economic analysis. Analyses of the gear marking requirements (§7A4.34) above and the recreational finfishing sector (§7A4.5) below are presented, however, the estimated impacts are independent of the level of landings expected.

As described above, the economic impact analysis consists of seven options for minimum fish/mesh size, exempted fishery conditions, and spawning area closures in the Gulf of Maine and Southern New England (Table 7A12). Option 1 is used as the baseline because it represents the do-nothing alternative. All other options are presented as changes from this baseline. The analysis includes all of the regulated species, all of the relevant exempted species except dogfish and squid, as well as white hake, windowpane flounder, summer flounder, and cusk. The difference between Option 2 through 7 and the baseline for each regulated species results from the estimated annual minimum fish/mesh size effects (from the biological analysis at the beginning of this section) and the landings lost in the spawning areas (which is a constant percentage from year to year). For each exempted species, the 1983 landing level is held constant over the ten-year period adjusted for the lost landings in the non-exempted large-mesh area (a constant percentage each year). For the other species, witch flounder (a regulated species), red hake (an exempted species, see subsection above), white hake, summer flounder, windowpane flounder, and cusk, the 1983 landing level is an unadjusted constant over the ten-year period. The selection of a constant level of landings for the exempted and other species is intuitively appealing in that the projected landings of the regulated species over the ten-year period assume constant recruitment and fishing mortality at the 1983-1984 levels. All options will actually show further increases in stocks and landings over the baseline (Option 1) because of improved recruitment although this cannot be quantified, and other changes (increases or decreases) in stocks and landings will assuredly occur but will not change the relative standing of the seven options. Three basic options: 5-1/2 inch with closures, 6 inch, and 6 inch delayed, are designed to achieve the same general recruitment benefit. The difference between Options 2-4 and Options 5-7 is that more stocks (deep-water the Gulf of Maine redfish and pollock) receive protection and improved recruitment in the latter case. Witch flounder landings are not included in the biological analysis because adequate assessment information are not available. However, species such as witch flounder, red hake, and the other species are included in the economic impact analysis because they are a part of a system of price equations used for this analysis.

Having the expected landings for each option during the ten-year period 1985-1994, a groundfish demand model is used to derive prices and revenues associated with each landing stream. The methodology used to estimate the demand model is described in Wang (1984). Price equations of the demand model generally depend on species landings, landings of the other species in the system, imports of all species in the system, consumer income, general price movements, lagged species price, and seasonal factors. Imports of each species or group are held at 1983 levels, similar to some landings as described above. Both consumer income and the general price index are projected using ARIMA time-series models. Lagged price is the predicted price from the previous period.

Expected changes in prices and landings for each of the regulated species are presented in Appendix 7. In general, all 6 inch options (immediate or delayed) result in smaller initial losses and greater equilibrium gains (higher landings and lower prices) compared to 5-1/2 inch options. This is expected because the 5-1/2 inch options include area closures which build inefficiency into the harvesting operation. Including the deep-water Gulf of Maine in the large-mesh area (Options 5 through 7) increases initial losses of redfish. Long-term equilibrium gains from redfish do not accrue for almost 25 years. From the landing and price streams expected species revenues are easily derived and are then summed to show total revenue impacts for each option (Figures 7A11 and 7A12) as compared to the baseline at zero. Changes in revenue paint the same picture as prices and landings, with 6 inch options being preferable to 5-1/2 inches. This conclusion holds when recruitment benefits are also considered, because all options are constructed to achieve the same improvements with respect to recruitment and resultant stocks and landings.

To determine whether an immediate or delayed 6 inch mesh, for example, provides the greatest net benefits or least costs, the streams of revenue for each option may be discounted and summed to one number for comparison. Table 7A13 presents the discounted cash flows for the regulated species (flounders includes American plaice, witch, and winter), the subtotal of the regulated species, and the overall total including exempted fisheries effects. All of the discounted cash flows reflect the spawning area closure effects in February in the Gulf of Maine. Gear marking, recreational fishing, and administrative (enforcement) costs are not included in these numbers, but all of these costs are constant across the particular options analyzed here and are treated below. Revenue streams are discounted with a rate of 10% in Table 7A13; Option 1 is reported in thousand dollars, whereas Options 2 through 7 are differences (in $1000) from this baseline. Again the most obvious result is that greater net benefits (i.e., lower negative benefits, measured as discounted cash flows) are expected with any 6 inch measure as compared with 5 1/2 inches. The discounted cash flow method also shows that the net benefits to the redfish fishery are consistently greater when deep-water Gulf of Maine is excluded from the large mesh area: -47.3% versus -70.1% for the 5-1/2 inch with closure (Option 2 versus Option 5), -47.8% versus -68.7% with both 6 inch options (Options 3&4 versus Options 6&7). Overall the most cost effective option is Option 3, a 6 inch mesh, slightly better than Option 4, a delayed 6 inch mesh, both excluding the deep-water Gulf of Maine redfish fishery. The reason that the two options are basically equivalent is because discounting reduces the value of years 3 through 6, when option 3 has relatively higher benefits (see Figures 7A11 & 7A12), more than for years 1 and 2 when the delay obviously produces relatively higher benefits (lower losses). The primary reason why all of the options show negative discounted cash flows relative to the baseline is because of an approximately 50-70% loss in the redfish fishery, and the fact that expected improvements in recruitment and subsequent landings are not included.



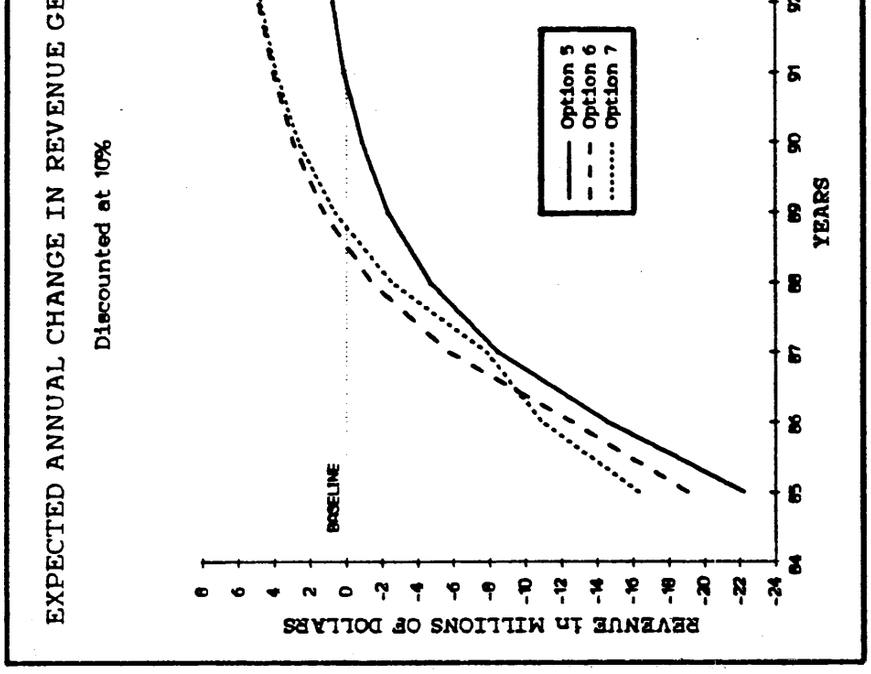


Figure 7A11

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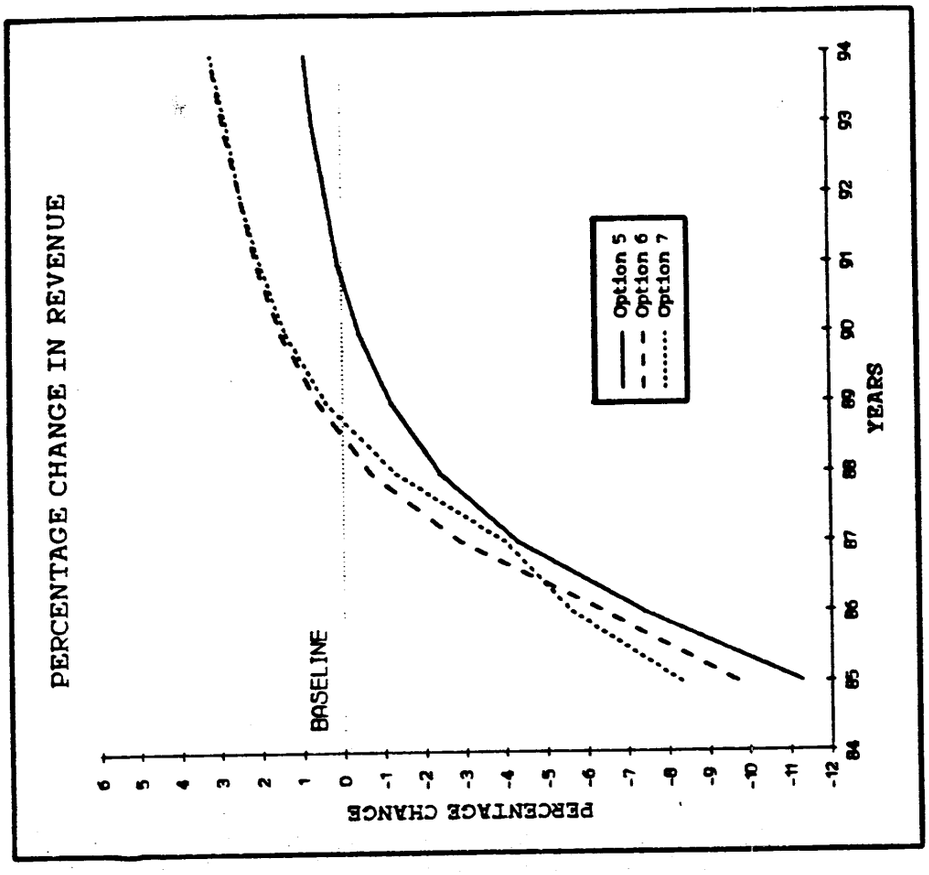

PERCENTAGE CHANGE IN REVENUE
BASELINE
PERCENTAGE CHANGE
YEARS
Option 5
Option 6
Option 7

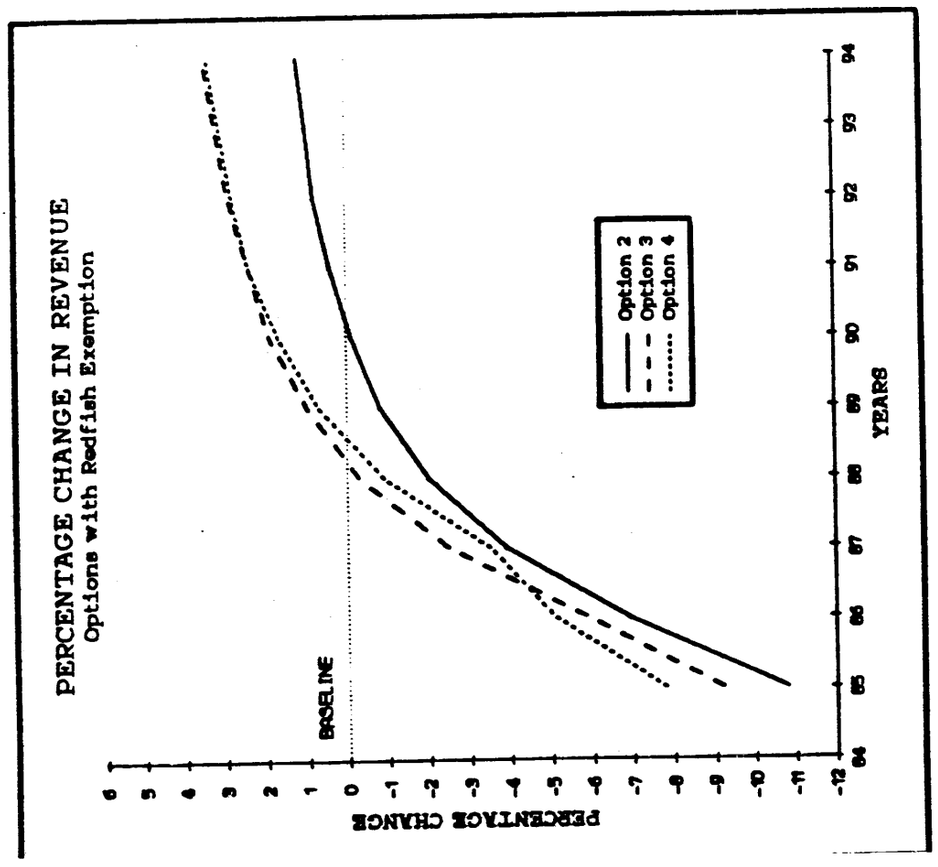

PERCENTAGE CHANGE IN REVENUE
Options with Redfish Exemption
BASELINE
PERCENTAGE CHANGE
YEARS
Option 2
Option 3
Option 4

Figure 7A12

TABLE 7A13:[1/]
Comparison of Revenue Streams ($1000), 1985-1994,
Discounted at 10%,
for Various ADF Mesh Size Options

	Option 1	Option 2	%	Option 3	%	Option 4	%	Option 5	%	Option 6	%	Option 7	%
COD	$324,821	-23,781	-7.3	-11,851	-3.6	-12,883	-4.0	-23,782	-7.3	-11,853	-3.6	-12,887	-4.0
HADDOCK	$106,781	865	0.8	4,494	4.2	4,542	4.3	865	0.8	4,494	4.2	4,542	4.3
POLLOCK	$69,804	-4,301	-6.2	-2,135	-3.1	-2,015	-2.9	-4,302	-6.2	-2,140	-3.1	-2,022	-2.9
YELLOWTAIL	$426,622	7,568	1.8	20,907	4.9	21,253	5.0	7,560	1.8	20,876	4.9	21,219	5.0
FLOUNDERS	$531,071	-5,951	-1.1	-1,366	-0.3	-812	-0.2	-5,767	-1.1	-859	-0.2	-252	-0.0
REDFISH	$26,371	-12,486	-47.3	-12,596	-47.8	-12,594	-47.8	-18,494	-70.1	-18,107	-68.7	-18,106	-68.7
SUB-TOTAL	$1,485,469	-38,087	-2.6	-2,547	-0.2	-2,510	-0.2	-43,920	-3.0	-7,589	-0.5	-7,506	-0.5
TOTAL	$1,935,433	-41,357	-2.1	-6,838	-0.4	-6,912	-0.4	-49,368	-2.6	-14,062	-0.7	-14,097	-0.7

[1/] A description of costs and benefits of management options considered by the Council is given in Section 782.

§7A4.4 Socio-Cultural Impact Analysis of Alternative Measures

Total Employment Effects

The most striking and quantifiable impacts of the six management alternatives may be found in the area of employment, and in this section the changes in regional employment will be analyzed and other likely social cultural impacts noted. In the Northeast, since fishing is often a family tradition with each employed member of the family involved in some aspect of the industry, employment loss could have severe repercussions on whole families and, in some cases, whole communities. Since success in fishing has little correlation with years of education and, consequently, fishermen are generally not formally educated, even where alternative employment is available in a community, fishermen are less likely to be qualified for jobs in other sectors. In addition, their social networks tend to be limited to others in the fishing industry; thus, access to and familiarity with employment in other sectors is also limited.

Besides the obvious impacts on employment, the proposed management actions could have less quantifiable but significant effects on such social cultural considerations as life-style, job satisfaction, family and community orientation.

Nevertheless, on a port-by-port basis the socio-cultural costs of the management program delineated in this plan would be calculably less than the short-term socio-cultural costs of a restrictive effort control program or, conversely, the long-term impact of no management at all. Indeed, market forces may mitigate impacts of the proposed plan. If prices of fresh groundfish reflect a quality (size) premium, the actual returns to fishermen and others in the industry might lessen the expected negative impacts suggested by employment statistics based on current landings and prices.

In the case of an effort control program, the short-term socio-cultural costs might be far greater than with the proposed management program since the opportunity for fishermen to participate might be directly affected. There is evidence that fishermen do not fish simply for financial rewards. Researchers have found that fishing is intrinsically rewarding as an occupation. Participants mention freedom and independence, adventure and challenge, fellowship and tradition as benefits of their occupation. Those people who could not obtain licenses or who could not fish at accustomed times might be forced out of the profession and be required to physically relocate in order to find alternative employment. If fishing as an occupation were effectively restricted, the impact would be significant even if alternative employment were available. Furthermore, effort restrictions often have a greater negative impact on small, day boats. This in turn can have negative consequences for consumers since day boats as a whole may provide higher quality fish.

Under no management at all the short-term socio-cultural costs would not be as high as those under the proposed scheme, while the long-term costs would be far greater. This trend would likely prove devastating to the industry in the long run. As the resource becomes increasingly overexploited, fishing could lose its viability as an occupation for a majority of participants. In some ports, traditional family occupations would be lost. Fishing jobs lost

through overexploitation could only be regained by allowing the stocks to recover, which may require a long time, impose high social costs and lead to more restrictive management measures than the ones proposed in this FMP.

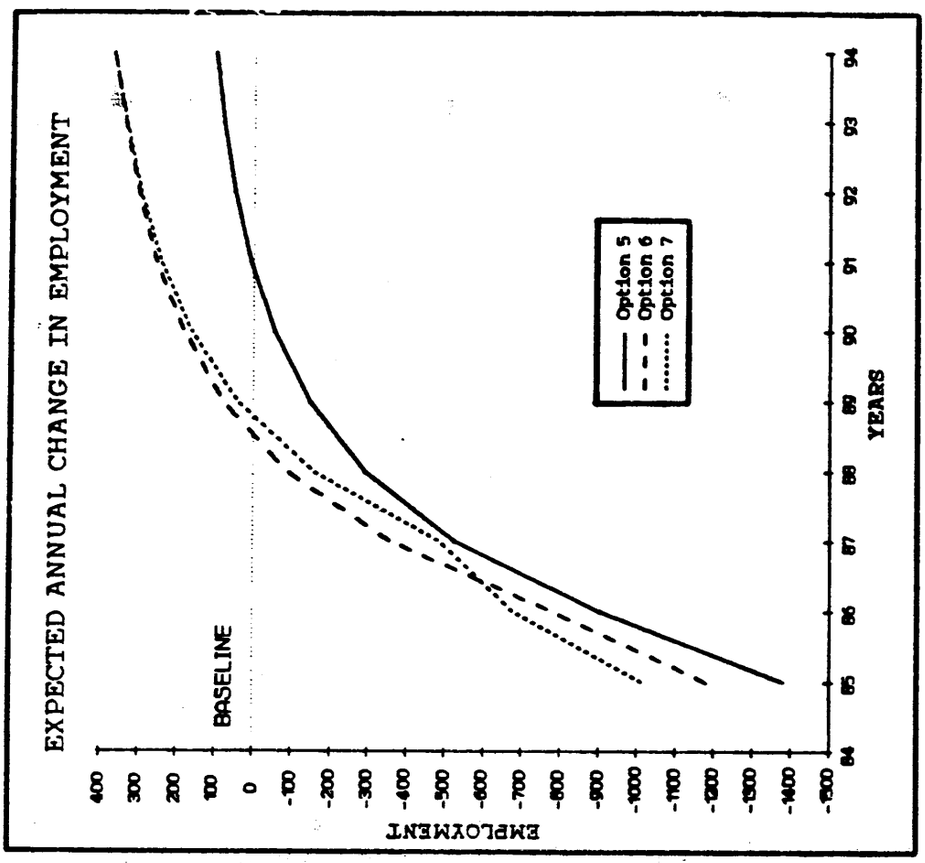
Increases or decreases in employment opportunities, due to government regulatory action which affects finfish harvesting revenues, may be described using input-output analysis. In such analysis one may examine the direct, indirect and induced employment effects of that action, if one presumes an average output per employee measured in total man-years. The graphic representation (Figure 7A13) of the employment impact of the six management alternatives relative to the first option (the baseline) is considered a 'worst case' analysis. That is, the employment effect of the six management options takes into account all possible marine-related impacts including the induced change in consumer demand. It is based on the 'worst case' revenue projections discussed in §7A4.34.

A coefficient which computes employment based on ex-vessel revenues was derived through input-output analysis. This was used to describe the impact of various management options on a number of marine affiliated industries. These industries included the commercial finfish industry, processing, wholesale and retail fishing industries, marine recreation and tourism (e.g., hotels, motels, marinas, charter fishing, etc.), marine manufacturing, marine military, marine research and education, and other industries such as marine construction, water transportation, marine finance and insurance. All of these affiliated industries would be affected at some level if regulatory action curtailed fishing activity. If net revenues from the industry are lowered, the impact would be reflected first in direct job losses in the harvesting sector, then in indirect but related job losses, and finally through induced effects and changes in consumption patterns in all other sectors ("Estimation of Income and Employment Multipliers for Marine-Related Activity in the Southern New England Marine Region" URI 80-10).

As graphically represented, all management options result in an initial employment displacement. The magnitude of that displacement varies from a low of 952 jobs lost with option 4 to a high of 1381 jobs lost with Option 5. Twenty-seven percent, or 257 jobs with Option 4 and 372 jobs with Option 5, would be in the harvesting sector. Initial losses range from 7.8 - 11.3% of the labor force. In each case, after the first year there is a net gain over jobs lost the previous year (although still a loss from the baseline values until year five). In particular, Option 4 shows a gain of 334 (90 fishermen) in year two after the initial loss.

The break even relative to the baseline occurs for options 3 and 4 by 1989, or year five. By 1994, or year ten, there is a relative gain of some 400 (108 fishermen) jobs for these options. Option 2 results in an overall relative loss during the tenth year of 142 (38) jobs.

The management options which include mesh regulation for deep water Gulf of Maine show a break-even point just prior to 1989, or year five, in the case of Options 6 and 7, while Option 5 breaks even closer to year seven, or 1991. The net gain by 1994, year ten, for Options 6 and 7 is 370 (99) jobs, while 101 (27) jobs are gained after ten years for Option 5. Thus, forgoing more jobs initially, results in a higher employment level overall.


EXPECTED ANNUAL CHANGE IN EMPLOYMENT
BASELINE
EMPLOYMENT
YEARS
Option 5
Option 6
Option 7

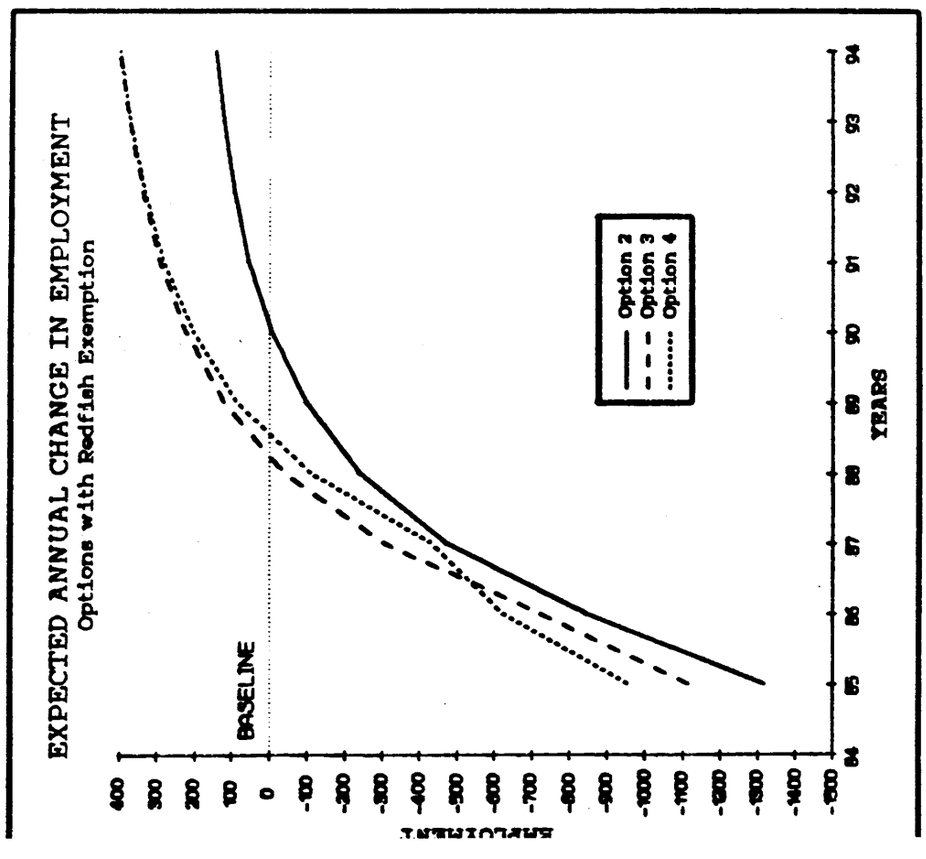

EXPECTED ANNUAL CHANGE IN EMPLOYMENT
Options with Redfish Exemption
BASELINE
YEARS
Option 2
Option 3
Option 4

Figure 7A13

The graphic representation of this data shows employment in man-years. The impact would clearly be less severe if employment were part time or seasonal. That is, the impact might be mitigated if one man-year output were performed by two part-time employees. Likewise, if one man-year were made up on a seasonal basis, and employment elsewhere was normally sought during the remainder of the year, the impact might be lessened. Part-time or seasonal employees would more likely have other ready employment options than would permanent full-time employees.

The impact differential between the various options during the ten-year period changes. It is clear that the options which represent the highest net employment gain after ten years are Options 3 and 4. The rate of net job gain from the initial job loss is greater and more consistent with Option 3, particularly in the first year. With mesh regulation in deep water Gulf of Maine, the rate of employment gain and the net increase of jobs is highest with Option 6. The difference between options without or with deep water Gulf of Maine mesh regulation is approximately 64 man-years for each option (i.e. Option 2 vs. Option 5).

Port Specific Impacts

According to the 'worst case' analysis conducted for the mesh management regime, the social costs of the management options considered would be high in most New England ports during the first year of implementation. The net benefits of this management program are allocated evenly throughout New England for Options 5, 6, and 7. Options 2, 3, and 4 distribute benefits somewhat less evenly, in that there is no mesh regulation in the Southern New England region. Since this management plan does not call for effort control, vessels in any port would be free to continue fishing in compliance with mesh, minimum size, and spawning area closure regulations.

Given that the management alternatives would impact the industry region-wide, it is difficult to predict the individual port impact with accuracy. However, the overall impact on the larger ports may be generally assessed. In a port such as Gloucester, where 40-45% of the community's employment and revenue is dependent on the fishing industry (See Section 3E2), the socio-cultural impact of management alternatives which resulted in job losses would be substantial. Alternative employment would be difficult to rely on in this port. Whereas the community is largely an ethnic, family oriented one, loss of fishing jobs with no alternative employment might result in severe socio-cultural dislocation and family break-ups.

In New Bedford, fishing-related employment represents close to 1/3 of the city's economic base. Changes in fishing regulations would most likely redistribute the fishing effort into other fisheries. Fishing effort is currently concentrated on species which bring high prices. Changes to other fisheries would be likely to decrease income for time or effort expended. Lower returns would negatively impact related industries, but direct job loss, i.e., loss of fishing sites, might be minimal. If the management regime and related regulations are overly restrictive, and if the opportunities in other fisheries are limited, there will likely be a loss of jobs in the fishing industry. This loss in the marine sector might be made up in other non-marine fields in New Bedford or outlying towns. Thus, the socio-economic impact in New Bedford might be less severe than the impact in Gloucester due to alternative fisheries and non-marine employment opportunities.

The impact of the management measure alternatives on smaller ports such as Provincetown is somewhat more difficult to project. Tourism is the dominant industry in Provincetown, although the potential of the fishing industry has been revived in recent years. Restrictive management regulations could result in limiting this development. Provincetown's fishing fleet is also made up primarily of relatives carrying on family traditions, so job loss and dislocation would affect whole families. Non-fisheries employment options would be available, although largely seasonal.

The impact of the management options with Southern New England mesh or closure regulations would be significant on Point Judith, which has never before had to contend with either regulation. If regulation in the groundfish fishery resulted in job displacement, it would most likely result in switchover to other fisheries where opportunities continue to exist. It could also result in a switch in effort to fishing further south. Newport on the other hand will be impacted regardless of Southern New England regulations, because vessels from this port tend to work Georges Bank waters.

In Portland, Maine, the impact would be significant. While the port is the home of a substantial lobster fleet, any displacement of the groundfish fleet could not be totally offset by the lobster fishery. The inshore scallop fishery would provide some alternative opportunity if the management regime resulted in groundfish employment loss. Non-marine employment is available, although tourism related employment is seasonal.

A mesh management regime could have severe impact in Rockland, Maine, where the alternative fisheries, redfish and herring, are in serious decline and the loss of traditional waters to Canada further limits the opportunities. However, Options 2 through 4 which allow for a deep-water Gulf of Maine exception to the mesh size would mitigate this impact. While fishing is thought to make up a major part of the town's economic base, there are some non-marine employment opportunities if fishing employment becomes limited.

While it is difficult to assess the real impact of a mesh management program on various ports it can be conjectured that if unemployment results from such a program some ports would be better able to provide alternative employment than others. The socio-cultural impact could be greater in cases where entire families are involved in the fishing industry and where lack of formal education stands in the way of alternative employment.

§7A4.5 Impacts of Minimum Sizes on Recreational Fisheries

Minimum fish size is the only measure in the proposed action which would have a direct impact on the recreational fisheries included in the management unit. Three alternatives have been identified and analyzed regarding minimum sizes for the recreational fisheries:

Alternative A:

The minimum sizes are the same as for the commercial fisheries (see §7A3), except that a total of 2 undersized fish per fisherman per day would be allowed.

Alternative B:

The minimum sizes for cod and haddock will be 15 inches in the first year, 17 inches in the second and third years, and will increase to 19 inches at the beginning of the fourth year of plan implementation.

Alternative C:

The minimum sizes for cod and haddock will be 15 inches in the first year, 17 inches in the second and third years, and will increase to 19 inches at the beginning of the fourth year of plan implementation. Also a total of 2 undersized fish per fisherman per day would be allowed in all years.

General Comments

Several factors which affect the size distribution of the recreational catch include population age structure, mode of recreational fishing, distance from shore, migratory patterns and distribution, fishing tackle and commercial and recreational effort levels. The size distribution of the recreational catch can vary greatly as a result of any combination of these factors. For example, the results of two sea sampling trips aboard party boats from Newburyport and Gloucester fishing different areas known as Old Scantum and Middle Bank are shown below.

Table 7A15: Length/Frequency Results of Party Boat Sea Sampling*

BOAT	PERCENT OF FISH > 19 IN.		SAMPLE SIZE	
	COD	HADDOCK	COD	HADDOCK
CAPT. RED (Newburyport) 7/30/78	27%	63%	45	232
YANKEE CAPT'S (Gloucester) 6/10/78	82%	86%	28	22

* Data provided by Dr. Fred Serchuk, NEFC.

The analysis of the 3 alternatives is limited to an examination of the potential total recreational catch precluded (Alternative B only) and number of trips affected by the proposed minimum fish sizes. The relative share of the total impacts among the four recreational modes (party/charter, private boats, beach/bank, and pier/jetty/bridge) is assessed with regard to the potential number of trips affected. Time and data constraints did not permit an examination of the size distribution of recreational catch by mode. However, because they fish farther from shore, the catch of cod, haddock and pollock by party/charter and large private boats will be reduced less than the catch of shore-based anglers. National Survey data shows that party/charter boats in the North Atlantic and Mid-Atlantic regions catch fewer and larger fish (see §3D2). This generalization may be less true with respect to the recreational catch of winter flounder.

All of the alternatives except B provide for a two-fish exemption from the minimum size which is intended to minimize the impact on the recreational fisheries. Tables 7A16, 7A17 and 7A18 provide information on the success and number of recreational fishing trips, and on the number of cod, pollock and winter flounder caught in the New England area (the National Survey does not list catches of haddock). Table 7A19 presents information on the percentage of fishing trips on which Atlantic cod and pollock were the primary species sought. This information is examined for each of the alternatives. Table 7A16 indicates that alternatives A and C would have no impact on 71% of all recreational fishing trips from bridges, jetties, etc.; no impact on 48% of all party/charter trips; no impact on 53% of private/rental trips; and no impact on 82% of all beach/bank fishing trips based on four-year averages of all trips on which less than two fish were caught by anglers. In contrast, New Hampshire Fish & Game data (personal communications Robert Fawcett) for 1982 indicates that alternatives A and C would have no impact on 93% of all shore-based trips; no impact on 60% of all party/charter trips; and no impact on 67% of all private boat trips taken by New Hampshire based anglers.

Table 7A16: Percent of All Fishing Trips Taken Where 2 or Less Fish Were Caught

North Atlantic	Bridges, Jetties, Piers	Party/ Charter	Private/ Rental	Beach/ Bank
1979	70.4%	61.5%	54.0%	-
1980	68.9	36.4	50.3	77.7%
1981	66.2	46.0	53.3	83.1
1982	78.1	48.2	52.9	85.7
Average	70.9%	48.0%	52.6%	82.2%

National Survey (DOC)

Table 7A17: Number of Fishing Trips by Mode (thousands)

North Atlantic	Bridges, Jetties, Piers	Party/ Charter	Private/ Rental	Beach/ Bank
1979	1,493	561	3,897	1,304
1980	1,782	777	3,676	1,534
1981	1,083	2,133	2,409	932
1982	1,752	1,509	3,069	1,342
Average	1,090	1,245	3,262	1,278

National Survey (DOC)

Table 7A18: Total Number of Cod, Winter Flounder and Pollock Caught by Mode (thousands)

North Atlantic	Bridges, Jetties, Piers	Party/ Charter	Private/ Rental	Beach/ Bank
1979				
Cod	96	777	2,213	5
Winter Flounder	3,005	603	27,935	1,212
Pollock	1,101	654	1,721	172
1980				
Cod	7	1,023	979	429
Winter Flounder	1,871	469	15,322	1,062
Pollock	768	592	2,565	507
1981				
Cod	8.5	3,141	1,875	8.5
Winter Flounder	2,976	811	14,581	646
Pollock	644	824	1,021	161
1982				
Cod	29	1,711	1,267	-
Winter Flounder	826	1,167	16,847	472
Pollock	830	222	526	73

National Survey (DOC)

Table 7A19: Percent of Fishing Trips on Which Atlantic Cod and Pollock were the Primary Species Sought as Reported by Fishermen in the Intercept Survey

North Atlantic	1979	1980	1981	1982	Average
Cod and Pollock	8.2	4.7	8.7	7.1	7.2
Cod (alone)	6.8	3.4	7.2	6.3	5.9

National Survey (DOC)

Impacts of Alternative A

There are no substantial recreational fisheries for redfish, witch flounder, yellowtail flounder and American plaice and, therefore, a minimum size for these species will have negligible impacts, particularly with a two-fish exemption provision.

The two-fish exemption limits the total number of recreational trips for cod, haddock and pollock that will be affected by the minimum sizes. Trip success data demonstrates that anglers frequently do not catch more than two fish. Table 7A20 shows the average number of trips from 1979-1982 on which three or more fish were caught and on which anglers seeking cod and pollock might have been impacted under this alternative.

Table 7A20: Number of Recreational Trips by Mode on Which Cod and Pollock Were Sought by the Angler and Where 3 or More Fish Were Caught

Mode	1979-1982 Average Trips	Percent of Total Trips*
Bridges, Jetties, Piers	22,805	2.1
Party/Charter	46,530	3.7
Private/Rental	111,124	3.4
Beach/Bank	16,402	1.3

Derived from National Survey Information (DOC)

* % trips 3 or more fish, Table 7A16, times % trips cod and pollock sought, Table 7A19.

The impact in terms of fish lost to the recreational fishery is likely to vary by mode. The loss will depend on the proportion of the total catch which is undersize and which is caught on trips on which 3 or more fish are caught. With a higher percentage of trips with 3 or more fish caught, the party/charter mode would seemingly be in a position to lose more fish yet it is known that, in general, this mode catches larger fish.

Data is not currently available to the Council on the amount of, or size distribution of the recreational catch of haddock on trips where three or more haddock are caught.

The potential impacts of an 11 inch minimum size on winter flounder would vary by state. Virtually all (98% in 1982) of the recreational catch of winter flounder comes from the territorial sea or inland waters. Massachusetts and New Hampshire currently have an 11 inch minimum size on winter flounder (effective 1984). Connecticut will have a 10 inch recreational minimum size effective January 1, 1985. In those states which currently have an 11 inch minimum size, this alternative would have no negative impact. Table 7A21 presents the catch of winter flounder by state for 1982.

Table 7A21: Number of Winter Flounder Caught by Recreational Anglers by State in 1982 (thousands)

State	Number of Winter Flounder
Maine	48
New Hampshire	40
Massachusetts	11,872
Rhode Island	748
Connecticut	1,164
New York	3,009
New Jersey	2,430
Total	19,311

National Survey (DOC)

Substracting from the total the catch from those states which already have an 11 inch minimum size leaves a catch of 7,399,000, or 38% of the total winter flounder subject (assuming worst case scenario) to the proposed minimum size. For 1982, the State of New Hampshire estimates (Personal communication Robert Fawcett, New Hampshire Fish & Game) that 26% of its catch of winter flounder were below 11 inches. Assuming the size distribution information from New Hampshire is representative, then 1,924,000 winter flounder or about 10% of the total catch would be affected (i.e., lost to the recreational fishery).

Impacts of Alternative B

Since this alternative does not provide any exemption for undersized fish, it potentially could impact on all fishing trips on which cod and haddock are caught. Adjusting the four-year average number of total fishing trips by mode presented in Table 7A17 by the four-year average percentage of trips where cod is the primary species sought (Table 7A19) provides an indication of the likely maximum number of trips potentially affected by this alternative. Table 7A22 presents an estimate of the average maximum number of recreational trips which could be impacted by minimum sizes on cod.

Table 7A22: Average Number of Trips by Mode Where Cod is the Primary Species Sought by Anglers

Mode	1979-1982 Average Number of Trips where Cod are Sought
Bridges, Jetties, Piers	64,746
Party/Charter	73,953
Private/Rental	193,763
Beach/Bank	75,913

National Survey (DOC)

If the 1982 length/frequency recreational catch data from the New Hampshire fishery (Table 7A23) is representative of the region-wide catch across all modes, the number of cod which would have been lost to the fishery in 1982 under a 17 inch and 19 inch minimum size can be compared with the total shown in Table 7A18. The number of pollock is presented for exposition purposes.

Table 7A23: Number of Fish Which would have been Lost to the Fishery in 1982[1/] Under a 17 and 19 inch Minimum Sizes

	COD [2/]		POLLOCK [2/]	
Mode	17 inch	19 inch	17 inch	19 inch
Bridges, Jetties, Piers	10,530	15,146	770,157	818,712
Party/Charter	621.264	893,655	205,944	218,981
Private/Rental	460,048	661.754	488,075	518,846
Beach/Bank	-	-	67,737	72,007
Total	1,091,842	1,570,555	1,531,913	1,628,546

1/ No adjustment made for fish <15 already lost due to Interim Plan.

2/ Based on 1982 New Hampshire Length/Frequency Data:

	<17	<19
Cod	36.31	52.23
Pollock	92.79	98.64

National Survey data on the size distribution of the recreational catch of cod by party/charter and private recreational boats suggest that close to 24% and 50% of the catch in 1982 and 1983 could have been affected by an absolute minimum size of 17 and 19 inches respectively.

Finally, there will probably be no impact during the first year because the 15 inch minimum size is currently in force in the EEZ and all coastal New England states. The negative impact of this alternative would be greatest in the second year of the plan, and would moderate in years three and four with the growth of sublegal fish to legal size.

Impacts of Alternative C

The difference between Alternatives A and C is the exclusion of pollock and winter flounder from the minimum size regulations. Table 7A24 shows the reduced impacts of this alternative on fishing trips.

Table 7A24: Number of Recreational Trips by Mode on Which Cod was Sought by the Angler and Where 3 or More Fish Were Caught

Mode	Average Trips	% of Total Trips
Bridges, Jetties, Piers	18,841	1.7
Party/Charter	38,440	3.1
Private Rental	91,804	2.8
Beach Bank	13,550	1.1

Derived from National Survey data (DOC)

Summary

Table 7A25 summarizes the impacts of recreational minimum sizes.

Table 7A25: Recreational Minimum Sizes;
Expected losses as either % trips or % catch.
$1000

Alternative	Cod	Haddock	Cod&Pollock	Winter Fl.
A	NA	Unk.	2.6% trips	10% catch
B	36-52% catch 5.9% trips	Unk.	NA	NA
C	2.2% trips	Unk.	NA	NA

§7A4.6 Impact Expected from the U.S. - Canadian Boundary Decision

The International Court of Justice decision on October 12, 1984 established a boundary through the Gulf of Maine and Georges Bank between the 200-mile limits of the U.S. and Canada. This new boundary cuts off access to a substantial portion of the fishery resource area by fishermen of both countries. The effects of this decision on domestic fishermen has not been included in the regulatory impact analysis (Section 7A4) because the analysis preceded the decision, and more importantly, because the impacts of the proposed management program are independent of those which result from the I.C.J. decision. Nevertheless, both the management program and the new boundary will affect the industry simultaneously and it is prudent to be aware of these circumstances.

Currently, data on the impacts of the decision are only available for U.S. participation in the Georges Bank fishery area. The immediate impact of the boundary decision on U.S. fishermen will be a complete loss of Georges Bank landings from east of the new international boundary, and a concurrent gain in landings roughly equivalent to historical Canadian landings west of the boundary. This displaced fishing effort is expected to be more inefficient for both countries than the status quo prior to the decision. Lacking elaborate quantitative models to estimate the degree of switching from fishing area to area and information on Canadian landings, it is still possible to estimate the new mix of species caught by U.S fishermen on Georges Bank. The percent of total species landings from the now Canadian portion of Georges Bank were as follows:

	1982	1983
COD	6.5%	8.8%
HADDOCK	17.2	19.5
YELLOWTAIL	3.8	7.2
WINTER FL.	1.5	3.3
AM. PLAICE	1.6	1.8
WITCH FL.	0.4	1.4
POLLOCK	6.5	12.0
REDFISH	6.8	5.1
WHITE HAKE	2.7	3.6
SWORDFISH	11.2	14.9
SCALLOPS	15.1	7.4

Other species such as fluke, whiting, red hake, scup, butterfish, squid, and lobster sustain less than 1% losses. Again, U.S. fishermen are expected in the short-run to simply intensify effort and landings west of the boundary in an attempt to make up these losses with reduced Canadian competition west of the boundary.

Using 1982 landings per fishing trip data from the Northeast Fisheries Center, the mix of species caught by eight major New England ports are shown in Table 7A27, and the percent loss of total port revenue is shown in Table 7A28. The expected loss from the boundary decision are also shown. It should be noted that these estimates are based on 1982 landings and are "worst case" estimates in that they do not take into account the likelihood that the displaced effort will be re-deployed in other areas. The ports most affected include Boston, Gloucester, New Bedford, Portland, and Rockland; all of which generally concentrate on cod, haddock, pollock, and redfish. Boston is perhaps the most severely impacted, especially in terms of the percent of loss. Flounder landings as a group appear to be only slightly affected by the boundary decision, with the exception of yellowtail in New Bedford. The final impacts and a determination of whether any port will benefit monetarily from the decision will depend on the actual level of landings realized once former Canadian landings are netted in.

Using 1983 monthly landings data from the Northeast Fisheries Center, the mix of species caught by the six major New England ports which are most affected are shown in Figures 7A14 through 7A19. These ports include Newport, New Bedford, Boston, Gloucester, Portland, and Rockland. Newport monthly landings are shown in Figure 7A14, with actual 1983 landings on the left and

losses expected from the boundary decision on the right. The most notable impact for all of the ports in the following figures is a general reduction in peak monthly landings; from 1.5 million pounds to 1.4 million pounds for Newport. The reduction is mainly in yellowtail landings from June to August and somewhat from cod landings in May (see arrows). New Bedford monthly landings (Figure 7A15) are lowered by almost a million pounds, also by yellowtail and cod from June to August. Boston (Figure 7A16), similar to Newport, losses about 100 thousand pounds in monthly landings, mostly cod throughout the year and pollock during the last half of the year. Gloucester losses February-March cod landings; Portland, cod-haddock landings in June; Rockland, cod-haddock-pollock from June to September.

The overall impacts of the boundary decision coupled with the proposed management program should be evaluated with respect to immediate or delayed implementation of the 6 inch mesh size. The alternative with either the highest quantitative net benefit or the least cost is not always the preferred solution (ND 21-24, page 25).

TABLE 7A27: IMPACTS OF CANADIAN BOUNDARY SETTLEMENT ON GEORGES BANK BY PORT & SPECIES

(Thousand Pounds)

	Portland			Rockland			Provincetown			Newport		
	Total	Loss	%	Total	Loss	%	Total	Loss	%	Total	Loss	%
Cod	6269	423	7	2088	308	15	3839	4	0	2363	181	8
Haddock	4466	726	16	4086	911	22	143	12	8	826	19	2
Yellowtail	83	14	17	11	2	16	2810	90	3	8646	462	5
Fluke	11	0	0	+	0	0	146	+	0	1453	2	0
Blackback	572	12	2	200	+	0	1605	3	0	1909	6	0
O. Flounder	9253	106	1	4508	13	0	1998	5	0	1134	38	3
Pollock	7206	316	4	2674	384	14	1169	0	0	153	13	9
Redfish	3913	343	9	6450	204	3	4	0	0	3	0	0
Whiting	691	0	0	77	0	0	1539	0	0	1108	59	5
Red Hake	82	0	0	0	0	0	954	0	0	56	1	2
White Hake	3728	70	2	2195	53	2	92	1	1	59	2	3
Scup	0	0	0	0	0	0	1	0	0	2632	0	0
Butterfish	+	0	0	+	0	0	34	0	0	2171	6	0
Squid	2	0	0	0	0	0	87	0	0	639	0	0

	New Bedford			Gloucester			Boston			Pt. Judith		
	Total	Loss	%	Total	Loss	%	Total	Loss	%	Total	Loss	%
Cod	31243	1546	5	33040	2456	7	12682	2330	18	762	14	2
Haddock	6300	1003	16	18344	2514	14	5636	2048	36	92	0	0
Yellowtail	24519	1501	6	2209	83	4	343	26	8	8128	0	0
Fluke	382	2	1	259	2	1	2	1	55	2104	0	0
Blackback	11762	234	2	900	83	9	822	35	4	5310	0	0
O. Flounder	3870	80	2	12038	403	3	1094	58	5	683	0	0
Pollock	950	35	4	11270	431	4	3116	881	28	24	+	2
Redfish	1	0	0	5537	221	4	2236	467	21	+	0	0
Whiting	2	0	0	6808	10	0	2	+	22	11795	0	0
Red Hake	2	+	22	1316	8	1	0	0	0	771	0	0
White Hake	17	1	3	3117	136	4	597	110	18	47	0	0
Scup	30	0	0	0	0	0	0	0	0	3041	0	0
Butterfish	254	0	0	50	0	0	1	0	0	11387	0	0
Squid	300	0	0	81	0	0	0	0	0	3004	0	0

\+ Indicates an amount less than 1,000 pounds.

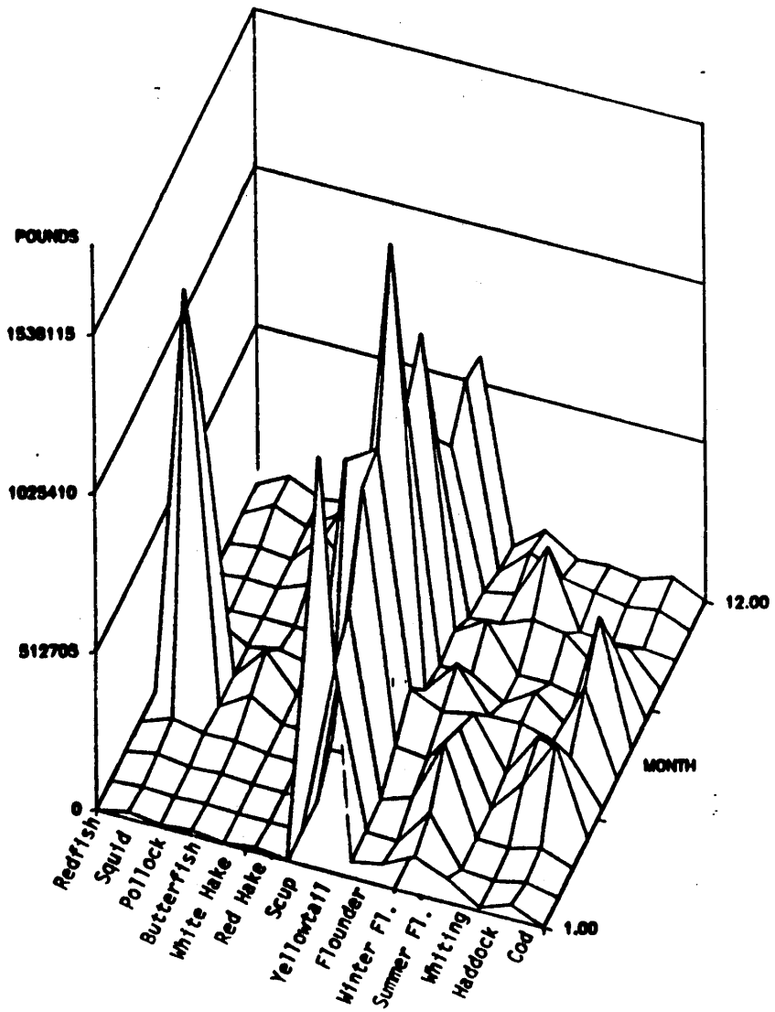
Source: NMFS, 1982 Interviewed Trip Data

TABLE 7A28: IMPACTS OF CANADIAN BOUNDARY SETTLEMENT ON GEORGES BANK BY PORT & SPECIES

	Percent Reduction in Total Port Revenues			
	Portland	Rockland	Provincetown	Newport
	%	%	%	%
Cod	0.8	1.0	0.0	0.4
Haddock	2.2	4.2	0.1	0.1
Yellowtail	0.1	0.1	0.8	1.1
Fluke	0.0	0.0	0.0	0.0
Blackback	0.1	0.0	0.0	0.0
O. Flounder	0 3	0.0	0.0	0.1
Pollock	0.3	0.7	0.0	0.1
Redfish	0.5	0.5	0.0	0.0
Whiting	0.0	0.0	0.0	0.1
Red Hake	0.0	0.0	0.0	0.1
White Hake	0.1	0.1	0.1	0.1
Scup	0.0	0.0	0.0	0.0
Butterfish	0.0	0.0	0.0	0.0
Squid	0.0	0.0	0.0	0.0
	4.4	6.6	1.0	2.1

	New Bedford	Gloucester	Boston	Pt. Judith
	%	%	%	%
Cod	0.7	1.8	6.5	0.1
Haddock	0.6	2.9	8.6	0.0
Yellowtail	0.9	0.1	0.1	0.0
Fluke	0.1	0.1	0.1	0.0
Blackback	0.2	0.1	0.1	0.0
O. Flounder	0.1	0.4	0.3	0.0
Pollock	0.1	0.2	1.7	0.1
Redfish	0.0	0.1	1.1	0.0
Whiting	0.0	0.0	0.1	0.0
Red Hake	0.1	0.1	0.0	0.0
White Hake	0.1	0.1	0.3	0.0
Scup	0.0	0.0	0.0	0.0
Butterfish	0.0	0.0	0.0	0.0
Squid	0.0	0.0	0.0	0.0
	2.9	5.9	18.9	0.2

Source: NMFS, 1982 Interviewed Trip Data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POUNDS
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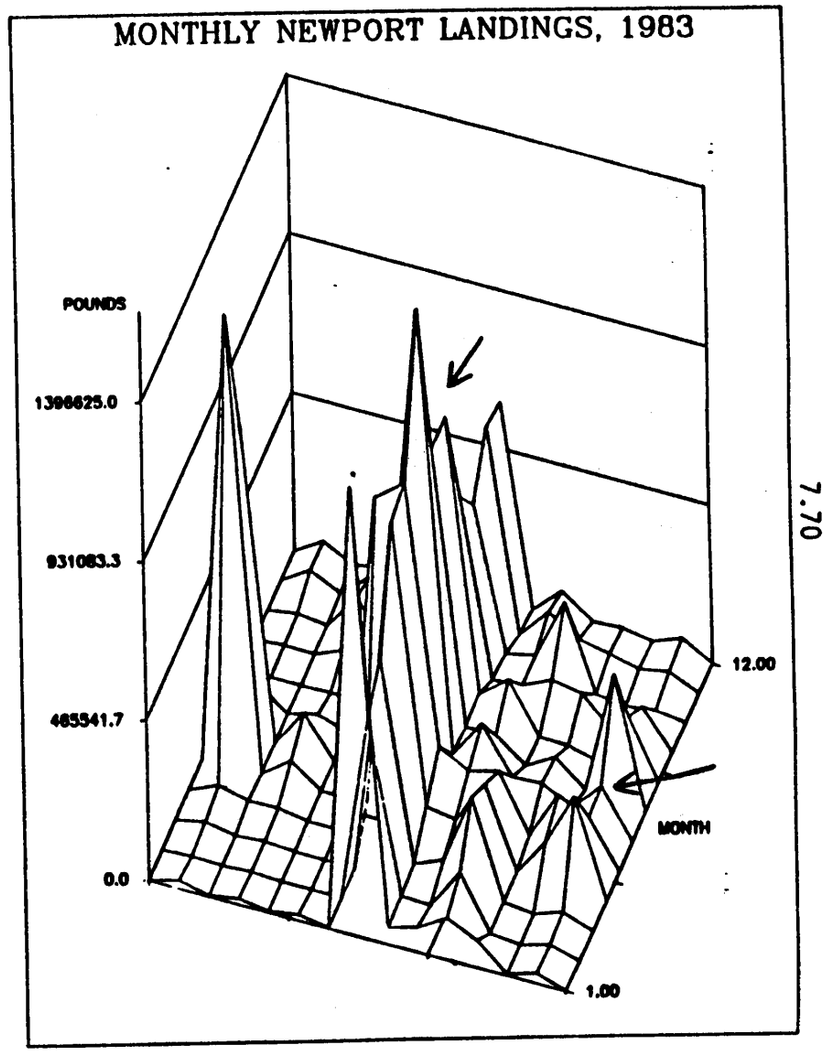
1025410
512705
0
Redfish
Squid
Pollock
Butterfish
White Hake
Red Hake
Scup
Yellowtail
Flounder
Winter Fl.
Summer Fl.
Whiting
Haddock
Cod
1.00
12.00
MONTH


MONTHLY NEWPORT LANDINGS, 1983
POUNDS
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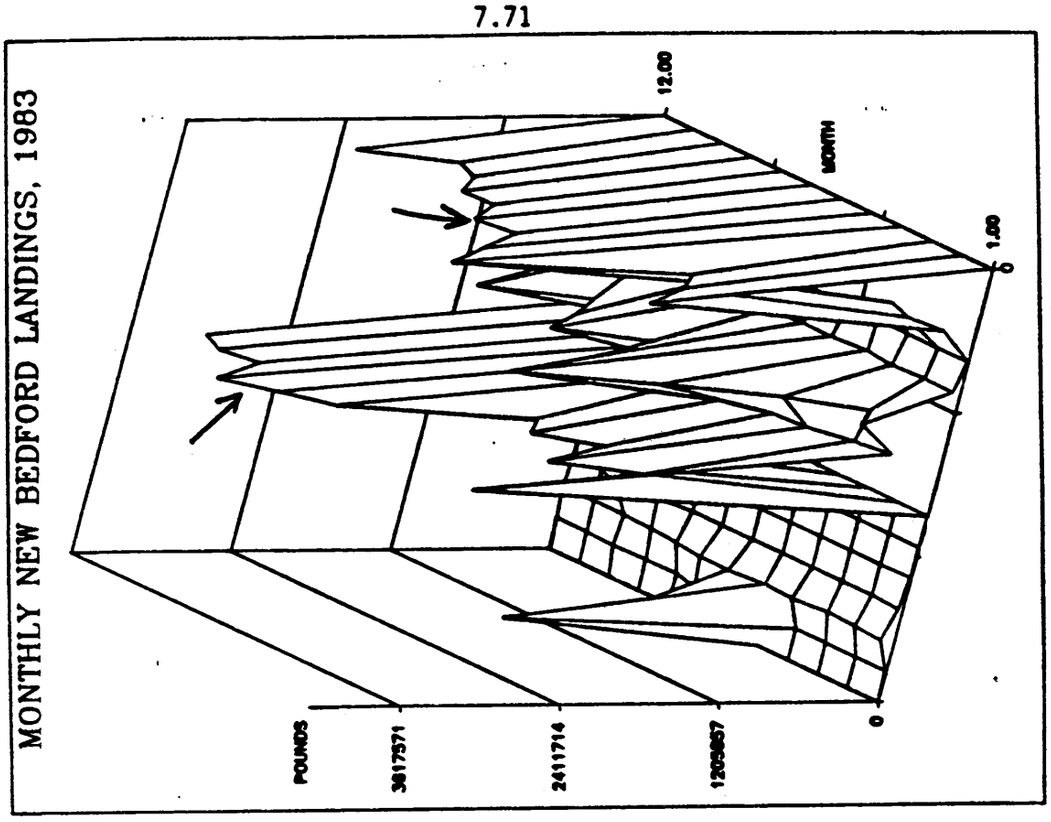
931083.3
465541.7
0.0
1.00
12.00
MONTH

Figure 7A14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POUNDS
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1205857
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MONTH
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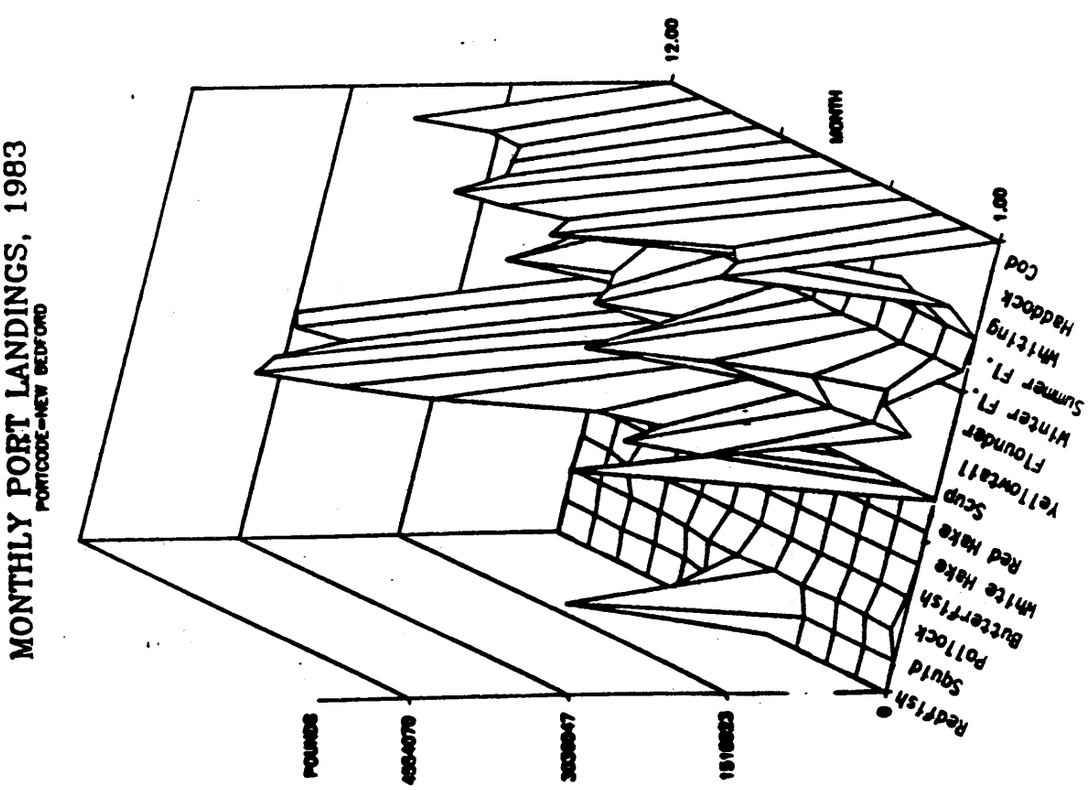
1.00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POUNDS
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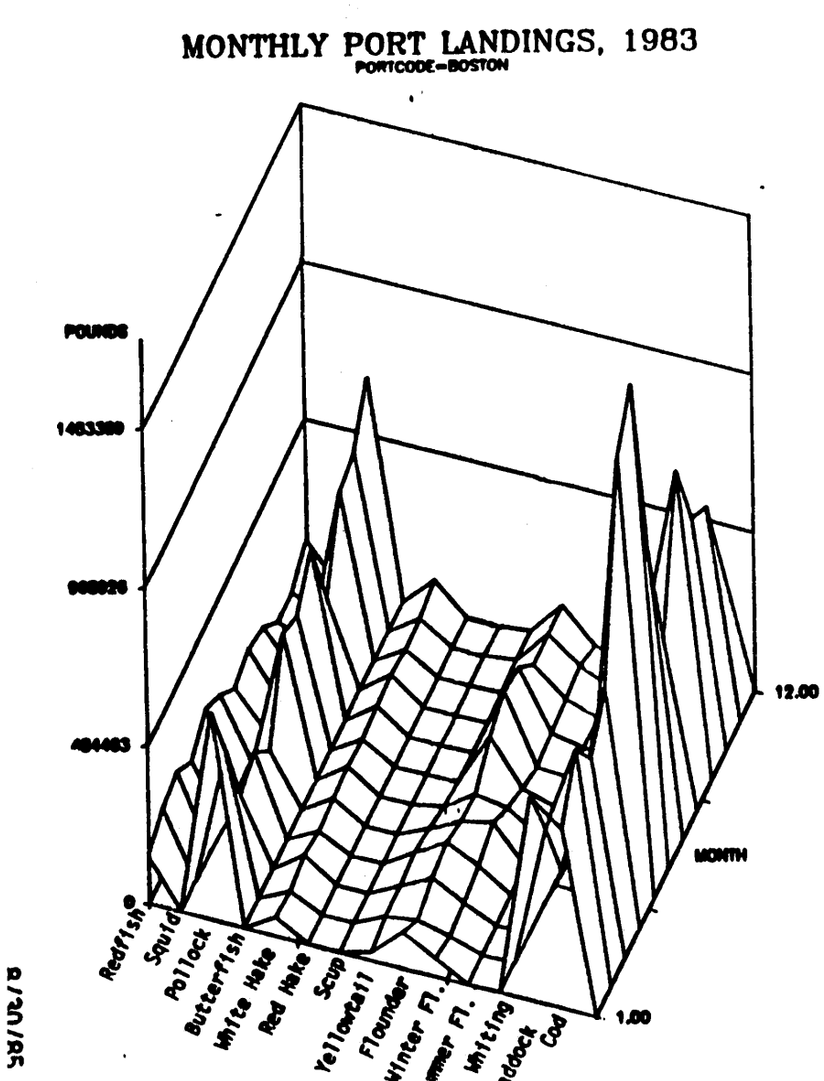
12.00
1.00
Redfish
Squid
Pollock
Butterfish
White Hake
Red Hake
Scup
Yellowtail
Flounder
Winter Fl.
Summer Fl.
Whiting
Haddock
Cod

Figure 7A15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POUNDS
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Butterfish
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Red Hake
Scup
Yellowtail
Flounder
Winter Fl.
Summer Fl.
Whiting
Haddock
Cod
1.00
MONTH
12.00

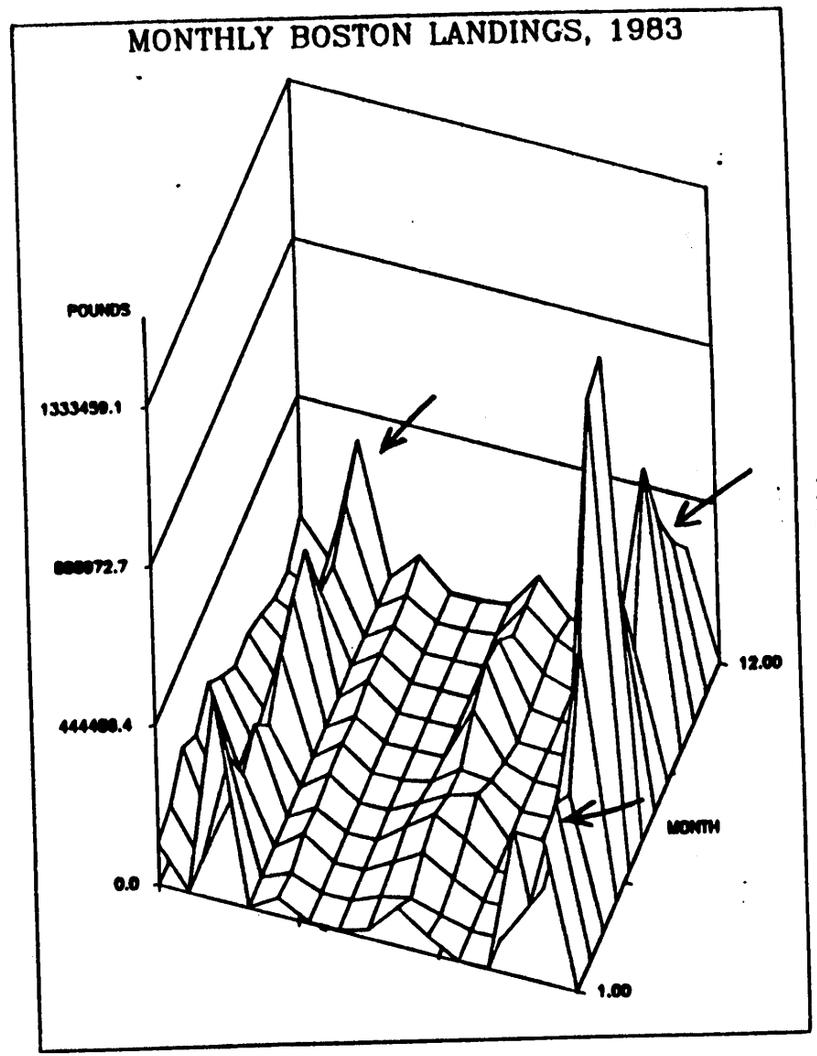
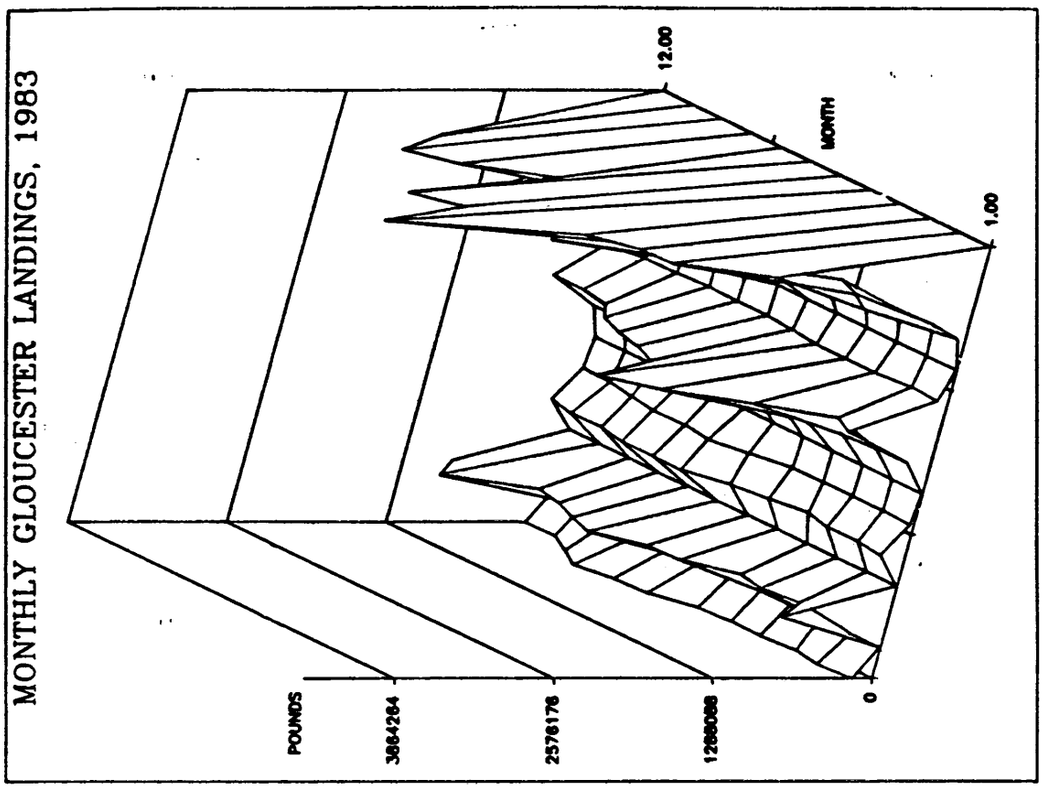

MONTHLY BOSTON LANDINGS, 1983
POUNDS
1333450.1
888972.7
444486.4
0.0
1.00
MONTH
12.00

Figure 7A16



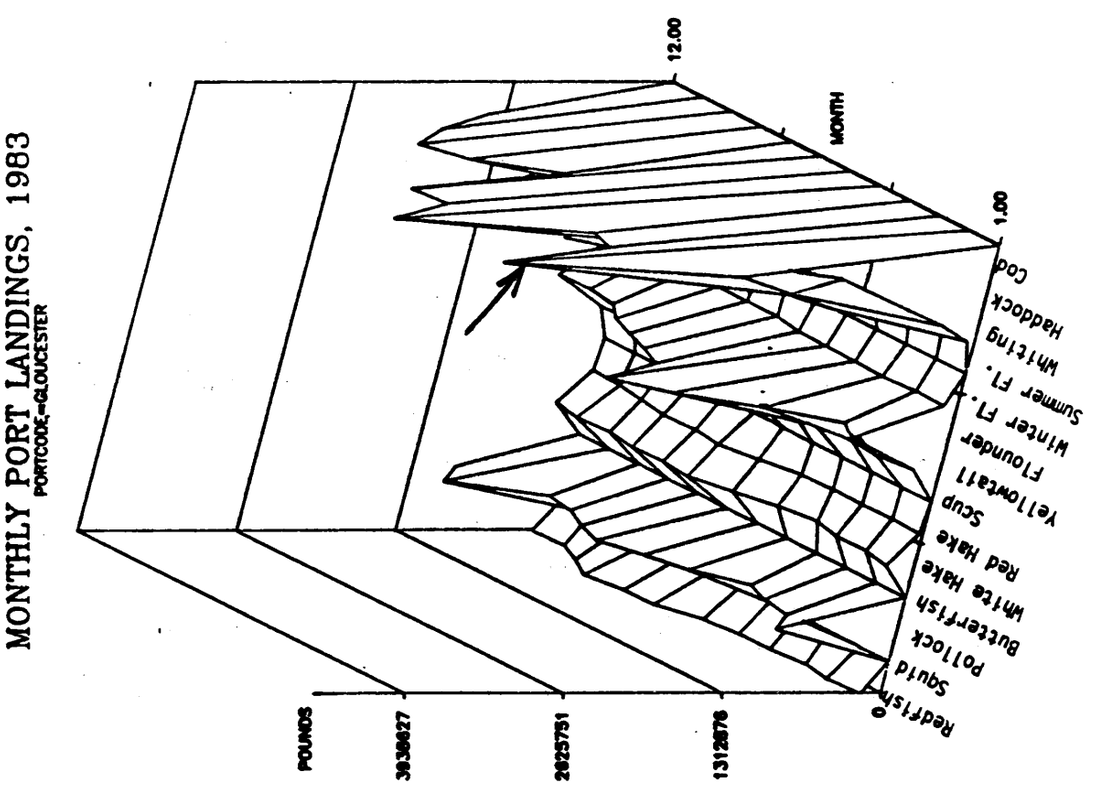


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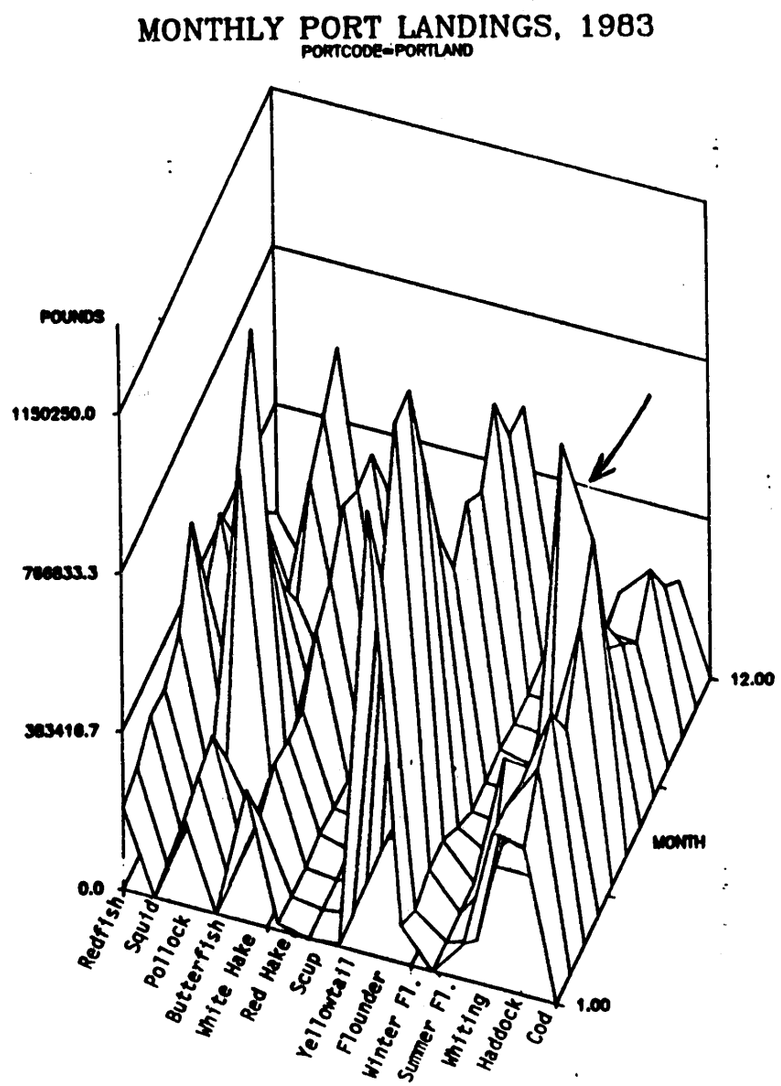
Figure 7A17


MONTHLY PORT LANDINGS, 1983
PORTCODE=PORTLAND
POUNDS
1150250.0
766833.3
383416.7
0.0
Redfish
Squid
Pollock
Butterfish
White Hake
Red Hake
Scup
Yellowtail
Flounder
Winter Fl.
Summer Fl.
Whiting
Haddock
Cod
1.00
12.00
MONTH

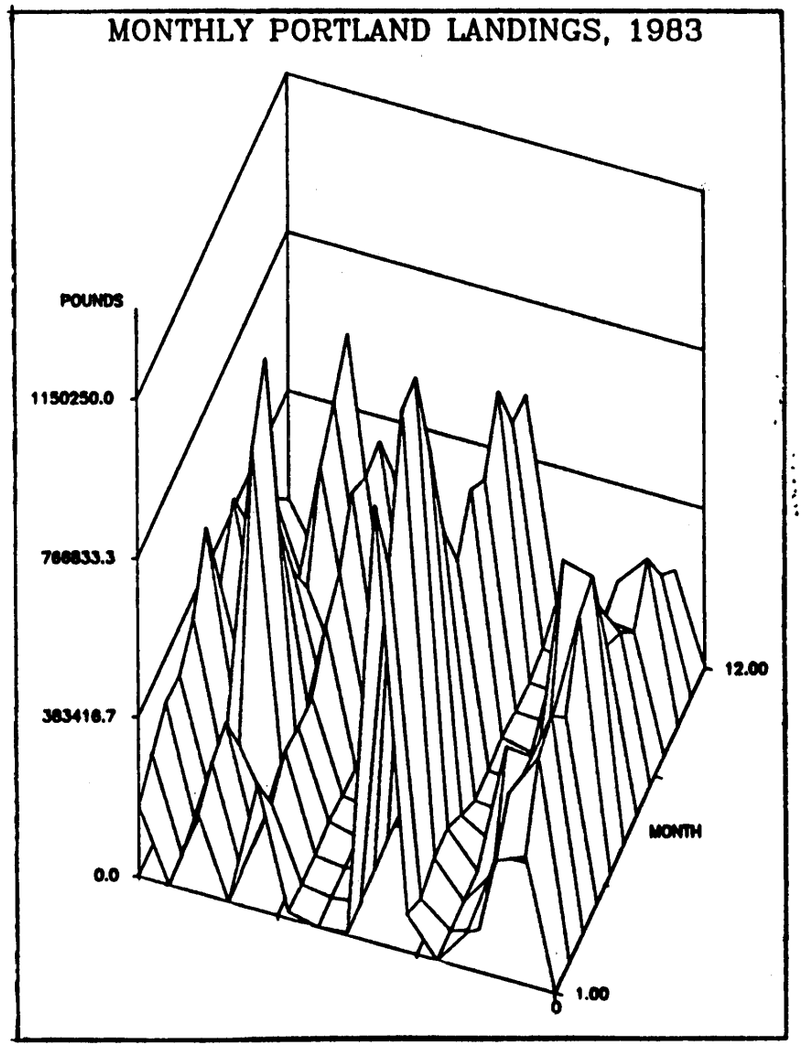
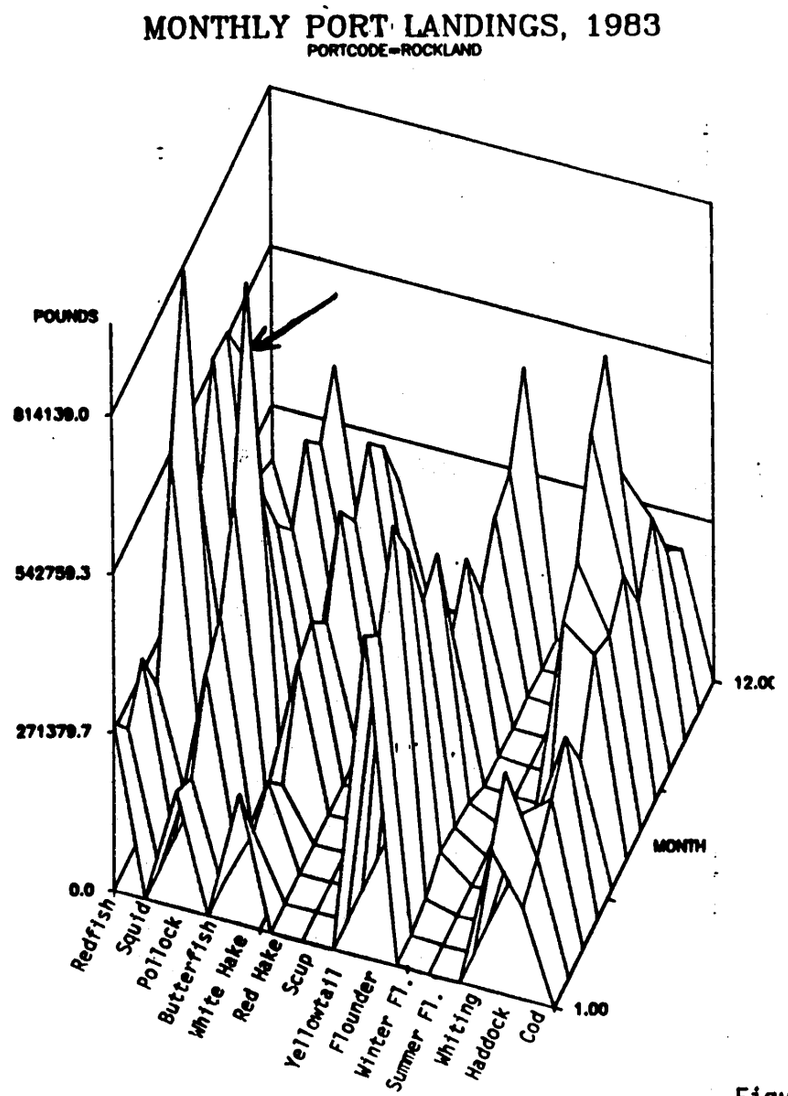

MONTHLY PORTLAND LANDINGS, 1983
POUNDS
1150250.0
766833.3
383416.7
0.0
0
1.00
12.00
MONTH

Figure 7A18


MONTHLY PORT LANDINGS, 1983
PORTCODE=ROCKLAND
POUNDS
814139.0
542759.3
271379.7
0.0
Redfish
Squid
Pollock
Butterfish
White Hake
Red Hake
Scup
Yellowtail
Flounder
Winter Fl.
Summer Fl.
Whiting
Haddock
Cod
1.00
MONTH

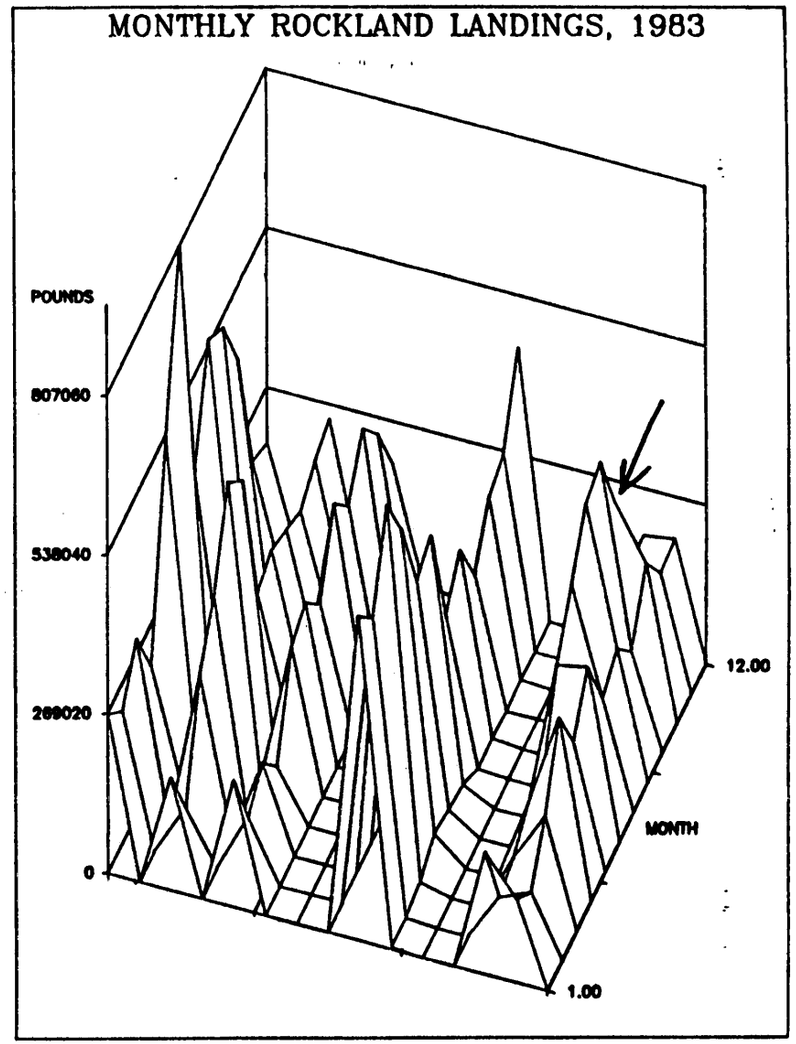

MONTHLY ROCKLAND LANDINGS, 1983
POUNDS
807060
538040
269020
0
1.00
12.00
MONTH

Figure 7A19

SUBPART B: STRUCTURE OF THE MANAGEMENT PROGRAM

§781 Proposed Management Program (Preferred Alternative)

The management program consists of three parts: 1) operative measures to achieve the management objectives, 2) administrative measures to promote both monitoring/enforcement of the FMP and provide for continued industry access to the resources, and 3) procedures to provide an effective basis for continuing management. Any fisherman holding a federal multi-species fishery permit must operate in accordance with federal regulations implementing this FMP even when fishing in state waters. However, where more stringent measures than those proposed in this FMP exist to regulate state landings, the more stringent measures shall prevail.

Operative Measures

1. Minimum Fish Size:

		Year 1	Year 2+
Commercial: (total length)	cod, haddock, pollock . . .	17 inches	19 inches
	witch flounder	14 inches	14 inches
	yellowtail, Am. plaice . . .	12 inches	12 inches
	winter flounder	11 inches	11 inches

All sizes are effective upon implementation of the FMP and will be enforced on the basis of possession in or from the EEZ. In addition, no fish taken subject to this FMP that are smaller than the prevailing commercial size limit may be sold, and minimum sizes will apply to imported fish.

Recreational : (total length) cod, haddock: 15 inches (year 1); 17 inches (year 2 & 3)
19 inches (year 4 +)

Recreational fishermen are not subject to minimum size in possession requirements for pollock, American plaice, or yellowtail, winter and witch flounders. Each recreational fisherman may have in his possession a total of two undersized fish (cod and/or haddock).

2. Minimum Mesh Size: The Council presumes the initial use of cod end mesh attached in a diamond configuration, and has specified the minimum cod end mesh accordingly, the Regional Director is authorized to permit the use of smaller cod end mesh so long as it is attached to the net in a square configuration and he finds that it achieves the same level of selectivity relative to haddock retention as is achieved with the mesh as specified herein.

Gulf of Maine In the area bounded on the north and west by the territorial sea, the east by the limits of the EEZ and on the south by Mass Bay and 42° 20'N (east of 70°00'W), cod end and bottom-tending gillnet mesh shall be as follows::

- Regulated minimum mesh in cod end . . . . . 5-1/2 inches
- Regulated minimum mesh in bottom-tending gillnets . . 5-1/2 inches

- Exceptions - 1) within the exempted fishing area illustrated in Figure 7B1, the conditional use of cod end mesh smaller than 5-1/2 inches is allowed as described under Exempted Fishery Regulations below; and 2) within the area designated as the "redfish area" in Figure 7B1, the minimum cod end mesh requirement will not apply during the months of March through July or until the point in that time interval when 3500 mt of redfish have been landed within the calendar year.

Georges Bank In the area of the EEZ bounded on the north by 42°20'N, on the south by LORAN C lines 9960-Y-43500 and 5930-Y-30750, and on the west by the territorial sea above 41°35'N and by 69°40'W below 41°35'N, except as provided under Exempted Fishery Regulations below, cod end and bottom-tending gillnet gear mesh shall be as follows:

- In years 1 and 2 of FMP implementation, the minimum mesh in cod end and bottom-tending gillnets shall be 5-1/2 inches

- Within the third year of FMP implementation, the minimum mesh in cod end and bottom tending gillnets shall increase to 6 inches subject to the Regional Director's determination, made in consultation with the New England Council, that the Canadian management program for Georges Bank stocks is substantially consistent with the conservation objectives of the FMP.

Other New England: In those parts of the New England Area not otherwise regulated for mesh, the minimum mesh in bottom-tending gillnets must be equivalent to that in the Georges Bank area during the months of November through February.

3. Exempted Fishery Regulations

- Opportunities to fish with small mesh cod ends in the regulated mesh areas are provided for the exempted fishing area shown in Figure 7B1.

- Exempted fisheries for commercially valuable species, which require the use of mesh smaller than the regulated mesh size, will be allowed as specified below. Exempted fisheries must be applied for independently and may not be granted for more than one exemption at a time.

- Regulated species include cod, haddock, pollock, redfish, Am. plaice, and yellowtail, winter and witch flounders.

- Exempted fishery options:

Period	Exempt Species	Comment
June - November	open	Regulated species may not exceed 10% of the total landings of all species during the reporting period.

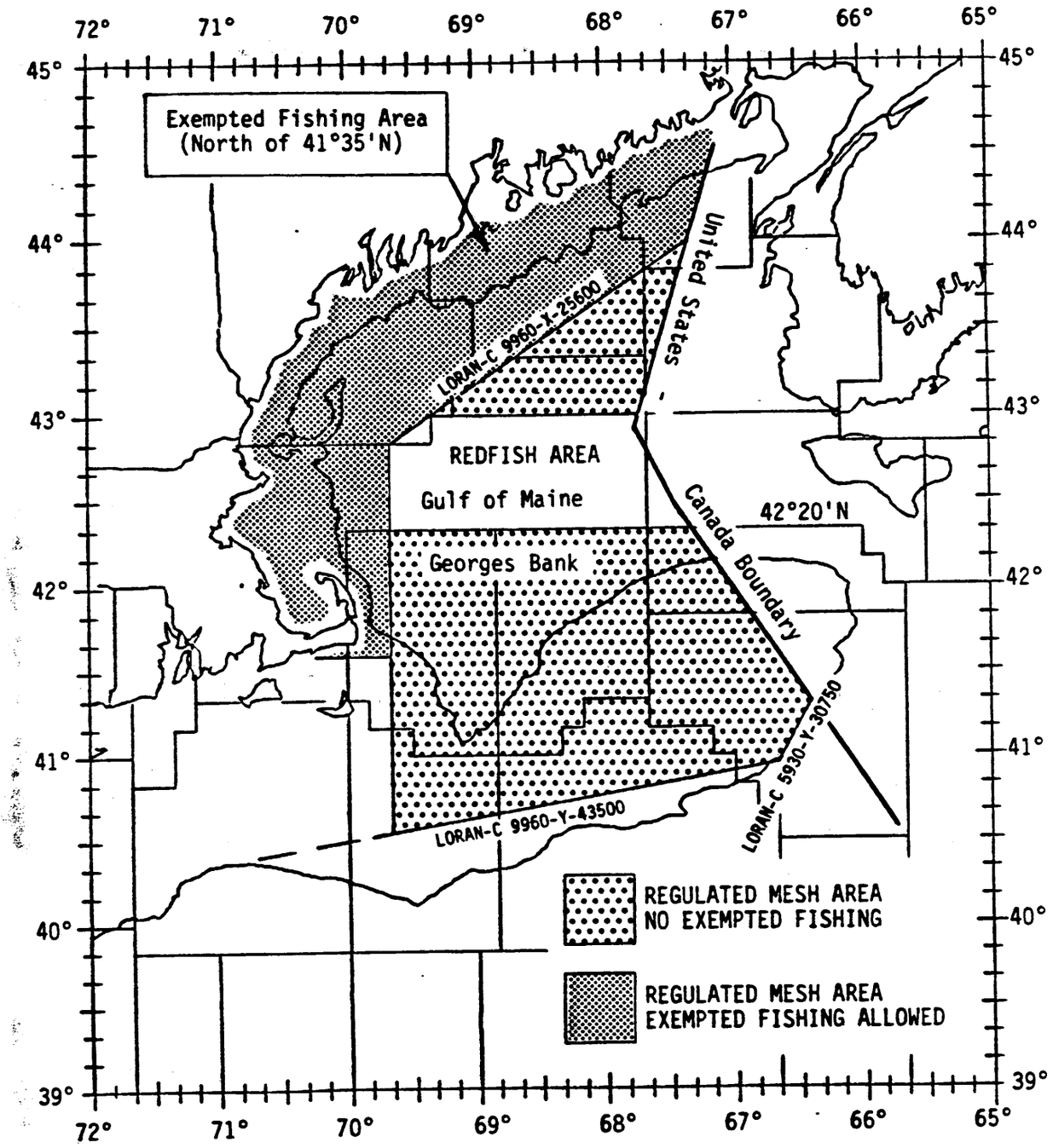


Figure 7B1 New England regulated mesh area illustrating areas of exempted and non-exempted fishing and the redfish exception area. See text for details.

- Exempted fishery options (continued):

Period	Exempt Species	Comment
December-January	whiting	Regulated species may not exceed 10% of the amount of whiting landed over the reporting period; the fishery will be monitored by sea sampling.
January - April or as specified by ASFMC	shrimp	Regulated species may not exceed 10% of the amount of shrimp landed during the reporting period.
December-May	herring mackerel	Regulated species may not exceed 10% of the amount of herring plus mackerel landed over the reporting period.

- Area exception- a fishery for herring, mackerel and/or squid may be conducted in the regulated mesh area of Georges Bank throughout the year using cod end mesh less than the regulated minimum subject to the stipulation that mid-water trawl gear be used and the by-catch for regulated species be held to 1%.

- Reporting period- The reporting period for the exempted fisheries shall be 30 calendar days or until withdrawal of the vessel from the exempted fishery, whichever is the shorter period.

- Report form - existing federal reporting form submitted by each participating fisherman at the end of the reporting period. Individual trip records that are verified by the dealer(s) handling each trip or part thereof must be retained by participating fishermen to corroborate compliance data over the reporting period.

4. Area Closures

Spawning areas

Spawning areas, principally designed for haddock, will be seasonally closed to fishing with all mobile or fixed gear except with scallop dredge gear and hooks having a gape not less than 1.18 inches (30 mm.).

- Spawning areas to be closed include traditional areas I and II shown in Figure 7B2(a). It is recognized that only a small part of Area II is under U.S. control.

- The closure period in Area I will be from February 1 through May 31, except that each area (or relevant portion thereof) may be opened after April 30, upon the authority of the NMFS Regional Director. The closure period in Area II will be determined in consideration of Canadian management regulations.

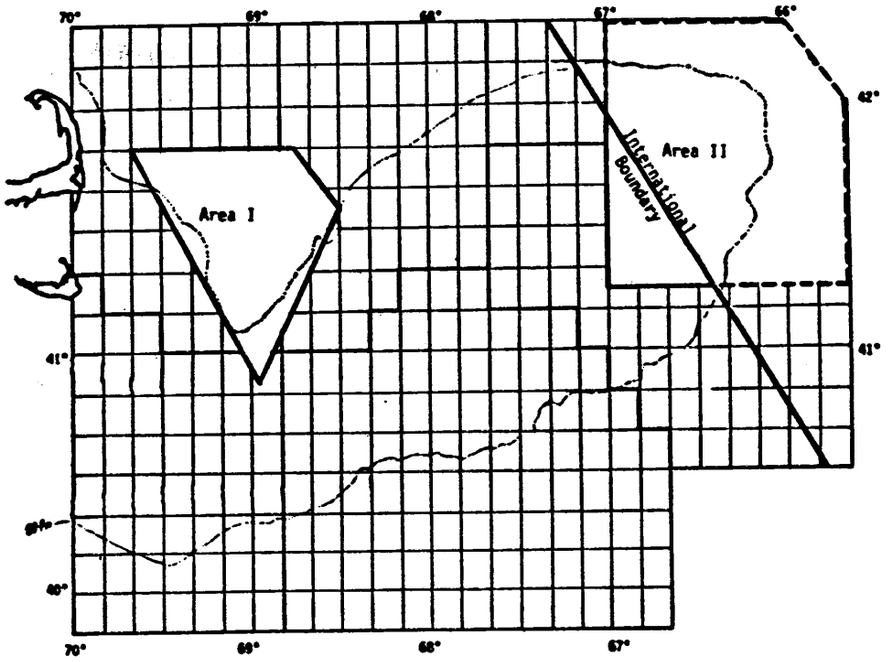


Figure 7B2.a Georges Bank spawning area closures I and II.

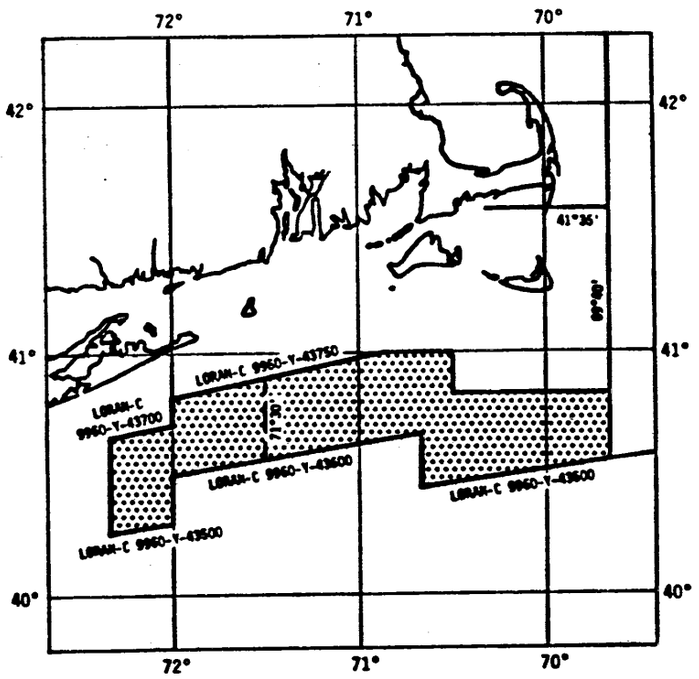


Figure 7B2.b Southern New England-Middle Atlantic area closure. See text for details.

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Other areas:

A portion of the New England/ Mid-Atlantic area west of 69°40', illustrated in Figure 7B2(b), is defined as an area to be seasonally closed to provide reduced mortality and enhanced spawning opportunity for yellowtail flounder. This closure is compatible with management efforts for yellowtail stocks in other resource areas.

The portion of this area east of 71°30'W longitude will close on March 1; whereas the portion west of 71°30'W will close on April 1. The total area will remain closed as far into May as the Council determines appropriate to achieve the objective of the FMP relating to Southern New England yellowtail flounder, at which time notice of reopening will be published in the Federal Register.

This area will be closed to all mobile gear fishing with the following exceptions: a) mid-water gear operating with a permit issued by the Regional Director and subject to the restriction of a zero by-catch of regulated species, and b) sea scallop or surf clam/ ocean quahog dredges subject to the Regional Director's specification of by-catch reporting requirements. The Council may specify by-catch limits to sea scallops or surf clam/ocean quahog operations in the closed area after a careful review of by-catch information.

5. Additional Measures[1/]

Regulated Mesh Area

If fishing mortality for key species is determined to jeopardize achievement of the management objectives, or if a new year class of haddock is jeopardized by overfishing, then four options to further control fishing mortality will be considered for Council action using the regulatory amendment process (public hearings will be held):

- Make regulatory modifications promoting the effectiveness of existing measures.
- Establish other time/area restrictions on the fishery.
- Increase minimum fish size.
- Increase mesh size.

Non-regulated Mesh Area

If fishing mortality for key stocks not adequately protected by the regulated mesh area remains too high to achieve the plan objectives, then three additional options to further control fishing mortality will be

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1/ The decision to proceed with additional measures that will impose area or gear restrictions in the Mid-Atlantic area will require joint Council concurrence before a regulatory change process can be utilized.

considered for Council action using the regulatory amendment process (public hearings will be held):

- Close key grounds for limited periods of time until conditions change.

- Increase minimum fish size.

- Establish a minimum mesh size for all or part of the area during some or all of the year.

Other

The Council may, in addition, take action as warranted to ease or remove regulations, authorize experimental fishing, or modify regulations to accommodate advanced gear technology.

6. Administrative Measures

Gear Marking Requirements

Throughout the New England area, bottom-tending fixed gear must have the name of the owner or vessel, or the official number of that vessel permanently affixed to any buoys, gillnets or longlines. In addition:

- Bottom-tending gillnet or longline gear must be marked as follows: the westernmost end (meaning the half compass circle from magnetic south through west to and including north) of the gear must display a standard 12" tetrahedral corner radar reflector and a pennant positioned on a staff at least 6 feet above the buoy. The easternmost end (meaning the half compass circle from magnetic north through east to and including south) of the gear must display only the standard 12" radar reflector positioned in the same way.

- The maximum length of continuous gillnet sets shall not exceed 6,600 feet between end buoys.

- In the Gulf of Maine, sets of gillnet gear which are of an irregular pattern or which deviate more than 30° from the original course of the set shall be marked at the extremity of the deviation with an additional marker which must display a number of highly visible streamers and may either be attached or independent of the gear.

Data Reporting Requirements

This FMP establishes no new data reporting requirements other than those required under the exempted fishery regulations. Reports for the exempted fisheries are expected to use forms and procedures used in the Interim Groundfish FMP and already approved by OMB. The New England Council does require that NOAA/NMFS retain the identification number of vessels on data records acquired through the Three-Tier Data Collection System and maintained or archived as part of the commercial fisheries database in the Northeast Region, unless otherwise directed by a vessel owner to delete the identification code from records pertaining to his particular vessel.

Permit Requirement

Any vessel wishing to participate in the Northeast multi-species finfish fishery, regardless of species sought, must obtain an annual permit. This permit does not supplant the permitting requirements of any other FMP.

Experimental Fishing

The Council may request that the Regional Director issue a permit for vessels to operate in a manner contrary to the requirements of the FMP for the explicit purpose of either gathering information on or demonstrating the feasibility of some fishing activity that may provide an economic opportunity for the fishing industry and that may be conducted without detriment to the achievement of the FMP objective. Experimental fishing would be recommended by the Council based upon an evaluation of its justification and operational design. The experimental fishing activity would be conducted under the close, operational supervision of the Regional Director, who could withdraw the permit in the event that the fishing activity was not meeting its objectives.

§7B2 Rationale for Adoption - An Analysis of Costs and Benefits

The purpose of management plan is to achieve increased biological benefits in terms of increased spawning potential for the commercially most important stocks of fish. Some of the management measures, such as minimum fish size, mesh size and protected spawning areas, directly contribute to acheiving this goal while others, such as the exempted fishery program, contribute indirectly by providing fishermen the opportunity to use small mesh nets in a way that is less harmful to the regulated species than under the existing optional settlement program.

Unfortunately, it was not possible to quantify the major expected benefit of increased spawning potential to be gained by increases in either mesh or minimum fish sizes. It was only possible to estimate the benefits that these measures would have by increasing the yield per recruit and their costs in terms of the amount of fish lost in the short-term. Consequently, the economic impact analysis shows only negative results for the different alternatives, yet the Council and those familiar with the fishery are confident that the economic impacts of increases in mesh and minimum size will be positive.

1. Minimum Size Regulations

Economic Costs and Benefits

The net economic impacts of the proposed increases in minimum sizes for certain regulated species are included in the economic analysis of Options 2 through 7. These regulations are not analyzed separately from the minimum mesh size options because they are so interdependent. Although the economic benefit of the proposed increase in minimum sizes cannot be analyzed separately nor can they be quantified because of a lack of available data, the minimum size increase would decrease the per unit cost of fresh fish fillet production. Larger fish lower the labor costs of hand filleting because it takes fewer large fish have to be filleted to produce the same yield from many smaller fish. In addition, a higher

price is generally paid for fish larger than the minimum sizes of cod, haddock and flounders which are currently harvested. Unfortunately, there is not enough data available to accurately quantify the benefits of an increase in minimum sizes, however, they are probably very large.

Biological Benefits

The proposed increases in minimum size are necessary to acheive the plan's objective.

Social Costs and Benefits

The main social benefit of the proposed minimum size regulations is that they are simple, readily understood by fishermen and enforceable both at sea and at the dock.

Administrative Costs

There would be a negligible increase in enforcement costs from extending minimum size requirements to pollock, witch flounder, American plaice and winter flounder. Since minimum size regulations already exist for cod, haddock and yellowtail flounder, these additional minimum sizes would not require any additional enforcement coverage. In addition, some of these minimum size regulations are already enforced at the state level.

2. Mesh Size Regulations

Economic Costs and Benefits

The major management measures, the minimum sizes for the commercial fishery and mesh size Option 4, the preferred alternative, were shown in §7A4 to have the second lowest (to Option 3) expected long-term costs among the seven alternatives considered. This alternative proposes the phased-in implementation of a 6 inch minimum cod end mesh size for the large mesh area on Georges Bank, a closed area in Southern New England, and a 5-1/2 inch minimum mesh size in the Gulf of Maine except for the deep-water redfish fishery there. In addition to producing the second lowest expected long-term costs, this alternative has the lowest negative impacts during the first two years of implementation.

Biological Benefits

The preferred alternative, delayed implementation of the 6 inch mesh option, provides for the greatest possible long-term biological benefits for the fishery by providing the greatest increase in spawning potential, yield per recruit and protection from stock collapse. In addition, this alternative, if effectively enforced, is more certain to achieve the biological objectives than options 2 and 5 which rely on closed areas on Georges Bank. Options 2 and 5 would cause an undetermined fishing effort to be displaced from the closed areas into other areas and, therefore, would not be as effective in controlling fishing mortality. Conversely, the analysis in section 7A4 shows that closed areas in the Southern New England region are preferred to a large mesh area (see Table 7A13). Thus options 3&4 provide greater net benefits than options 6&7 because the large mesh area in Southern New England adjacent to Georges Bank infringes on many inshore small-mesh fisheries (i.e., scup and squid) which the more offshore closed area does not.

Social Costs and Benefits

Some of the major social benefits to be derived from a fishery management plan are long-term increased employment in the fisheries, job satisfaction, acceptance by fishermen and fairness in any redistribution of benefits caused by the plan.

The major social benefit provided by this management plan is continued employment opportunities in fishing communities. According to the analysis presented in §7A5, the preferred alternative is expected to provide for one of the greatest long-term increase in the amount of employment in the fishery and fishing-related industries. After an initial decrease, the increased employment is conservatively estimated to be at least 400 man years by 1994. It is important to remember that this estimate represents a permanent increase in employment due to the stabilization of fish abundance at a higher level given current rates of fishing mortality, fishing technology and fish prices. The social cost of this alternative is an immediate, short-run decrease in employment of up to 950 man years in the fishery and fishing related industries. The relative merits of the preferred alternative in terms of its ultimate effects on employment are the same as its relative merits in terms of its overall economic impact. The preferred alternative results in the lowest first year decrease in employment, and would not impose any more operational costs upon the fishing community than any of the other six alternatives considered.

Another major social benefit provided by the preferred alternative is that it minimizes discarding of undersized fish caught by trawlers. Fishermen have strongly objected to any management measures which increase the level of discarding because they find it illogical to kill valuable fish and not be able to sell them. This benefit comes under the category of management regulations which fishermen can understand and accept.

Administrative Costs

Administrative costs include all the costs, such as monitoring, legal and enforcement costs, of implementing a management program. All the alternatives have substantially the same administrative costs because they are similar in the type of management measures they contain. Options 2 through 5 would probably have higher administrative costs than the other alternatives because in addition to enforcing mesh size regulations these would require an increase in enforcement effort to police the large increase in the duration and amount of closed fishing areas.

3. Exempted Fishery Regulations

Economic Costs and Benefits

Bearing in mind that the exempted fisheries potentially lessen the beneficial effects of the plan on the regulated species, the principal economic benefit of the proposed exempted fisheries regulations is that it provides opportunities to fish for small mesh species. Rather than sacrifice or severely restrict the small mesh fisheries in order to safeguard the major commercial, large mesh species, this program attempts to give fishermen the maximum flexibility in fishing for small mesh

species consistent with sound management of large mesh species. Unfortunately, this benefit cannot be quantitatively measured, however, to the extent possible, the other impacts of the exempted fishery regulations, such as the increased protection of regulated species, are included in the economic analysis of the major management options in §7A4.

These regulations are expected to have a positive economic impact in that they help ensure compliance with the major management measures by reducing the opportunity to catch undersized regulated species with small nets. Currently an undetermined but significant amount of immature cod, haddock, flounder and redfish are caught both legally, under the optional settlement program, and illegally with small mesh nets. Of principal concern are the illegal and unreported landings of immature fish. The exempted fishery regulations are designed to reduce this shortcoming of the optional settlement program by reducing bycatch levels for regulated species and the area and seasons in which small mesh nets can be used.

The only negative impact of these regulations will be the potential reduction in the catch of certain species with small mesh nets by bottom-tending gear. The greatest impact will be a potential reduction of 9% in the landings of whiting, 0.8% of scup, 2.5% of butterfish, and 0.4% of squid, depending on whether a closed area or large-mesh area is selected in the Southern New England region. The reduction in landings of herring and mackerel will be less than 1%. Based on the value of landings in 1983, the maximum amount of this negative impact could be about $3 million. As pointed out earlier, this is an unlikely, worst case estimate because the vessels affected by these reductions will fish for these species in other areas; and some of them will be able to continue to fish year-round for mackerel and herring in exempted fishing areas, provided they use pelagic gear.

Biological Costs

The biological costs of the exempted fishery regulations are virtually the same as the economic costs: the reduction in the harvest of immature fish is not fully achieved, but greater compliance with the major management regulations is expected.

Social Benefits

The major social benefit of the exempted fisheries regulations are that they allow the fishery to be managed in a manner which is least disruptive to the traditional, opportunistic nature of the multi-species fishery. The exempted fishery regulations should also provide major social benefits in that they encourage compliance with fishing regulations by reducing the opportunity to illegally catch regulated species with small mesh. The alleged lack of compliance with the mesh regulations in the Interim Groundfish Management Plan has caused a large number of fishermen to become disenchanted with the fisheries management process and has reduced the incentive for fishermen who would otherwise obey fishing regulations to do so. Fishermen who abide by regulations are at a competitive disadvantage with fishermen who do not. In the Northeast multi-species fishery, which has recently experienced large declines in the profits of individual vessels and has had a growing number of business failures, the loss of any competitive advantage by any fishing vessel is a very serious

problem. Even if they provided no improvement in the biological condition of the regulated fish species, the exempted fishery regulations are neccessary to improve the effectiveness and, therefore, the fairness of existing regulations.

Administrative Costs

The exempted fishery regulations should reduce enforcement costs from current levels because they reduce the amount of time during which restrictions on fishing with small mesh nets must be enforced. In addition, the amount of area where small mesh nets may be used in the Gulf of Maine has been substantially reduced.

The costs of administering a reporting system for vessels participating in the exempted fisheries should not be substantially greater than the cost of administering the existing optional settlement reporting system.

4. Increased Spawning Area Closures

Economic Costs and Benefits

The analysis of the economic effects of the increased spawning area closures, in both Georges Bank and Southern New England, is included in the overall economic impact analysis for the major management options.

Biological Benefits

This management strategy was included in the plan in order to help acheive the plan's main objective of providing for a certain level of spawning potential per recruit.

Social Costs and Benefits

The proposal to extend spawning area closures into February and to replace a large-mesh area in Southern New England were made in response to the comments from many fishermen that the extension would better protect spawning aggregations of haddock and yellowtail respectively; however, the measure may have a negative effect on employment. This is a management measure which reduces fishing mortality and which fishermen can understand.

Administrative Costs

Because NMFS personnel are already familiar with enforcing area closures, no administrative costs other than those for increased surveillance should be incurred. The cost of increased surveillance by a medium-endurance coast guard cutter is estimated to be $1.924 million (74 days x $26,000 per day) and the cost of increased aircraft surveillance is estimated to be $207,000 (90 days X $2,300 per day). The total estimated cost is $2.131 million. Given the likelihood that no additional funds will be available for enforcement in either the NMFS or Coast Guard budgets, the increased closed areas will have to be monitored with existing resources and therefore will not increase enforcement costs.

5. Redfish Management Regulations

Economic Costs and Benefits

The analysis of the economic effects of redfish management measures are contained in the economic impact analysis of the preferred management alternative. Given the 5-1/2" mesh size requirement without any mesh size exemption for redfish and the change from the optional settlement to the exempted fisheries program, the catch of redfish would be reduced 73% and the revenue would be reduced 68 to 70%. The reduction in landings and revenues for redfish under the preferred management alternative would be substantially more than it would be for any other species.

Biological Costs and Benefits

This measure meets the plan's objective of substantially increasing the spawning potential for and eventually the landings of redfish. The biological cost implementing this alternative is that allowing the use of small mesh gear to catch redfish will increase the bycatch of small pollock and thereby reduce the spawning potential for these species.

Social Costs and Benefits

Although the redfish managment measures decreases the opportunity to catch redfish in order to improve the spawning potential for this stock, they still provide some opportunity to catch redfish. The opportunity to catch redfish is important to a number of Maine fishermen who derive a substantial part of their revenues from redfish and who can not readily switch to other groundfish species such as cod, haddock and flounder because of their low availability in the Gulf of Maine.

Administrative Costs and Benefits

These measures are expected to cause a slight increase in administrative costs because the catch from this area needs to be monitored. After the exempted fishery has closed, there should be no additional administrative burden.

6. Gear Marking Requirements

Economic Costs and Benefits

Although the costs of the different gear marking alternatives are explained in §7A4, it is not possible to quantify the benefits because there is no data on specific conflicts involving gillnets and longline gear. However, recreational and some trawl fishermen have stated at public hearings that better and more consistent gear marking would reduce their gear conflicts with gillnetters, decrease the cost of gear replacement and increase their fishing time and catch. Many gillnetters have acknowledged the potential of the marking measures to reduce conflicts with other fishermen. It is important to note that the initial version of fixed gear marking measures were developed, in part, by gillnet industry advisors to the Council. The Council has been advised that many gillnetters already mark their gear in a manner which largely complies with the proposed marking requirements.

Both gillnetters and recreational fishermen have agreed that the benefits from the selected alternative, C, outweigh its costs. Council advisors have indicated that this alternative would provide for the minimum level of gear marking which would be effective under the range of weather conditions experienced at sea. Because alternatives A and B do not sufficiently improve the visibility of fixed gear or help to indicate the direction in which it is set, they are less cost effective than alternative C despite their lower absolute cost.

The overall cost of the proposed gear marking requirements will be less than that estimated in §7A4 ($60-100 thousand) because many gillnetters, as mentioned above, already mark their gear in accordance with the proposed marking requirements with the exception of mid-markers on sets having a deviation greater than 30° from the initial direction of the set.

Biological Benefits

None of the gear marking alternatives which have been considered will provide any quantifiable biological benefits. However, it is known that lost gillnet gear continues to cause some level of fish mortality. To the extent that the proposed marking requirements reduce lost gillnets, they will achieve some biological benefits.

Social Costs and Benefits

Both gillnetters and charter and party boat operators have stated at public hearings and at Council meetings that their working and social relations have been strained by recent gear conflicts. Many recreational anglers have also notified the Council that they have lost a substantial amount of fishing time and recreational benefits because their hooks and jigs have become entangled in poorly marked gillnets. Consistently marked gillnet gear should provide benefits to anglers by reducing the number of inadvertent drifts into and entanglements with poorly marked and defined sets of gillnet gear. Any management regulations which lessen gear conflicts would also reduce the social tension between these groups and improve their ability to communicate and, therefore, to operate more efficiently on the fishing grounds.

Administrative Costs

The selected gear marking alternatives are not expected to cause any significant increase in enforcement costs. Gillnetters have indicated that they would have a strong incentive to abide by a practical and consistent gear marking system in order to reduce gear conflict and loss.

Gillnet fishing areas are fairly well concentrated and known. Random inspections for compliance on routine, multiple mission patrols by Coast Guard vessels should be adequate to accomplish the goals of the Council. Further, the Council anticipates that if there are fishing areas with high rates of non-compliance, they will be quickly discovered and remedied.

7. Recreational Fishing Regulations

Economic Costs and Benefits

Among the four alternatives for minimum sizes for the recreational fishery, alternative D allows for the greatest recreational fishing opportunity. It imposes the lowest cost on recreational fishermen in that it places the fewest number of restrictions on recreational fishing. The ability to catch fish in the recreational fishery has a large economic value because increasing the likelihood of catching fish increases the value of each recreational fishing trip.

This alternative has only a small negative impact on the average recreational angler because of the allowance of two fish below the minimum size per fisherman. As stated in §7A4, this alternative is thought to have no impact on 71% of shore-based trips, on 48% of party/charter boat trips, on 53% of all private boat trips and no impact on 82% of all recreational trips from beaches and banks along the New England coast.

Biological Benefits

The primary biological benefit of increasing the minimum size for the recreational fishery is that it is a component in the overall strategy to increase spawing stock biomass per recruit; and, therefore, it will help increase the amount of fish available to recreational anglers in the future. The proposed recreational minimum sizes do not strictly conform to the proposed commercial minimum sizes because of the very high value per fish of recreationally caught fish and because recreational fishing is a relatively small part of total fishing mortality.

Social Costs and Benefits

The main social benefit of this management alternative is the eventual availability of more large fish to recreational anglers. Further, it keeps recreational fishermen on a more or less equal footing with commercial fishermen in terms of the minimum size regulations for cod and haddock. It is not possible to increase the minimum size for fish caught by commercial fishermen and not recreational fishermen without causing commercial fishermen to feel that they are being unfairly restricted.

Administrative Costs

There should be no increase in administrative costs because there are already minimum size regulations for cod and haddock in the recreational fishery.

8. Annual Permit System

Economic Benefits

The benefits of an annual permit system will be more accurate information about the number of vessels which are actively fishing for groundfish, and a reduction in the amount of government notices to permit holders not actively fishing.

Administrative Costs

The costs of requiring annual permits were estimated by NMFS to be about $4.40 per permit. There are currently about 5,000 groundfish permit holders, however, this number may decrease by about one third with the initiation of an annual permit system. The cost of administering this system may therefore range from about $14,700, if the expected decrease in the number of permit holders occurs, to $22,000 if there is no decrease in the number of permit holders.

Social Costs and Benefits

The Council does not anticpcipate that the permit requirement will impose any social costs or create any social benefits.

9. Other Measures

The actitivity of the Technical Monitoring Group and the retention of vessel identification numbers as part of the NMFS Northeast fisheries data base are not expected to add to the present cost of fisheries management.

§783 Determination of "Major Rule" under E.O. 12291, or "Significant" Impacts under the Regulatory Flexibility Act

This section provides the information necessary for the Secretary of Commerce to address the requirements of Executive Order 12291 and the Regulatory Flexibility Act. The purpose and need for management (statement of the problem) as well as a description of the Council's efforts to minimize the regulatory impact of managment are described in section 1.1. The management objectives are in sections 6.1 and 6.2. The alternative management measures are described in sections 7A1, 7A2 and 7A3. The economic and social impact analysis for these alternatives are in section 7A4 and is summarized below. The proposed managment program is explained in 7B1. The rationale for the choice of the proposed regulatory action and the benefits and costs of the action are described in 7B2. Other elements of the Regulatory Impact Review and the Regulatory Flexibility Act are included below.

Regulatory Impact Review

Because the goal of the management measures is to improve or maintain spawning potential and the expected impact of improved spawning potential cannot be quantitatively assessed, a cost-effectiveness rather than a cost-benefit framework is used to identify the most efficient way of acheiving the objective (NOAA Directive 21-24, page 24). Additionally, the expected impact of improved spawning potential cannot be quantitatively measured. Costs are measured in terms of foregone revenues, assuming that operational costs remain unchanged (an increase in operational costs would lessen the amount of foregone revenues).

Focusing upon the regulatory impact analysis in Section 7A4, which presented long-term impacts on ten-year flows of ex-vessel landings, prices, and revenues, this section concentrates on the initial first year changes in

these same variables. In addition, the one year impacts on the squid fishery (a $1.1 million loss in 1983) may be added to the impacts for Options 5-7, and the one year impacts associated with the gear marking requirements ($0.06-0.1 million) may be added to all of the options. It should be clear from the analysis in Section 7A4.5 that first year losses (lower landings and revenues, higher prices) constitute the worst one-year losses for every option relative to the baseline (see for instance Figures 7A11 and 7A12). The expected revenues, and derived total employment impacts, for 1985 from Figures 7A11 and 7A12 are shown below:

Change in Total Revenues & Employment, 1985

	BASELINE	$MILLION	$CHANGE	PERCENT	MAN-YEARS
Option 2	196.301	176.046	-21.255	-10.8	-1317.8
Option 3	196.301	178.300	-18.001	-9.2	-1116.1
*Option 4	196.301	180.934	-15.367	-7.8	-952.7
Option 5	196.301	174.023	-22.278	-11.3	-1381.2
Option 6	196.301	177.254	-19.047	-9.7	-1180.9
Option 7	196.301	179.989	-16.311	-8.3	-1011.3
Squid	5.73	4.63	-1.1	-19.2	

*Council preferred option.

As explained in detail in Section 7A4, all options are presented as differences from the baseline (Option 1), and the first three options (Options 2 through 4) are the same as the last three options (Options 5 through 7) in terms of mesh size, except that the former include a Southern New England closed area instead of the large mesh area, and also include a deep-water Gulf of Maine redfish exception. The 6 inch mesh options (3 & 4) show lower negative impacts relative to the 5-1/2 inch with a Georges Bank closure (Option 2), and to their counterparts which include the Southern New England large mesh area (Options 6 & 7). This is the same result as when looking at the present values for the ten-year period described in the regulatory impact analysis (Table 7A13). The same story is told looking at landings and prices in Appendix 7. For example, the preferred option 4 has lower ex-vessel price increases and landing decreases than Options 2 or 3 for each species in 1985 and 1986, except for redfish which is the same for all three options. Redfish losses (and higher prices) in 1985 are much lower for Options 2-4 (-51% landings) than for Options 5-7 (-73% to -76% landings). This relationship continues to hold in 1994 except that both 6 inch options 3 & 4 are equivalent. Thus, exclusion of the deep-water Gulf of Maine from the large mesh area results in greater benefits in the short-term and near future. The conclusion then is that the preferred option is Option 4 when looking at the first year costs, and when considering the overall impacts for the ten year period, while achieving the biological benefits of spawning potential, yield per recruit, and protection from stock collapse.

8/30/85

Employment impacts follow directly from ex-vessel revenues and include impacts on finfishermen, processing employees, lumpers, etc., and even include the induced employment impacts resulting from changes in consumption patterns (see Section 7A5, Socio-Cultural Impact Analysis). Percent changes in expected employment and total ex-vessel revenues are identical, because employment is calculated as a function of revenues. Models for final consumption demand (retail price) are unavailable, but assuming a simple mark-up relationship, the changes in consumer costs are expected to be about the same across options as for ex-vessel prices and revenues, albeit at slightly lower percentages. The ex-vessel price model used in this analysis contains consumer income, imports, and the consumer price index as explanatory variables, which are generally associated with retail demand. Analysis of profits in the industry is also not available because models which determine costs as a function of changes in landings (the primary impact of this program) are not available. Models which incorporate costs as a percentage of gross revenue will not show percent changes different from those for revenue. There currently are not any sizeable exports of the regulated fish species in question, and the level of change in landings for any option is not expected to impact greatly the import market (see Section 7B7, Assessment and Specification of DAH, DAP, JVP, and TALFF). Changes in landings, prices, and revenues from the proposed management program are not expected to have differential effects on vessel size groups within gear classes per se. Individual vessels may indeed be differentially impacted, but our knowledge is insufficient to assess those impacts. The program is designed to affect all users equally, is not expected to hamper anyone's competitive position, and is expected to promote investment and innovation in more selective gear types. Although recreational costs cannot be assessed in dollars an overall reduction in catch of cod and haddock of about 6% is expected in the first year.

Compliance costs and reporting burdens are identical for all user groups. The cost of new, larger size nets is not an additional burden on the industry, because a number of nets are purchased throughout a year of normal operation. Likewise, operating and maintenance costs should remain relatively unchanged. Reporting forms for the exempted fisheries are existing federal reporting forms and constitute no additional burden. Administrative costs should be very similar to those now being used to administer the Interim Groundfish FMP and also result in no change. Enforcement costs are required to increase (see Section 7B8) because the current level of enforcement is insufficient to achieve the objectives of either the Interim Groundfish or Northeast Multi-Species Plans, and NOAA/NMFS should conduct an analysis to determine the amount of increase necessary. The cost of gear marking requirements is estimated at $0.1 million and, being independent of landings levels, may be added to any option.

Initial Regulatory Flexibility Analysis

If, based upon the information presented in this FMP, the Administrator is unable to certify that the proposed action will not have a significant economic impact on a substantial number of small entities, then an Initial Regulatory Flexibility Analysis must be prepared by the Administrator and provided to the Council for inclusion in the Final EIS (NOAA Directive 21-24, page 8). The regulatory impact analysis above provides the industry-wide impacts, and the resultant processing and consumer impacts, expected with the

seven options considered, as well as the preferred option. All of the vessels and processors involved in the New England multi-species fishery are considered to be small businesses, that is, none is dominant in the Atlantic demersal finfish industry. The costs of compliance are shown in the table above and in Table 7A13 for the industry. NOAA/NMFS can determine that all small businesses directly impacted (fishing vessels) are equally affected or, alternatively, may develop specific analysis of individual vessels. The Council is unable to conduct the latter because information identifying individual vessels is not available to the Council for the relevant time period (1982-1983). Likewise, the costs of completing paperwork and the effects on competitive position, cash flow, and ability to remain in the market of each individual small entity are best determined with the appropriate detailed analysis. The New England multi-species fishing industry directly affected by this management program is composed of all small entities operating in primarily New England waters (small portions operate in Mid-Atlantic waters south of Long Island). The number of units operating, provided by the Northeast Fisheries Center, is given below.

	OTTER TRAWLERS	GILLNETTERS	LINE TRAWLERS
1982	1148	169	48
1983	1174	129	33

§7B4 Continuing Management, Framework Procedures

Introduction

The proposed management program includes a commitment to plan monitoring and timely Council action to make such modifications to the plan as may be necessary and appropriate to achieve the FMP objective. There are two key aspects to the adopted management process that assure efficient continuing management: 1) a monitoring panel to assess the effectiveness of the management program and make appropriate, specific recommendations for further action, and 2) a set of additional measures that have been preliminarily reviewed by the public and may be implemented without formal FMP amendment. In addition, given the complexity of the FMP, it is reasonable to conclude that the objective of the plan may need to be changed or augmented as stock or fishery conditions change. These various aspects of continuing management are discussed in more detail below.

Multi-Species FMP Technical Monitoring Group

The Council shall empanel a Technical Monitoring Group (TMG) of assessment scientists and fishery experts to evaluate both current conditions within the fishery and the status of implementation of the management program in relation to the achievement of the FMP objective. The TMG shall report to the Council on these matters at least annually and, as the need arises, make recommendations for program modifications or changes appropriate to the quality or significance of the information available. In making its

recommendations, the TMG shall provide the Council with a full range of options, including those which are amenable to implementation through regulatory amendment, as well as those which follow from other management strategies than that adopted in this FMP, and which would require formal FMP amendment.

The TMG shall be composed of six members, including three analysts working directly in related fishery assessment activities:

- designee of Northeast Fisheries Center Director;
- qualified technical staff member, New England Council;
- qualified technical staff member, Mid-Atlantic Council;

and three biologists working directly in marine fishery management activities:

- designee of New England Council Chairman;
- designee of Mid-Atlantic Council Chairman;
- designee of Northeast Regional Director.

Other experts could be called upon or co-opted by the TMG, and the staffs associated with TMG members would be available for analytical support or consultation.

In practice, the Working Group will report at least annually to the Council through its Multi-Species FMP Committee. The Committee will review the findings and recommendations of the Working Group, consult with its advisory panel as to the practical implications of the Working Group's recommendations and make its own specific recommendations to the Council.

Changes in the Management Program

The FMP contains a specific set of measures which may be used to change or modify the FMP, as required, using a 60 day regulatory amendment process. These additional measures are listed in §7B1. It is anticipated that the Working Group will consider this set of measures as the principal means for correcting deficiencies in the management program, and will make recommendations to the Council regarding their use. The Working Group, however, is not constrained to consider only that set of measures detailed in §7B1; it may additionally consider measures which follow from other management strategies, including effort control or catch control. The Council will consider the complete range of options presented by the Working Group, and will include formal public input in that consideration process. The Council will take whatever action it deems necessary and appropriate to restore or maintain the FMP's ability to achieve the management objective. The Council may either initiate a regulatory amendment process, based upon the implementation of the additional measures listed in the FMP, or initiate a formal plan amendment process to consider the implementation of measures which are not immediately consistent with the management strategy of this FMP.

Discretionary Actions by the Regional Director

Currently, the Regional Director is empowered to evaluate the time frame for the haddock spawning closures on Georges Bank and make certain modifications using a field order process. In particular, the proposed management program calls for spawning areas I and II to be closed to fishing from February 1 through May 31 each year. Because the purpose of the closure is to enhance spawning activity, it may be unnecessary to continue the closure beyond April 30. The decision to open one or both of the spawning closed areas on May 1 is left to the Regional Director, who is expected to consult with the New England Council prior to taking action.

Reconsideration or Augmentation of the Management Objective

The management objective of the plan is reflective of current and anticipated conditions in the fishery. It is reasonable to expect that refinements to the objective may become appropriate as described in §6.3. As noted in the latter section, a change in the specification of the objective will be accomplished without a formal plan amendment.

§7B5 Other Management Options

Future Consideration of Gear Conflict Reduction Measures

The FMP establishes marking requirements for gillnet and longline gear (see Sec.7B1) in an attempt to reduce the occurrence of inadvertent gear conflicts between mobile gear and fixed gear and between recreational user groups and gillnetters. The Council is aware that these marking requirements will not address all dimensions of the problem between recreational users and gillnetters. This problem stems from both user groups competing for access to the same bottom areas at key times during the year while using seemingly incompatible fishing methods. This management program does not currently contain any management objectives to justify remedial actions for what, in essence, is a difficult political resource allocation issue. Consideration of a measure requiring gillnetters to continually attend their gear was dropped for this and other reasons.

However, the Council believes that it is appropriate to provide a forum for a thorough examination of the causes and impacts of these conflicts with participants from both sides. Advisors to the Council from the gillnet industry and party boat industry agree that a significant component of the problem stems from a lack of communication and working relationships. To this end, the Council has charged its Enforcement, Regulations and Gillnet Committee to meet with advisors and develop specific recommendations for solutions to this problem by April of 1985. At that time, a formal amendment to the FMP will be considered, if the Council decides that the Committee's recommendations so warrant.

§7B6 Optimum Yield

The Magnuson Act requires that any fishery management plan must assess and specify the optimum yield (OY) from the fishery. The Act defines the term optimum, with respect to the yield from a fishery, as that amount of fish (A) which will provide the greatest overall benefit to the nation, with particular

reference to food production and recreational opportunities; and (B) which is prescribed as such on the basis of the maximum sustainable yield from such fishery, as modified by any relevant economic, social or ecological factor.

Guidance prepared by NOAA states that "the determination of OY is a decisional mechanism for resolving the Act's multiple purposes and policies for implementing an FMP's objectives, and for balancing the various interests that comprise the national welfare." In the preparation of this Northeast Multi-Species FMP, the Council has endeavored to satisfy the intent of the Act with respect to the sustained productivity of the fishery resources, while at the same time determining what constitutes the nation's greatest overall benefit from the fishery.

Fundamentally, this FMP addresses the conservation and productivity of the fishery resources up-front in the management policy and the management objective. The biological principle that is employed in the FMP is that of maintaining sufficient spawning potential in each stock to provide for the replacement of year classes on a long-term average basis. Given the uncertainties of the environment, application of this principle provides, over the long term, for a condition which is recognized to be MSY. The parameters that are manipulated through the measures of this plan, namely age-at-entry and fishing mortality, are the same ones that correspond to more traditional approaches to achieving MSY, such as fishing at Fmax or $F_{0.1}$. By effectively employing the spawning potential/ year class replacement concept, this FMP assures that MSY will be achieved over the same time frame for which it is defined. The maintenance of sufficient spawning potential for individual stocks is not compatible with overfishing, and thus the approach is entirely consistent with National Standard #1.

The management program adopted in this FMP is carefully tailored to be as compatible as possible with the traditional nature of the multi-species fishery. The strategy employed by the plan works in harmony with the industry to preserve both fishing opportunities and the freedom and flexibility for fishermen to choose among those opportunities according to the natural stimuli of the market. The management policy of this FMP embodies those attributes of the fishery which allow it to continue to function in a way which generates benefits to the region and the nation, both in terms of revenue and employment. The management program also address the need for continued recreational opportunity by promoting abundant, healthy resources, and access to the fishing grounds.

Because of the comprehensive nature of this FMP, the achievement of optimum yield from the fishery necessitates trade-offs among the stocks upon which it depends. As natural variations in stock abundance and market conditions occur to influence the yield from the fishery, some stocks will necessarily be exploited more than others. Nevertheless, the structure of the proposed management program, incorporating a formal monitoring process, will produce an environment of continuing management that will preserve long-term benefits from the overall multi-species fishery.

Therefore, optimum yield from the Northeast multi-species fishery is defined as that level of yield which results on an annual basis from implementation of the management program over time. As a consequence, optimum yield is firmly based on the long-term viability and productivity of the

species resources that collectively support the fishery, and further reflects considerations for the economic, social and ecological factors in the fishery, which have been important considerations in the design of this management program, and which are instrumental in generating the greatest overall benefit to the nation.

§7B7 Assessment and Specification of DAH, DAP, JVP AND TALFF

Proposed Levels for DAH, DAP & TALFF

Table 7B1: Proposed Levels for DAH, DAP & TALFF (Metric Tons)

Species	OY	1983 Catch	DAH	DAP	TALFF
Cod	ns	51,638	= OY	-	-
Haddock	ns	14,756	= OY	-	-
Pollock	ns	13,486	= OY	-	-
White hake	ns	6,410	= OY	-	-
Total	ns	86,290	= OY	150,000	-
Flounders	ns	77,900	= OY	95,000	-
Ocean perch	ns	6,028	= OY	13,100	-
Other Species	ns	na	= OY	-	-

- "ns" indicates that there is no specific level of OY. Instead, the OY is the level of harvest that results from the management plan.
- Cod, haddock, pollock, and white hake are readily substituted for one another in the production of fresh fillets and, therefore, are grouped together in calculating processing capacity for roundfish fillets.
- Flounders include yellowtail, American plaice, winter flounder, witch flounder and fluke.
- The DAH for whiting may be underestimated for 1985 in view of potential joint venture activity. For the same reason the TALFF may be overestimated.
- DAPs for cod, haddock, pollock, white hake, flounders and ocean perch were estimated by Georgianna (1984) using a modified peak-to-peak method.

Rationale for Recommended Levels of DAH and DAP

Cod, Haddock, Flounders, Pollock, Redfish

Because domestic processors already import large quantities of whole fish of these species, it is clear that domestic annual fish processing capacity (DAP) exceeds domestic harvesting capacity for these species. Imports of whole fresh cod, haddock and flounder have increased dramatically since 1978, as shown in Table 7B2

Although redfish is not imported in whole form, it is imported in the form of fresh as well as frozen fillets. The existence of these imports indicates that the domestic demand for redfish exceeds the domestic harvest. Domestic processing capacity for redfish is constrained by the available harvest.

Except for a small quantity of pollock which is shipped to Canadian producers of salted fish products, there are no exports of whole fish of the species regulated under this plan.

Table 7B2: Imports of Fresh, Whole Cod, Haddock and Flounder

Year	Million Pounds	Metric Tons
1978	10.893	4,941
1979	14.787	6,707
1980	15.451	7,008
1981	30.372	13,777
1982	40.686	18,455
1983	53.690	24,353

Source: U.S. Customs data, Georgianna (1984)

The existence of excess processing capacity for groundfish products has been well documented by Georgianna (1984) and Smith & Peterson (1978). Figures 7B3-5 (taken from Georgianna's study) show production and capacity graphs for the relevant groups of these species. In all cases the annual average capacity as measured by the area under the capacity line exceeds production, although there are some months when production has exceeded capacity. It should be noted that capacity as shown in these graphs has been conservatively estimated by using an economic definition of processing capacity which systematically understates physical processing capacity. In this instance, capacity has been defined as the quantity of output that can be produced in the short run before per unit cost of production rises sharply exclusive of the cost of fish inputs. Production levels include fresh, whole imported fish as well as domestically caught fish.

Estimates of annual processing capacity assume that full capacity can be used twelve months of the year. As can be seen from Figures 7B3-5, monthly production levels are rarely greater than estimated capacity levels because of the great variability in the monthly supply of fresh fish inputs. As a result, annual capacity estimates greatly exceed annual production levels.

Other Species

For all other species included within the management unit of this management plan, DAH is assumed to equal OY; and, therefore, TALFF is equal to zero.

Figure 7B3

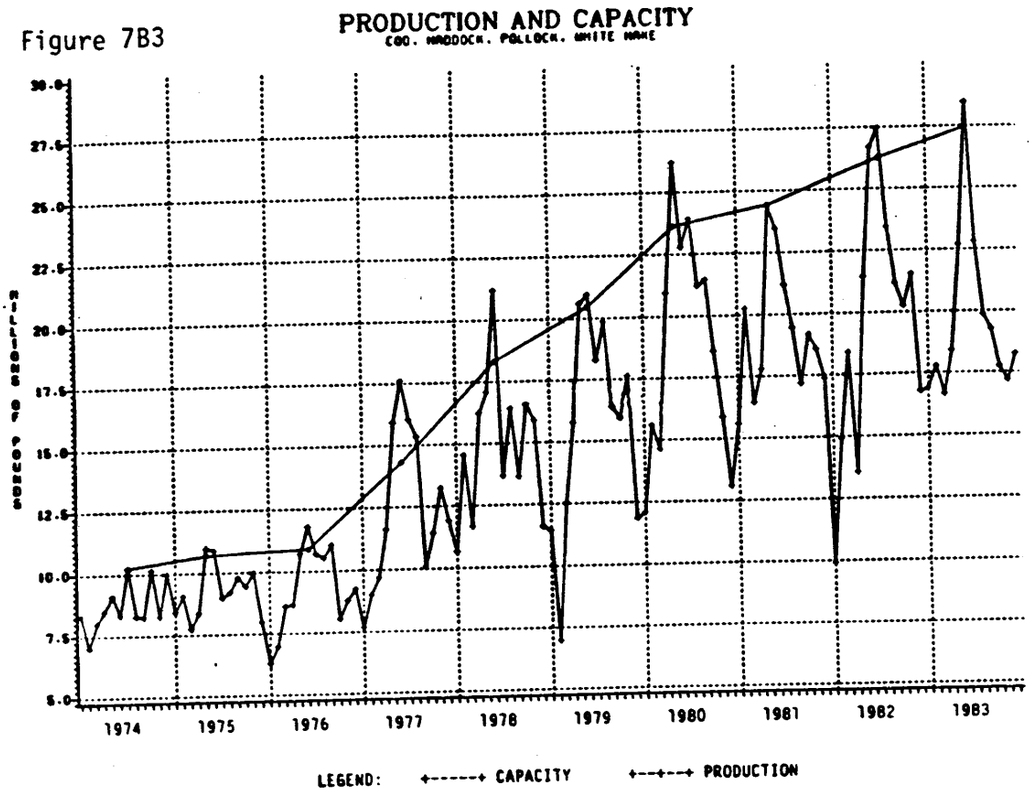


Figure 7B4

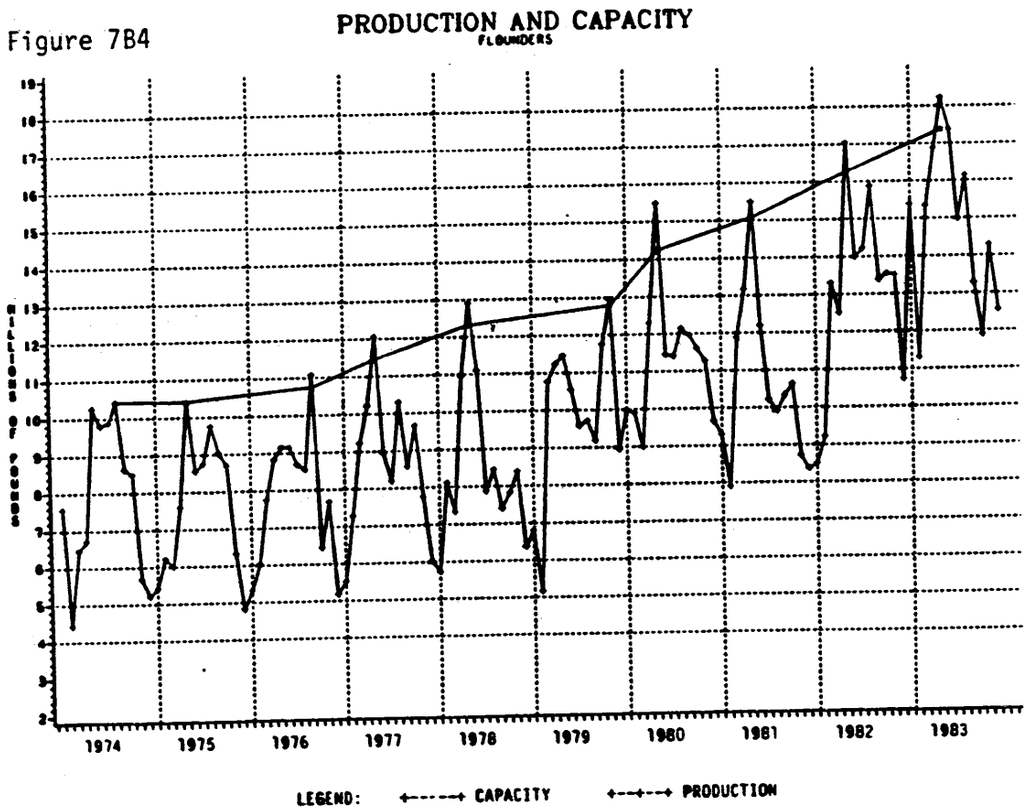
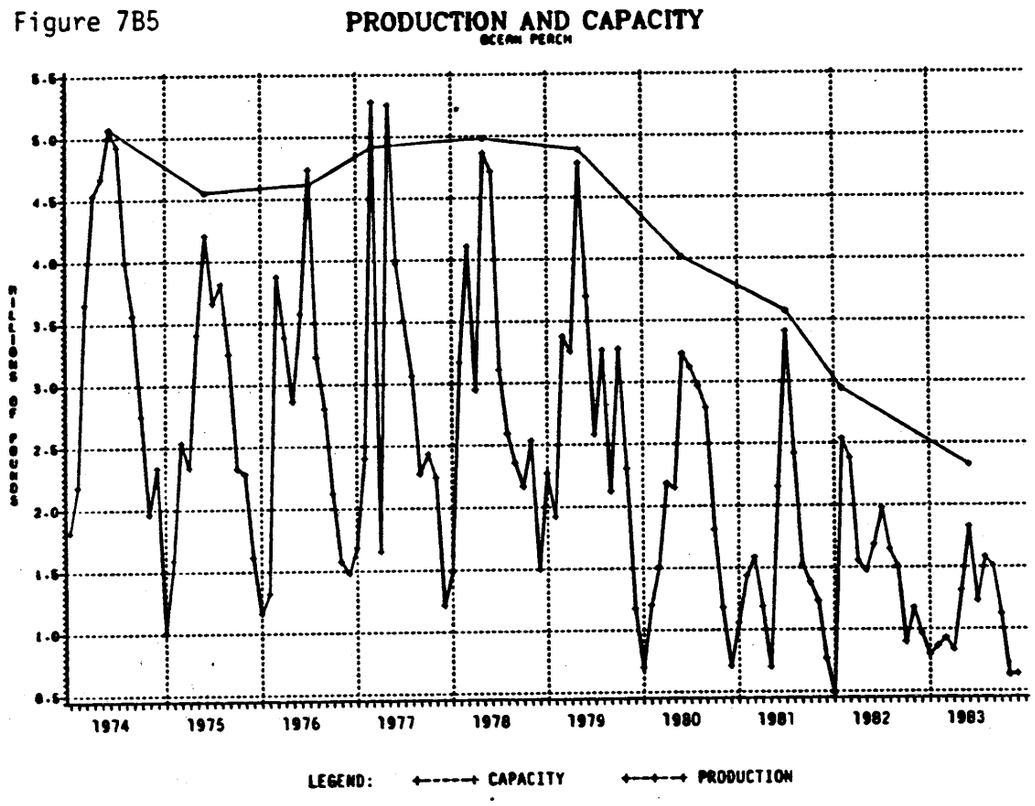


Figure 7B5


PRODUCTION AND CAPACITY
OCEAN PERCH
MILLIONS OF POUNDS
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
LEGEND:
CAPACITY
PRODUCTION

§788 Enforcement Program Considerations

The New England Fishery Management Council recognizes that the management measures of the Interim Groundfish FMP, which are essentially similar to those adopted for this FMP, have not proven to be as effective as anticipated, primarily due to industry non-compliance. The Council believes that restrictions on fishing practices, such as minimum mesh restrictions and closed areas, can be effective if the proper incentives for compliance exist. In most cases, regulations are not adhered to because of four factors: 1) the economic cost of compliance is significant; 2) the perception of unfair treatment; 3) the risk of receiving a citation is low; and 4) the cost of receiving a citation is low. All of these factors are related to individual perceptions of how one's operation is affected by management relative to others, and whether or not expected penalties can be subsumed within the cost of doing business.

In the development of any FMP, the Council may adopt only those management measures which can be shown to be necessary and appropriate to achieve the management objectives, and which, in relation to other equally effective measures, result in the least regulatory burden. Therefore, apart from convincing the industry of the merits of the management program, the Council must accept that the sacrifices which individual fishermen must suffer will lead invariably to some level of non-compliance. As a result, the areas in which the Council can be effective in mitigating the potential for non-compliance are related to factors 2, 3 and 4.

Factor 2 is the perception that the proposed management measures are not being applied fairly to all user groups. The Council has made every effort in the development of this FMP to devise management measures which treat the problems as they exist. That is, if the condition of the Georges Bank stocks warrants more restrictive management intervention than the Southern New England stocks, then the measures have been designed accordingly, and always with a view toward eliminating unjustifiable regulatory burdens. Still, those sectors of the industry most dependent upon the Georges Bank fishery, and thus most impacted by Georges Bank management measures, may perceive that they are bearing an excessive share of the burden. The Council has justified its management program in relation to its objectives and management policy for the regions' multi-species fishery, and is prepared to similarly justify any future actions that may prove necessary.

Factors 3 and 4 relate to the risk that an individual violator will be caught and the price that the violator will pay, either in terms of a cash penalty (immediate or deferred) or in terms of lost revenue (as a consequence of impeded or lost access to the fishery). Multiplied together, the result gives a fisherman the expected cost of his non-compliance, which can be compared directly with the expected benefit from his engaging in an illegal fishing activity. Because there are two factors in the equation, either one or a combination of both can be adjusted in such a way that the expected cost will be perceived to outweigh the benefits. That is, either the frequency of contact between fishing and enforcement vessels (or boardings) can be increased, with a concommitant perception of increased risk of being cited for a violation, or the penalty can be increased to the point where even the remote possibility of a boarding poses an unacceptably high risk. In practical terms, the best solution probably results from a combination of increased contacts and penalties.

The Council believes that the reliance of the Magnuson Act on the Coast Guard to conduct at-sea enforcement results in a mis-match of capability and need. Most vessel fishing days are spent relatively close to shore, probably within 30-40 miles. In most cases, fishing vessels are concentrated on fairly well-defined grounds in close radio contact with one another. Coast Guard vessels are well suited to far-ranging, all-weather operations where speed and endurance are critical to search and rescue operations. The available Coast Guard vessels are few in number, easily identifiable, fully committed and awkward for routine fisheries boarding operations. Their utility in fisheries enforcement clearly falls in the off-shore areas where larger trawlers operate under a broad spectrum of weather conditions. Coast Guard vessels are not the best choice for conducting near-shore fisheries enforcement operations because contacts are infrequent and geographically spotty, and in many cases violators have ample opportunity to avoid or elude citation.

The Council believes that some means must be found to substantially increase the visibility of enforcement personnel in the areas of concentrated fishing activity. The enforcement presence must be highly maneuverable and unpredictable by time or area so as to maximize (from the fishermens' perspective) the risk of being boarded. It is conceivable that this task can be accomplished in near-shore areas at minimal additional cost by taking advantage of existing state resources through improved cooperative arrangements with the National Marine Fisheries Service. It is also possible that substantial funds will have to be re-deployed or appropriated to provide the means for effectively enforcing this and other FMPs at sea.

It is universally accepted that the purpose of a civil penalty is to discourage further violation of the applicable regulation. In producing the desired effect, two aspects of the penalty process are relevant: 1) the penalty should be applied as close to the point of violation as possible; and the amount of the penalty should be in keeping with the nature and severity of the transgression. The Council is aware that the time required to administratively process a citation cannot be significantly shortened, so in many cases the penalty is applied well after the violation occurs. Such timing has more the effect of an irritant than a disincentive, and habitual violators may continue their practice to the chagrin of law-abiding fishermen. Penalties that cost the fishermen time, catch or fishing opportunity are more effective than fines. They have the effect of an immediate cost rather than a deferred cost, they affect the current trip's cash flow position and they change the fisherman's perception of risk.

The Council is very aware that non-compliance, even at a relatively low level, will weaken the adopted management measures and lead to more restrictive methods and measures. Therefore, the Council believes that violations of the operative measures in this FMP should draw severe penalties. The Council ranks violations of minimum size, by-catch in exempted fisheries, area violations and mesh violations as warranting immediate and severe penalties. Procedural and administrative measures of this FMP would warrant lesser penalties. The Council supports penalties up to and including, in some cases, permit sanctions in order to achieve the desired level of compliance. Severe penalties, including the denial to operate in the multi-species fishery, are justified by the potential negative effect of non-compliance on the revenue derived by the many fishermen who wish to continue to operate in and derive the benefits from a well managed fishery

Therefore, the Council intends that the major aspects of the enforcement issue shall be addressed through a program involving the New England and Mid-Atlantic Councils, NOAA General Counsel, the Northeast Regional Office of NMFS, the Coast Guard and the relevant state enforcement agencies. This program, begun by the New England Council's Committee on Regulations and Enforcement, places emphasis on discussions in the following three areas:

1. A revised penalty structure and streamlined administrative procedures that will be appropriate to the importance of the management program and that will promote compliance. On May 21, the Council approved a proposed penalty schedule that defines simple and flagrant violations and incorporates permit sanctions and vessel seizures as appropriate penalties under well-defined circumstances.

2. Development of a near-shore enforcement capability that has the attributes of frequent contacts, wide coverage and unpredictable behavior, and enhancement of the existing shoreside and off-shore enforcement capability. Various institutional arrangements, incorporating available state and federal personnel and physical resources, should be explored. Also, any institutional or funding impediments to efficient enforcement structures should be identified.

3. Identification of sources of funds to generate and support the level of at-sea and shoreside enforcement that is critical to the success of the management program. Such funds may flow from new appropriations, reprogramming within agencies or efficiencies of scale.

The Council will strive to assure that the participants in the program identify an agenda and a timetable that will produce recommendations and actions in a time frame appropriate to the implementation of this FMP.

SUBPART C: RELATIONSHIP OF THE MANAGEMENT PROGRAM TO THE NATIONAL STANDARDS, OTHER APPLICABLE LAW, AND OTHER STATE/FEDERAL MANAGEMENT PROGRAMS

§7C1 Compliance With the National Standards

All fishery management plans and amendments to plans must be consistent with seven National Standards established by Section 301(a) of the Magnuson Act. The following is a discussion of the provisions of the Northeast Multi-Species Fishery Management Plan (Plan) in light of the National Standards.

National Standard No. 1: Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery.

As explicitly stated in the management objective for the Plan, the formulation of the proposed management measures has been for the purpose of maintaining sufficient spawning potential among the important fish stocks within the overall multi-species complex such that year classes of fish may continue to replace themselves on a long-term average basis. Overfishing is understood as that level of fishing activity that jeopardizes the capacity of a stock to recover to a level at which it is capable of producing the maximum biological yield. The concept of year-class replacement, as focused by the management objective and embodied in the management program, secures the long-term viability and productivity of the fish stocks, as reflected in the concept of MSY, and insulates the stocks against overfishing. In this multi-species fishery context, Optimum Yield is defined in consideration of the simultaneous maintenance of the productivity of the resource complex.

Consistent with the policy statement guiding FMP development (see §1.2) that seeks to provide an environment in which the multi-species fishery can operate and evolve with a minimum of regulatory intervention, Optimum Yield is defined in terms of that harvest which will result with effective implementation of the overall management program, including those aspects relating to continuing management. As such, it is expected that Optimum Yield will be a variable quantity reflecting the application of the management program in a dynamic resource environment. Notwithstanding the expected variability of yield, results of the biological impact analysis (§7A4) indicate that effective implementation of the management program should lead to a long-term average Optimum Yield which approaches the maximum biological yield, subject to the constraints imposed by the multi-species character of the fishery (see §5.1 for additional discussion).

National Standard No. 2: Conservation and management measures shall be based upon the best scientific information available.

The most recent scientific information has been used in the preparation of the Plan. The descriptive and analytical sections of the Plan pertaining to the fishery resources are based upon published NOAA/NMFS stock assessment and information, and have further benefited from results of ongoing research activity within the Northeast Fisheries Center. In particular, the contribution by NMFS/NEFC is acknowledged in developing the analytical basis

for analyzing the reproductive capacity of key fish stocks and assessing the effectiveness of candidate management measures in promoting the attainment of that capacity. The Northeast Fishery Center additionally provided much of the fishery data upon which the regulatory impact analysis has been based, and NMFS/NERO has provided technical input to the same analysis. In addition, the FMP includes substantial information on the social-cultural context of the fishery, which has been lacking in previous documents of this nature.

In sections dealing with possible future management actions (§6.3, §7B4), the FMP mandates activity, subject to certain criteria, which are expected to be supported by information supplied by the NMFS three-tier data collection system.

National Standard No. 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.

In keeping with the policy statement and in full recognition of the biologic and economic environment, the Council has embarked upon a comprehensive approach to management of the northeast fishery resource which has been dictated by the joint-harvesting relationships among the component species within the overall complex. Notwithstanding this approach, each species directly regulated under the aegis of this FMP shall be regulated throughout its range, necessitating consultations with the Mid-Atlantic Fishery Management Council in cases where a mutual interest exists. As a further consequence of the FMP's fishery-wide approach, the Council urges that the States adopt complimentary management measures applicable to those components of the resource which may be found in state waters.

National Standard No. 4: Conservation and management measures shall not discriminate between residents of different States.

Management measures proposed in this FMP are applicable to all particpants in the Northeast multi-species finfish fishery. The policy statement which guided the development of the Plan is very specific in mandating a minimum of regulatory intervention or restriction of fishery options. The proposed management program reflects a clinical treatment of the problems as they exist in the fishery. Therefore, the management program is the minimum necessary to achieve Optimum Yield. Finally, the policy specifically discourages unnecessary interference with access to the resource by individual fleet sectors.

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

The management measures incorporated in the Plan, focusing on enhancement of the long-term reproductive capacity of the resource, are expected to improve the long-term average productivity of the fishery such that harvests may approach the maximum biological yield. Thus, relative to the current fishery, the management measures move the fishery toward the point of maximum economic efficiency, yet do not achieve that level for very real operational and political considerations. Corresponding to increased productivity from the overall fishery is the preservation of the extraordinary species diversity which characterizes the northeast multi-species resource. The latter will act

to preserve and enhance the range of options available to participants in the fishery, thus improving the efficiency in utilization by providing a more stable resource base and reducing the dependency on one or more key components of that resource. The management measures chosen represent the most cost effective approach to achieving that long-term goal consistent with the adopted management strategy. None of the management measures chosen have implications with regard to resource allocation.

National Standard No. 6: Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

The initial management measures adopted by this Plan were formulated on the basis of the best scientific information available with full recognition of the historic variability that has existed in those data. Most particularily, the target level in the reproductive capacity for the important fish stocks was chosen in light of clear recognition of the extreme variability of the typical stock-recruitment relationship (see §5.3 and §5.4). The management measures adopted by the Council do not directly control the amount of fish landed, and thus do not impose costs on the industry as a consequence of natural variation in the resource complex.

In mandating a response to future significant unforseen variations in the important fishery parameters, the Plan establishes a Working Group which, in consideration of information routinely collected by the Council, the NMFS Northeast Fishery Center and the NMFS Northeast Regional Office, will provide advice to the Council in its continuing efforts to manage the fishery.

National Standard No. 7: Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

As exemplified by the currently depressed condition of a number of economically important fish stocks within the overall northeast multi-species fishery resource, prior management efforts for a narrow range of stocks have been generally unsuccessful in conserving the stocks and preventing overfishing, which has been due in part to a lack of enforcement. To conserve and rebuild the resource, the Council has found it necessary to embark on the new approach to fishery management, which is embodied within this Plan. The management strategy and measures that have been chosen to achieve the FMP objective were designed to give fishermen the greatest possible freedom of action in conducting business and pursuing recreational opportunities that is consistent with ensuring the conservation and wise use of the resource. The preferred management program represents the least-cost approach to achieving that end.

§7C2 Conformance with Other Laws and Management Programs (PMP's, FMP's, State Regulations, ASMFC Programs, CZMP's, MMPA and PRA)

Preliminary Management Plans and Other Fishery Management Plans

Discussion on the relationship of this plan to Preliminary Fishery Management Plans and Other Fishery Management Plans can also be found in section 4.3.

Fisheries in the areas covered by this plan, which are currently under regulation by other fishery management plans include Atlantic Sea Scallops, Surf Clams and Ocean Quahogs, American Lobster, and Squid, Mackerel and Butterfish. Fishermen fishing for the species contained in this plan are subject to these other plans if their activities are likely to result in the harvest of any of these other species. Similarly, fishing for any of these other species may subject a fisherman to the provisions of this plan if his activities are likely to result in the harvest of species contained in this plan.

Preliminary management plans (PMP's) are put into place by the Secretary of Commerce to permit foreign nations to fish in the fishery conservation zone (FCZ) and remain in effect until superceded by approved fishery management plans developed by the Fishery Management Councils. Regulations implementing PMP's may be promulgated by the Secretary as interim measures pending regulations promulgated by the Secretary from Council plans.

A PMP must describe the fishery, provide a preliminary estimate of the optimum yield (OY), and determine the total allowable level of foreign fishing (TALFF), if any. In addition, the preliminary plan should contain permit requirements for foreign fishing vessels, as well as data reporting procedures that must be met during fishing activities.

Preliminary Fishery Management Plan for the Hake Fisheries of the Northwest Atlantic

Harvesting of red and silver hake off the northeastern United States was, until January 1, 1977, regulated under the International Commission of the Northwest Atlantic Fisheries (ICNAF) and ssubsequent agreements between the 18 signatory nations. In January 1977 the National Marine Fisheries Service submitted a PMP for these hake fisheries to the Secretary of Commerce. The PMP was approved in February 1977.

THE Hake PMP recommended the following for the 1977 fishing season:

Species	ICNAF Subdivision	Optimum Yield (metric tons)	USA Fleet Capacity (metric tons)	Total Allowable Level of Foreign Surplus (metric tons)
Silver Hake	5Ze	70,000	15,000	55,000
	5Zw+SA 6	45,000	14,500	30,500
Red Hake	5Ze	16,000	1,500	14,500
	5Zw+SA 6	28,000	7,600	20,400

ICNAF subdivision 5Ze is Georges Bank; subdivision 5Zw is southern New England; and SA 6 extends from Long Island to North Carolina and eastward. Time, area and gear limitations were also placed on foreign states to minimize conflict with the US offshore lobster pot fishery, the recreational fishery and to minimize by-catch.

An amendment to the Hake PMP was later made which:

1. Reduced the silver hake optimum yield for Georges Bank from 35,000 mt to 25,000 mt and for the Southern New England/Mid-Atlantic area from 55,000 mt to 30,000 mt.

2. Reduced the total allowable level of foreign fishing for silver hake from 26,000 mt to 10,000 mt on Georges Bank and from 34,400 mt to 9,400 mt for the Southern New England/Mid-Atlantic area.

3. Established reserves for Georges Bank of 6,000 mt for silver hake and 3,000 mt for red hake.

4. Increased optimum yield and domestic annual harvest for red hake in the Southern New England/Mid-Atlantic area from 11,000 mt to 16,000 mt and from 8,000 mt to 13,000 mt, respectively.

5. Reduced the TALFF for Georges Bank red hake from 5,500 mt to 2,500 mt.

Preliminary Fishery Management Plan for Finfish Caught Incidental to the Trawl Fisheries of the Northwest Atlantic

Harvesting of finfish caught incidental to the trawl fisheries of the Northwest Atlantic off the Northeastern United States was, until January 1, 1977, regulated under terms of ICNAF and subsequent agreements between the 18 signatory nations. In January of 1977 the National Marine Fisheries Service submitted to the Secretary of Commerce a PMP for Finfish Caught Incidental to the Trawl Fisheries of the Northwestern Atlantic which was subsequently approved on February 4, 1977.

The PMP for other finfish proposed the following:

Species or Stock	Maximum Sustainable Yield (metric tons)	Optimum Yield (metric tons)	Estimated US Capacity (metric tons)	Total Allowable Level of Foreign Surplus (metric tons)
Butterfish[1/]	20,000	18,000	12,500	5,500
River Herring[2/]	25,000	10,000	9,500	500[3/]
All Other Finfish	247,000	247,000	187,000	60,000

1/ Butterfish is currently managed under the Atlantic Mackerel, Squid and Butterfish FMP
2/ These data apply to the stocks of the Mid-Atlantic.
3/ Reserved for unallocated incidental catches.

Further, the Other Finfish PMP proposed that the foreign incidental by-catch of each of the species listed below be limited individually to one percent of all other fish on board the vessel or 2,500 kg, whichever is

greater and that the catch of all these species be limited to seven and one-half percent of all other fish on board or 12,000 kg, whichever is greater.

1. Bluefish
2. Scup
3. Sea Bass
4. Weakfish
5. River Herring
6. Croaker
7. Spot
8. American Shad
9. Tautog

A very small incidental by-catch of river herring is allowed by foreign vessels so as not to totally disallow directed fisheries for herring, mackerel, squid and the hakes. No foreign incidental catch of striped bass is permitted.

The other finfish group includes some 60 finfish species within ICNAF SA5 and 6 for which individual species assessments are either unavailable or are available only in preliminary form. Specifically, this category excludes tunas, billfishes, large sharks and menhaden (which are captured primarily inshore in the southern portion of SA6) as well as cod, haddock, redfish, silver hake, red hake, pollock, sea herring, mackerel and flounders.

State Regulations

The species covered under this FMP are distributed within most of the New England and Mid-Atlantic states' territorial waters as well as within the FCZ. The management unit is considered to include the regulated species when they occur within the states' waters as well; and the management policies, measures and recommendations contained in the plan are appropriate for application in state waters. Therefore, the coordination of the states' policies toward the species contained within this plan is important to the implementation of an effective and sound regional multi-species management policy.

In general, it is concluded that this management program is consistent with the approach taken by the various states for regulating their marine fisheries; and the only deviations with the states relate to specific measures which will need to be reconciled or accommodated for effective implementation of this plan. Further details of individual states' regulations can be found in §3F1.

ASMFC - Northern Shrimp Section

This FMP does nothing to usurp the prerogatives of the Northern Shrimp Board with the exception that if the Northern Shrimp Board allows the shrimp fishery to open prior to January 1, or to stay open beyond April 30, we would request that the gear used be separator trawls due to the possible negative impacts on the harvest of small flatfish.

Coastal Zone Management Programs

Most of the states in the areas affected by this plan have approved Coastal Zone Management Programs. Since this fishery management plan does not specifically authorize any physical change in the coastal zone, it will not have any direct impacts to measure against standards set in the various state programs. Nonetheless, these programs have been reviewed, and no inconsistencies between them and the measures, policies and provisions of this plan have been found.

OCS Leasing

The Council is on record as having commented unfavorably on numerous occasions on the inclusion of certain tracts into the lease sale offering. The tracts that the Council has objected to are areas of high biological activity, spawning areas, areas of significant fishing activity or sensitive habitats. The Council will continue to monitor all exploratory drilling that may be undertaken pursuant to tracts which have already been leased under lease sales 42 and 52 and tracts which may be sold under area-wide lease sale 82.

Marine Mammals Protection Act

This management program is not believed to have any adverse affect on the marine mammals that occur in the waters of the northeast coast of the United States, which include endangered and threatened sea turtle species and endangered fish species which have been identified in §2B5.

Paperwork Reduction Act

This FMP requires no new data collection information or recordkeeping beyond that which is already in place as part of the regional data collection program.

§7C3 Relationship to Prevailing Canadian Management Program

As noted in §3F2, the major management approach to the stocks within the management unit of this FMP has been to support spawning area closures and to establish a minimum mesh size. As a consequence, it appears that the management program proposed is generally consistent with the Canadian management program with respect to its reliance on spawning area closures, but may be deleteriously affected by a failure of the Canadians to adopt consistent mesh or minimum fish sizes.