FISHERY MANAGEMENT PLAN FOR THE SUMMER FLOUNDER FISHERY

October 1987

Mid-Atlantic Fishery Management Council
in cooperation with the
National Marine Fisheries Service,
the
New England Fishery Management Council,
and the
South Atlantic Fishery Management Council

Draft adopted by MAFMC: 29 October 1987
Final adopted by MAFMC: 16 April 1988
Final approved by NOAA: 19 September 1988

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See page 2 for a discussion of Amendment 1 to the FMP.

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THIS DOCUMENT IS THE SUMMER FLOUNDER FISHERY MANAGEMENT PLAN AS ADOPTED BY THE COUNCIL AND APPROVED BY THE NATIONAL MARINE FISHERIES SERVICE. THE REGULATIONS IN APPENDIX 6 (BLUE PAPER) ARE THE REGULATIONS CONTROLLING THE FISHERY AS OF THE DATE OF THIS PRINTING (27 FEBRUARY 1991).

READERS SHOULD BE AWARE THAT THE COUNCIL ADOPTED AMENDMENT 1 TO THE FMP ON 31 OCTOBER 1990 TO DEFINE OVERFISHING AS REQUIRED BY 50 CFR 602 AND TO IMPOSE A 5.5" (DIAMOND MESH) AND 6" (SQUARE MESH) MINIMUM NET MESH IN THE TRAWL FISHERY. ON 15 FEBRUARY 1991 NMFS APPROVED THE OVERFISHING DEFINITION AND DISAPPROVED THE MINIMUM NET MESH. OVERFISHING FOR SUMMER FLOUNDER IS DEFINED AS FISHING IN EXCESS OF THE F_{MAX} LEVEL. THIS ACTION DID NOT CHANGE THE REGULATIONS DISCUSSED ABOVE.

2. SUMMARY

This Fishery Management Plan (FMP) for the Summer Flounder Fishery, prepared by the Mid-Atlantic Fishery Management Council (Council), is intended to initiate management of the summer flounder (*Paralichthys dentatus*) fishery pursuant to the Magnuson Fishery Conservation and Management Act of 1976, as amended (MFCMA). The management unit is summer flounder in US waters in the western Atlantic Ocean from North Carolina northward. The objectives of the FMP are to:

1. reduce fishing mortality on immature summer flounder;
2. increase the yield from the fishery;
3. promote compatible management regulations between the Territorial Sea and the EEZ; and
4. minimize regulations to achieve the management objectives recognized above.

The Summer Flounder FMP is a joint effort in planning with the Atlantic States Marine Fisheries Commission, the States, and the Council. Some measures in this Council FMP are supportive of current State regulations. The adjustment mechanism is provided to automatically proceed to a 14" minimum fish size should the biological/fishery indicators continue to show stock declines.

The FMP also has a provision that a vessel holding a Federal permit will fish under the more stringent of Federal or State rules.

It is critical to the success of the FMP that the States be given time to allow them to adjust their regulations to those of the FMP.

The Council has adopted the following management measures for this FMP:

1. It is illegal to possess summer flounder less than 13" total length (TL) and it is illegal to possess parts of summer flounder less than 13" to the point of landing.

2. Vessels with permits issued pursuant to this FMP would be required to fish and land pursuant to the provisions of this FMP unless the vessels land in States with larger minimum fish sizes than those provided in the FMP, then the minimum fish sizes would be required to meet the State limits.

3. Foreign fishermen would not be permitted to retain summer flounder since US fishermen, by definition, would be harvesting the Optimum Yield (OY).

4. Vessels fishing commercially for summer flounder, either directly or as a bycatch in other fisheries, and vessels for hire in the recreational fishery (party and charter boats) would be required to obtain annually renewable permits.

5. States with minimum sizes larger than those in the FMP and minimum mesh regulations are encouraged to maintain them.

6. After three years of Plan implementation the Council would begin to annually examine fishing mortality estimates of age II summer flounder to measure the effectiveness of the size limit relative to the FMP's objectives. If the Council finds that the fishing mortality of age II summer flounder has increased, based on the following adjustment criteria, and if the NMFS Northeast Regional Director concurs with the Council, the minimum fish length would be increased by the NMFS Northeast Regional Director to a minimum fish length of 14" TL.

   The adjustment criteria are (1) estimated fishing mortality from the NEFC spring survey and (2) estimated fishing mortality from a virtual population analysis (VPA) which would be tuned using commercial and recreational fishery CPUE indices. If a three year trend of either of these mortality estimates increases, an increase in the minimum fish length would be required.

The trend in post-FMP fishing mortality rate (age II fish) estimated from the NEFC spring survey will be measured relative to the baseline level defined from pre-FMP fishing mortality rates (age II fish) from NEFC survey data (catch at age available from 1976-1988). Likewise, the trend in post-FMP fishing mortality rates (age II) estimated from virtual population analysis (VPA) will be measured relative to the baseline level defined from pre-FMP fishing mortality rates (age II) from VPA (catch at age also available from 1976-1988). Best estimates of discards will be incorporated into both the catch-at-age data and commercial catch per unit effort (CPUE) data. Catch per unit effort indices to be used to tune the VPA will be evaluated from standardized fishing power analyses of commercial and recreational fisheries data. Candidate data series for CPUE indices include (but are not limited to) NEFC commercial weighout (1976-1988), North Carolina winter fishery (1982/83 - 1988/19) and Marine Recreational Fishery Statistics Survey (MRFSS) (1979-1988) data.

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4. INTRODUCTION

4.1 DEVELOPMENT OF THE PLAN

The Council first considered the development of a fishery management plan for summer flounder in late 1977. During the early discussions the fact that a significant portion of the catch was taken from State waters was considered. As a result, on 17 March 1978 a questionnaire was sent by the Council to east coast State fishery administrators seeking comment on whether the plan should be prepared by the Council or by the States acting through the Atlantic States Marine Fisheries Commission (ASMFC).

The decision was made that the initial plan would be prepared by ASMFC. The Council arranged for NMFS to make some of the Council's programmatic grant funds available to finance preparation of the ASMFC plan. New Jersey was designated as the state with lead responsibility for the plan.

This FMP was based on the management plan drafted by the State/Federal Summer Flounder Management Program pursuant to a contract between the New Jersey Division of Fish, Game, and Wildlife and NMFS. The State/Federal draft was adopted by the Atlantic States Marine Fisheries Commission at its annual meeting in October 1982.

The Council adopted the FMP for public hearings on 29 October 1987. The public hearings were help as follows: 11 Jan. 1988, Fairhaven, MA and Morehead City, NC; 12 Jan. 1988, Galilee, RI and Manteo, NC; 13 Jan. 1988, Riverhead, NY and Norfolk, VA; 14 Jan. 1988, Rockville Center, NY and Annapolis, MD; 15 Jan. 1988, Lewes, DE; 27 Jan. 1988, Cape May Court House, NJ and Wall, NJ. Summaries of the hearings, copies of written comments received, and a tabulation of the questionnaires distributed at the hearings are presented in Appendix 5 to this FMP.

The objectives of the hearing draft were the same as those of this final FMP (see section 3 and 4.3). The preferred management measures for the hearing draft were:

1. It would be illegal to possess summer flounder or parts thereof less than 13" total length (TL).

2. It would be illegal to land summer flounder less than 14" TL north of the line connecting the points 40° 31' N latitude, 73° 58.5' W longitude and 40° 23' N latitude, 73° 43' W longitude and extending seaward to the boundary of the EEZ. There would be no minimum mesh size north of the line.

3. Vessels south of the line specified above would be required to use a 4.5" minimum net mesh size for trips possessing 500 lbs or more of summer flounder.

4. The 4.5" minimum mesh size south of the line specified above would be increased automatically to 5" two years after plan implementation.

5. In all cases the minimum net mesh size would apply to finfish otter trawl vessels with trips landing 500 lbs or more of summer flounder. After 500 lbs of summer flounder have been retained, only nets of the legal size would be allowed on deck and in use. In no case does the minimum mesh provision apply to nets with a mesh equal to or greater than 16" in the body and/or wings of the net.

6. Vessels with permits issued pursuant to this FMP would be required to fish and land pursuant to the provisions of this FMP unless the vessels land in States with larger minimum fish sizes or larger minimum net mesh sizes than those provided in the FMP, then the minimum fish sizes or minimum net mesh sizes would be required to meet the State limits.

7. Foreign fishermen would not be permitted to retain summer flounder since US fishermen, by definition, would be harvesting the OY.

8. Vessels fishing commercially for summer flounder, either directly or as a bycatch in other fisheries, and vessels for hire in the recreational fishery (party and charter boats) would be required to obtain annually renewable permits.

9. States with minimum sizes and minimum mesh regulations larger than those in the FMP are encouraged to maintain them.

10. After three years of Plan implementation the Council would examine certain criteria (see below) to measure the effectiveness of the size and mesh limits relative to the FMP's objectives. If the stock continues to decline and the Council finds that the adjustment criteria have been met and if the NMFS Northeast Regional Director concurs with the Council, the minimum fish length and a minimum mesh size would be increased by the NMFS Northeast Regional Director to a minimum fish length of 14" TL and a minimum net mesh size of 5.5" and the line specified above would be eliminated from the management regime. The adjustment mechanism would be initiated if both the primary and one of the secondary indicators specified demonstrate continued stock decreases. The following indicators have been selected because of their previous use, the longevity of the data series and the likelihood that the indicator is measuring a real feature of the summer flounder population life history characteristics (i.e., not simply a spurious artifact). The two primary indicators are both derived from the NEFC spring offshore bottom trawl survey. Annual mortality estimates from the fisheries independent surveys will be developed for ages II to III summer flounder. (Age I summer flounder are only partially recruited to the commercial and recreational fisheries.) The second primary indicator will be the CPUE from the NEFC survey. Two secondary, fisheries dependent, indicators are proposed; a commercial CPUE index and a recreational CPUE index. In order not to initiate more stringent management measures unless such measures are truly required, both primary and one of the two secondary indicators must show that the stock is declining. The annual mortality estimate for Ages II to III allows analyses of the heavily exploited and fully recruited age groups and produces estimates that are more current than those generated with the five year lag time that is required if all age groups are considered in catch curve analysis . It is proposed that a trend line (regression) fitting 3 year averages be used to explore these data and test for significant decreases. The second primary indicator is the NEFC spring survey CPUE. Since results of a recent gear comparison experiment (Fogarty, pers. comm.), which targeted on summer flounder, showed no effect of door type (section 5.2), it is believed that data since 1968 are all comparable. These data are to be explored and, if the recent three year average is in the lowest quartile, then this indicator is met. Both primary indicators must show the stock condition is getting worse for the secondary indicators to be tested. Either secondary indicator, in conjunction with both primary indicators, is required for implementation of the 14" TL minimum fish size and 5.5" minimum net mesh size throughout the management unit. Both CPUE estimates will be examined with the same statistical approach as the survey CPUE (lowest quartile). The commercial CPUE analysis must focus on the 1986 estimate (since New York data were not part of the NEFC weighout system prior to 1986) and develop comparable estimates for previous years. Also, the estimate needs to be based on the regulated summer flounder commercial fishery defined comparably with the definition of regulated fishery in this FMP. The recreational CPUE will be based on all data since the initiation of the MRFSS in 1979.

There are three other issues related to the management measures for which the Council sought comment during the review process:

1. The provision that allows multiple nets on board a vessel and in use until the 500 lbs of summer flounder criteria is met creates a need for at sea enforcement. To minimize this demand as much as possible it is necessary to establish a rigorous penalty schedule. The logic is simply that if there is a relatively low probability of detection of an offense, then the penalty for those detected must be sufficient to provide an adequate deterrent. The Council has identified a series of penalty schedule options, which are presented in Appendix 2, for which the Council is seeking public comment through the hearing and review process.

2. The analyses of the alternatives are based on the assumption that all fish discarded in the trawl fishery die. At times the Council has received comments that discard mortality may, in fact, be less that 100%. To resolve this issue the Council is seeking comment during the hearing and review process on the proportion of discarded fish that may survive.

3. The preferred alternative specifies 500 lbs of summer flounder as the minimum for a trip for which the minimum net mesh size applies. The Council is seeking comment on whether the 500 lb specification is most applicable.

The complete description of the public hearing preferred alternative and its evaluation (as printed in the hearing draft) is presented in section 1 of Appendix 1 of this FMP. This approach was used so that the reader who wishes to understand the process of development can trace the evolution of the FMP from the hearing draft, through the comments thereon, to the final FMP, using only this document.

In general terms, the final FMP is essentially alternative 6 from the hearing draft combined with a framework measure to increase the minimum size limit from 13" to 14" if the fishing mortality rate increases. The reasons for the changes from the hearing draft to the final FMP came from the public comments (Appendix 5) and from the comments of the Coast Guard and NMFS.

The most dramatic change was elimination of the minimum mesh regulation and imposition of a coastwide minimum fish size limit of 13". The Council's initial concern was that a minimum size limit without an appropriate minimum mesh size would lead to excessive wastage through the mortality of discarded undersized fish. That was balanced against the lack of at sea enforcement resources and the difficulty of devising a minimum mesh regulation that would protect summer flounder and not impose unreasonable burdens on the fishermen (for example, one mesh on board versus several meshes on board but only one capable of immediate use). In the final analysis, the need to proceed with some level of initial management caused the mesh regulation to be dropped.

Both NMFS and the Coast Guard questioned the enforceability of the minimum mesh provision. The Council members were concerned that dropping the mesh size provision would create problems with national standard 1. The Council has been assured that we should not anticipate problems so long as we are regulating with an effective size limit and with dockside enforcement; that, in fact, the principle concerns related to the cost of enforcement, which were largely resolved by dropping the mesh regulations.

With the elimination of the minimum mesh size provision, the framework measure was changed to provide only for implementation of a coastwide 14" minimum fish size if fishing mortality increases. The conditions were also simplified from those in the hearing draft (see item 10 above) to simply (1) estimated fishing mortality from the NEFC spring survey and (2) estimated fishing mortality from a virtual population analysis (VPA) which would be tuned using commercial and recreational fishery CPUE indices. If a three year trend of either of these mortality estimates increases, an increase in the minimum fish length from 13" to 14" would be required.

During the Council's debate prior to adoption of the FMP there was considerable discussion on the question of whether implementation of the framework measure could be frustrated by one indicator moving up while the other moved down or whether more weight was to be put on the movement of one indicator over the other. The debate was concluded by agreement that it is the Council's intent that the provision means exactly what it states; that is "If a three year trend of *either* of these mortality estimates increases, an increase in the minimum fish length from 13" to 14" would be required". In other words, it is the Council's intent that either one of the trend indicators is sufficient.

It was also understood by the Council that the Council has an obligation to annually monitor the fishery and the status of the stock and to respond in any way that is appropriate. Hence, if serious stock problems prior to the end of the three year period that warranted, in the judgment of the Council, other forms of management, those management measures could be undertaken. That obligation exists independent of the framework measure of this Management Plan.

During the development of the FMP concern was raised over the prospect of fishermen avoiding the minimum fish sized limit by filleting the fish at sea. This led to inclusion in the hearing draft the provision "It would be illegal to possess summer flounder *or parts thereof* less than 13" total length (TL)". This provision led to negative comments from party boat operators, since party boat crew members supplement their incomes by filleting fish. NMFS concluded that it would be virtually impossible to enforce the provision. There was also much discussion over the appropriate fillet size for the 13" minimum fish size. During the Council's discussion prior to adoption of the final FMP it was agreed that the filleting provision would remain essentially the same as that in the hearing draft, recognizing that such a provision would effectively make filleting at sea illegal. The Council concluded that the possible subversion of the minimum fish size through filleting at sea could produce a greater negative impact than the inconvenience to the party boat crew members. It was felt that the impact on the party boat crew members would be minimized because through most of the year the party boats fish in the Territorial Sea and would not be subject to the FMP, but only to State regulations. The boat could get a federal permit only for the time it actually fished in the EEZ. During that period filleting would need to be done at the dock. There should, in fact, be a minimal problem with all recreational fishermen viz-a-viz filleting since the vast majority of the recreational catch comes from State waters, not from the EEZ (Table 47).

The South Atlantic Fishery Management Council endorsed the FMP on 28 April 1988 (Joseph, pers. comm.). The New England Council adopted a motion supporting a 13" minimum fish size and no mesh size initially, with an automatic minimum size limit increase to 14" at the end of three years, rather than the framework measure adopted by the Mid-Atlantic and South Atlantic Councils (Marshall, pers. comm.).

4.2. PROBLEMS ADDRESSED BY THE FMP

4.2.1. The Fishing Mortality Rate May Exceed F_{max}

The current best estimates of the instantaneous rate of fishing mortality, F, are on the order of 0.65 to 0.70 (section 5.3.7) for both sexes combined of summer flounder. The F_{max} level (the rate of fishing mortality for a given method of fishing which maximizes the harvest in weight taken from a single year class of fish over its entire life span) is estimated to occur at an F = 0.26 for females and F = 0.44 for males (section 5.3.8). Assuming a 1:1 sex ratio in summer flounder for all ages (section 5.3.4) allows averaging the two F_{max} estimates for a combined estimate of 0.35. Thus, the current instantaneous rate of fishing mortality is nearly double the rate which would produce the maximum yield from a single year class. In addition, although the overall sex ratio is 1:1, larger fish are generally females and, thus, a more conservative approach IS to consider the sexes separately. Both F_{max} and $F_{0.1}$ are much lower for females than males. Recent estimates of F are nearly three times F_{max} for females. Without question, long term yield from the fishery can be increased by reducing fishing mortality.

4.2.2. Yield from the Fishery Can Be Improved

Yield per recruit (per unit weight of recruits) estimates were maximized at F = 0.26 for females and F = 0.44 for males and is at best one half the current levels of fishing mortality occurring in the fishery. However, the $F_{0.1}$ level of fishing (rate of fishing at which the increase in yield per recruit for a small increase in fishing mortality is only one-tenth the increase in yield per recruit for the same increase in fishing mortality from a virgin fishery), which is a somewhat more conservative estimate, is significantly less. While $F_{0.1}$ may be more conservative than trying to always maximize the yield, extensive recent literature advocates a more conservative approach to managing a fish stock that is vulnerable to wide fluctuations in year class strength and does not have a defined stock-recruitment relationship.

The optimal levels (as defined in Gulland and Boerema, 1973) of fishing mortality ($F_{0.1}$) are considerably lower for females than for males. At a minimum size of 14", $F_{0.1}$, or optimal level of fishing, for females equals 0.16. Unquestionably the yield per recruit can be increased significantly by increasing the minimum size of the fish caught.

Spawning stock biomass per recruit declined markedly with increasing fishing mortality on females (Figure 11). The spawning stock biomass per recruit concept allows egg production for the population to be directly linked with fishing mortality. Egg production is highest without any F (unless there is density dependence in fecundity, which has not been currently detected for this species) and can be increased by decreasing or delaying mortality. The spawning stock biomass per recruit consistently increases with increases in the minimum legal size limits at the $F_{0.1}$ level.

4.2.3. Lack of Uniformity of Management Throughout the Range

The many jurisdictions involved in the summer flounder fishery create other problems. A major portion of both recreational and commercial catch comes from State waters between Massachusetts and North Carolina. Existing State regulations differ significantly (Section 9.3.4.1). Maine, New Hampshire, and Pennsylvania have no specific laws relating to summer flounder (Squires, Dunlop, and Abele, pers. comm.). Massachusetts prohibits catching, landing, and possession of summer flounder less than 14" TL (Pierce, pers.

comm.). Rhode Island prohibits harvesting and possession of summer flounder less than 14" TL (Sisson, pers. comm.). Connecticut prohibits possession, sale, and purchase of summer flounder less than 14" TL; recreational fishery minimum length is also 14" (E. Smith, pers. comm.). New York prohibits possession, sale, and transportation of summer flounder less than 14" TL and requires a mesh size equal to or greater than 4" in Long Island Sound (Mason, pers. comm.). New Jersey has a 13" minimum size limit for summer flounder in both the commercial and recreational fisheries; additionally, commercial fishermen engaged in a directed fishery must have a 4.5" stretched mesh codend (Freeman, pers. comm). Delaware prohibits possession (unless legally taken elsewhere) of summer flounder less than 14" TL (Lesser, pers. comm.). Maryland prohibits selling, buying, and possession of summer flounder less than 12" TL with a tolerance of 5% of the vessel load, by number, as indicated by a sample of not less than 200 fish, undersized (Casey, pers. comm.). There is also a 2.5" gill net minimum mesh size. Virginia prohibits taking and possession of any summer flounder less than 12" TL and requires a mesh equal to or greater than 4.5" (Travelstead, pers. comm.). North Carolina prohibits possession of summer flounder less than 11" TL (with a 5% undersized tolerance by weight) and also requires a 4.5" minimum mesh size when the load is 60% or more summer flounder (McCoy, pers. comm.).

In summary, Massachusetts, Rhode Island, Connecticut, New York, and Delaware have 14" minimum size limits. New Jersey has a 13" limit. The Maryland and Virginia limits are 12", while the North Carolina limit is 11". New York (4"), New Jersey (4.5"), Maryland (2.5" gill net), Virginia (4.5"), and North Carolina (4.5") have mesh regulations for some or all of their waters.

The lack of regulations in Maine, New Hampshire, and Pennsylvania does not present a problem because of the small amount of landings in those States. However, the lack of regulations could be significant if vessels land summer flounder in those States to avoid the regulations in other States.

Extensive efforts have been spent to coordinate this FMP with the ASMFC and the ASMFC Summer Flounder Plan (Scarlett, 1981). The ASMFC Plan provided background information and served as a spring board for many aspects of the Council's FMP. In June of 1987 an ASMFC advisory committee (ASMFC Advisory Committee, 1987) was convened to review the objectives of the ASMFC Plan and evaluate the condition of the stock. This committee's first two recommendations were: (1) "It is the feeling of the plan review subcommittee that the summer flounder plan should be updated once the draft summer flounder management plan prepared by the Mid-Atlantic c Management Council is accepted" and (2) "States should be encouraged to implement the recommendations of the original ASMFC Plan".

4.2.4 Lack of Data

Tremendous advances in the quantity and quality of data have occurred since 1979 when the Marine Recreational Fishery Statistics Survey (MRFSS) was initiated and all States finally began separating summer flounder from other flounders. Also the paper by Morse (1981) clarified much of the uncertainties of the biological characteristics of summer flounder. Thus, most of the catch and biological information necessary for management is currently being collected. Age composition of the commercial catch for recent years and age composition of the recreational catch are two critical biological pieces still needed. However, very little economic data are currently being collected. The key economic item needed is better effort information for the whole fishery. The addition of New York to the weighout system in 1986 will help the description of the commercial fishery, but still nearly one third of the commercial fishery landings will have no associated effort measurement. Expenditures for the recreational fishery are also needed.

4.2.5. Increase in Fishing Pressure due to Decrease of Other Flatfish Stocks

Unquestionably the continued decline of the New England groundfish fishery will cause more effort to be exerted on the summer flounder stocks. Nearly all the major groundfish stocks in New England (haddock, yellowtail flounder, cod, redfish, etc.) have their stocks severely depleted or have the current catch exceeding the long term potential catch (USDC, 1986d). Summer flounder commercial catch has remained relatively constant over the past several years (Table 1) while the catches of total flounders along the Atlantic coast (Table 60) have been decreasing. Significantly more effort (numbers of vessels) has been directed towards summer flounder during the past seven years (Table 55).

4.3. MANAGEMENT OBJECTIVES

The objectives of the FMP are to:

1. reduce fishing mortality on immature summer flounder;
2. increase the yield from the fishery;
3. promote compatible management regulations between the Territorial Sea and the EEZ; and
4. minimize regulations to achieve the management objectives recognized above.

4.4. MANAGEMENT UNIT

The management unit is summer flounder (*Paralichthys dentatus*) in US waters in the western Atlantic Ocean from North Carolina northward.

5. DESCRIPTION OF THE STOCK

5.1. SPECIES DISTRIBUTION

The summer flounder is one of the lefteye flounders in the family *Bothidae*. The geographical range of the summer flounder (*Paralichthys dentatus*) encompasses the estuarine and coastal waters from Nova Scotia to Florida (Leim and Scott, 1966 and Gutherz, 1967). Briggs (1958) has given their range as extending into the northern Gulf of Mexico. The center of its abundance lies within the Middle Atlantic Bight. North of Cape Cod, Massachusetts, and south of Cape Fear, North Carolina, summer flounder numbers begin to diminish rapidly (Grosslein and Azarovitz, 1982). South of Virginia, two closely related species, the southern flounder (*Paralichthys lethostigma*) and the gulf flounder (*Paralichthys albigutta*) occur and sometimes are not distinguished from summer flounder.

In the Middle Atlantic Bight, summer flounder can be found from the outer portion of the continental shelf to shallow inshore waters, and they exhibit strong seasonal inshore-offshore movements as observed in trawl survey data (Figures 1 and 2). Summer flounder normally inhabit shallow coastal and estuarine waters during the warmer months of the year and remain offshore in 200 to 500 ft of water during the fall and winter (Bigelow and Schroeder, 1953).

Summer flounder are serial spawners (multiplicity of egg batches which are continuously matured and shed) with a relatively protracted reproductive season (Morse, 1981). Ichthyoplankton survey data show the general spawning areas in the Middle Atlantic Bight (Figure 1). Spawning occurs during the fall and winter while the fish are moving offshore or at their wintering grounds. The well defined seasonal migratory/spawning pattern varies with latitude. Smith (1973) noted a seasonal progression with fish spawning and moving offshore earlier in the northern part of the range. Spawning generally occurs from September through December north of Chesapeake Bay and from November through February south of the Bay. The offshore migration is presumably keyed to declining water temperature and decreases in photoperiod during the autumn. Larvae and post larvae drift and migrate inshore, entering coastal and estuarine nursery areas from October to May. The fry become demersal on reaching coastal waters and the first year is spent in bays or inshore areas over the entire range of the species.

Summer flounder are distributed widely over the continental shelf during the spring, from 1 to 1000 ft in depth (Sissenwine *et al.*, 1979). During summer and autumn, summer flounder are primarily captured in depths of less than 300 ft. During winter, they are not found at depths of less than 200 ft. The distribution of summer flounder by depth is related to their temperature distribution (Sissenwine *et al.*, 1979). During spring they are primarily found between 46 and 61° F. During summer the distribution is between 59 and 82° F. The autumn distribution is between 54 and 82° F and the winter distribution is between 41 and 52° F. Prerecruit summer flounder are most abundant at temperatures in excess of 59° F, during the months in which they are caught by the trawl surveys (Sissenwine *et al.*, 1979).

Examination of the distribution pattern of prerecruit (less than or equal to 12" TL) summer flounder indicate a striking absence of small fish in northern areas (Fogarty, 1981). Both spring (Figure 3) and autumn (Figure 4) bottom trawl survey data indicate that the concentration of young of year summer flounder is south of 39° latitude. The importance of the Chesapeake Bight to this species is demonstrated by the fact that almost all of the young of year caught during the 1968 through 1979 spring surveys (Figure 3) were from this area. Some young of year summer flounder appear in the other areas during the autumn (Figure 4) but the percentage is again very high in the Chesapeake area. The primary nursery grounds for juveniles are the sounds of North Carolina, Chesapeake Bay, and the bays of the eastern shore of Virginia; however, juveniles are distributed to some extent during spring, summer, and fall in many estuaries from Massachusetts to North Carolina.

Powell and Schwartz (1977) evaluated the distribution of summer flounder and southern flounder which extensively use Pamilco Sound and the adjacent estuaries as nursery areas. Both species remain in these estuaries for the first 18-20 months of their life before moving into the ocean waters. Benthic (sea floor) substrate and salinity appear to be the two most important factors governing the distribution of the two species. Powell and Schwartz (1977) reported that summer flounder are most abundant in areas of moderate to high salinities and sandy bottom, while southern flounder prefer areas of low salinity and clayey silt or organic rich mud bottom.

Juveniles in southern waters generally overwinter in bays and sounds whereas in the north there is some movement offshore with the adult migration, although many larval and juvenile summer flounder still remain inshore through the winter months (Smith and Daiber, 1977 and Wilk *et al.*, 1977). The offshore population returns to the coast and bays in the spring with a tendency to return to the same estuary as the year before or to move to the north and east (Poole, 1962; Murawski, 1970; Westman and Neville, 1946; and Hamer and Lux, 1962). Those which enter bays and estuaries generally stay the entire summer. In the northern part of the range, fish which spend their summer in a particular bay tend largely to return to the same bay in the subsequent year. For example, although the northeast dispersal is considerable, with some summer flounder from inshore New Jersey moving the following year to Long Island, the majority of the fish return to inshore New Jersey. This homing is evident also in the summer flounder which largely return to New York waters, with some movement to waters off Connecticut, Rhode Island and Massachusetts (Poole, 1962).

Considerable attention has been devoted in recent years to determining the population structure of summer flounder in the Middle and South Atlantic Bights. Wilk *et al.* (1980) on the basis of stepwise linear discriminant analysis of morphometric and meristic features of summer flounder samples collected along the eastern seaboard from New York to Florida, concluded that a significant difference exists between summer flounder samples north and south of Cape Hatteras. Summer flounder collected throughout the Middle Atlantic Bight were statistically similar, as were fish sampled in the South Atlantic Bight. Population intermixing was most prevalent off North Carolina. Wilk *et al.* (1980) suggested that Cape Hatteras forms a zoogeographical barrier resulting in reproductive isolation of summer flounder. Fogarty *et al.* (1983) support the findings of Wilk *et al.* (1980) that summer flounder north and south of Cape Hatteras are statistically separable on the basis of morphometric characters, with apparent intermixing of northern and southern contingents in the vicinity of Cape Hatteras. The 1986 summer flounder stock assessment (USDC, 1986c) is based on the assumption of a unit stock existing north of Cape Hatteras.

The summer flounder stock discrimination workshop reported on in Fogarty *et al.* (1983) was unable to examine adequately the hypothesis of multiple stocks in the Middle Atlantic Bight. Smith (1973) identified concentrations of summer flounder eggs off Long Island, Delaware-Virginia, and North Carolina. The workshop concluded however that distribution of summer flounder eggs and larvae was continuous throughout the Middle Atlantic Bight and that apparent concentrations identified by Smith (1973) may have been due to sampling variability.

This FMP is based on the agreement of the ASMFC Summer Flounder Scientific and Statistical Committee, the MAFMC Scientific and Statistical Committee, and the most reliable biological data available which all dictate that management options be based on a unit stock.

5.2. ABUNDANCE AND PRESENT CONDITION

Total US commercial landings of summer flounder from the management unit of this FMP (North Carolina and north) peaked in 1979 at nearly 42 million lbs (Table 1). The reported landings in 1984 of slightly over 40 million lbs were the second highest landings ever and even though the landings in 1985 declined nearly 5 million lbs from the previous year, they were still among the 5 highest annual landings ever. Landings have fluctuated widely over the last five decades, increasing from less than 10 million lbs per year prior to World War II to averaging around 20 million lbs during the 1950s. Landings consistently decreased during the 1960s until a coastwide low of only 6.7 million lbs were reported in 1969. Commercial landings have been consistently high since the mid 1970s. Increased commercial landings are attributable mainly to increased levels of effort in the southern winter trawl fishery.

Since 1979, 70% of the reported commercial landings of summer flounder have come from the EEZ (Table 2). The percentage of landings attributable to the EEZ was at its lowest in 1983 with 63% and was the highest in 1979 at 77% (Table 2). In 1979 over 32 million lbs of summer flounder were landed from the EEZ. In 1985, 75% of the landings were from the EEZ with 26 million of the 35 million lbs being caught outside of three miles. Tremendous variability in summer flounder landings exist among the States over time and the percent of total summer flounder landings taken from the EEZ varied widely among the States (section 7 more fully describes some of these differences).

Estimated recreational catch of summer flounder in 1985 was 20.6 million lbs (Table 3). Estimated recreational catch derived from the 1979 through 1985 Marine Recreational Fishery Statistics Surveys (MRFSS) has averaged 32 million lbs and has ranged from 16.7 to 54.5 million lbs. No consistent annual pattern is discernible. Summer flounder are generally the second most frequently caught species by marine recreational fishermen along the East coast and comprise roughly seven percent of the total weight of all fish caught (Table 3). Creel census surveys conducted in New York, New Jersey, and Virginia provide indicators of trends in the summer flounder recreational fishery for restricted time periods and geographical locations. Catch per angler trip ranged from 2.6 to 9.5 fish during 1955 through 1962 for anglers aboard charter boats operating off the eastern shore of Virginia (Richards, 1965). Schaefer (1966) reported catch rates ranging from 4.0 to 6.8 fish per angler trip in Great South Bay, NY during 1957 through 1960. Similar trends in CPUE are evident for both data sets in years for which comparisons are possible. Sharply lower catch rates were evident in Great South Bay in 1966 and 1967, paralleling trends in the commercial fishery. Catch per angler trip, available for Great Bay, NJ declined from 0.6 in 1967 to 0.3 in 1970 and gradually recovered to 3.8 fish per trip in 1975 (Festa, 1979). Catch rates subsequently declined to 2.2 per trip in 1978 (Himchak, 1979). The slightly higher 1978 estimate of 3.2 fish per trip reported by Christensen and Clifford (1979) was restricted to charter boat catches off the New Jersey coast (the Great Bay creel census did not include charter boats).

A stratified random bottom trawl survey has been conducted in the spring and autumn by NEFC (Clark. 1978). The continental shelf between Cape Hatteras and Nova Scotia has been sampled since 1967 during the autumn survey and was also sampled between New Jersey and Nova Scotia during 1963 and 1966. The spring survey began in 1968 and has sampled from Cape Hatteras to Nova Scotia. The survey area is stratified into geographical zones (Figure 5) primarily on the basis of depth and latitude. Approximately 300 stations are sampled during each survey (Clark, 1978). A 30 minute tow is taken at each station at an average speed of 3.5 knots.

Bottom trawl surveys conducted during the spring in offshore waters were used to provide indices of abundance for summer flounder. Spring surveys were considered the most reliable indicators of biomass because summer flounder are concentrated in offshore areas during spring surveys and are more consistently available to the gear than in the fall (USDC, 1986c). A smoothed index (Pennington, 1986) for the survey catch per tow was constructed and used as the index of relative abundance. The method involves development of a time series model for the stratified mean catch per tow to filter measurement error (changes in catchability) from changes in population abundance. The delta distribution (Pennington, 1986) stratified mean catch per tow was relatively low during the late 1960s and early 1970s, increased during the mid 1970s and then declined again during the late 1970s and early 1980s (Tables 4 through 7). Considerable fluctuations have been evident since 1978. The 1985 and 1986 survey indices were higher than 1983 and 1984 levels, however caution is necessary in interpreting the 1985 and 1986 survey data since a change in trawl performance with the new doors indicates a significant increase in gear efficiency for all species combined with the new door type (USDC, 1986c). Results of a recent gear comparison experiment (Fogarty, pers. comm.) which targeted on summer flounder, showed no effect of door type; however, sample sizes were low, thus suggesting further experiments for summer flounder are needed. Byrne and Forrester (in press) recently completed analyses of gear comparison experiments conducted in 1984 of five flatfish species (not summer flounder). The results show that the previously reported differences (USDC, 1986c) primarily involved cod and haddock.

Annual variations in the timing of migratory activity may directly affect the availability of summer flounder during the surveys. Prior to the autumn migration, summer flounder are generally located in coastal areas and estuaries and are not available to the survey. Any delay in movements from coastal locations could reduce availability of summer flounder during the autumn bottom trawl surveys, thus resulting in underestimation of survey abundance indices. Coefficients of variation computed for survey indices differ among years (Tables 4 through 7). Coefficients of variation were consistently higher for Georges Bank and were also highest for each area during periods of low apparent abundance (Fogarty, 1981). Summer flounder at the extremes of the geographical range may be particularly vulnerable to environmental fluctuations, resulting in variable survival rates and/ or changes in distribution patterns. With the large coefficients of variation, Fogarty (1981) suggests that proportional changes in abundance of less than approximately half may not be detected with high probability.

Scarlett (1981) reported that the spring biomass indices for the entire survey area were significantly correlated with commercial landings. Commercial catch per unit effort (days fished) indices were calculated for tonnage classes 2, 3, and 4 otter trawlers (5- 50 GRT, 51-150 GRT, and 151-500 GRT, respectively) for trips in which 5% or greater of the catch was comprised of summer flounder. Catch per unit effort was similar for all three vessel classes from 1967 through 1975. After 1975, similar trends in CPUE are evident, however tonnage classes 3 and 4 show significantly higher CPUE than tonnage class 2 (Table 8). Rank order correlations between survey indices and CPUE for the three tonnage classes were highest for tonnage class 2 vessels ($r = 0.62$) and lower for tonnage class 3 ($r = 0.40$) and tonnage class 4 ($r = 0.47$) vessels (USDC, 1986c).

Catch per effort for tonnage class 2 vessels ranged from a low of 970 lbs in 1970 to a high of 2,646 lbs in 1974. The CPUE remained relatively constant from 1977 through 1982, increased slightly in 1983 and 1984, and then declined to its lowest level since 1972 in 1985 (Table 8).

5.3. STOCK CHARACTERISTICS AND ECOLOGICAL RELATIONSHIPS

5.3.1. Spawning

Summer flounder spawn during the fall and winter as they migrate offshore or are at their wintering grounds. Smith (1973) found that spawning starts in mid-September between southern New England and New Jersey. As the season progresses spawning moves southward, and by October spawning takes place nearly as far south as Chesapeake Bay. Spawning has been reported to continue into March (Morse, 1981).

Morse (1981) documented that summer flounder are serial spawners (Figure 6). The multiplicity of modes indicate egg batches are continuously matured and shed during a protracted spawning season. The complete separation of a ripe egg batch just prior to being shed can be seen in the "running ripe" figure at modal egg diameter of 1.00 mm. A few residual eggs from a previously spawned batch are evident in the "partially spent" graph of Figure 6.

Morse (1981) calculated the percent of ovary weight to total fish weight as an index for maturity. The mean maturity index increased rapidly from August to September, peaked in October-November, then gradually decreased to a low in July (Table 9). The wide range in the maturity indices during the spawning season indicates nonsynchronous maturation of females and a relatively extended spawning season. The length and peak spawning time as indicated by the maturity index agree with results determined by egg and larvae occurrence (Smith, 1973 and Herman, 1963).

Fertilized eggs are buoyant, floating at or near the surface, and are spherical with a transparent rigid shell of about 0.04". The heaviest concentrations of eggs and larvae are found between Long Island and Cape Hatteras (Smith, 1973); most eggs were taken within 17 mi of shore and larvae were most abundant 12 to 45 mi from shore. Larvae were found in the northern part of the Middle Atlantic Bight from September to February, and in the southern part from November to May.

Smith (1973) found that eggs were most abundant (approximately 77% of the total) in the water column where bottom temperatures were between 53 and 66° F. However, eggs were found in temperatures as cold as 48° F and as warm as 73° F. Larvae have been found in temperatures ranging from 32 to 74° F, but are most abundant between 48 and 64° F. The incubation period from fertilization to hatching is estimated to vary with temperatures as follows: about 142 hours at 48° F; 72 to 75 hours at 64° F; and 56 hours at 73° F (Smith, 1973).

5.3.2. Age and Growth

Several authors have investigated length at age relationships for summer flounder (Poole, 1961; Eldridge, 1962; Smith and Daiber, 1977; Shepherd, 1980 and Richards, 1970). The results of these past studies are not in total agreement. Summer flounder scales and fin rays follow the generalized temperate water growth pattern and indicate that rapid growth begins in early summer, continuing (probably intermittently) into the following winter. Growth rate interpretation based upon otolith zones may not be reliable due to problems with poor calcification and/or with resorbtion. Since the scientific literature was not consistent and age and growth information is critical for management, ASMFC sponsored an age and growth workshop (Smith *et al.*, 1981).

This ASMFC sponsored age and growth workshop concluded that the first distinct opaque zone away from the core on summer flounder otoliths from age "2 + " and older normally represents the second annulus; however, this determination should be made on a study-by-study basis using length frequency ranges as presented in Table 10. It is probable that age "1 + " flounder could show a distinct first annulus past the core. Otolith opaque zones representing year marks past number 2 are usually easy to distinguish on most otoliths (Smith *et al.*, 1981).

The calculated summer flounder lengths (Table 11) for Powell, Smith and Daiber, and Shepherd were considered realistic estimates for normal summer flounder growth by the workshop participants. Poole's (1961) lengths, while considered valid, were thought to be representative of very rapid growth not normally found. Eldridge's (1962) age groups should be adjusted back one year to fit the growth pattern selected by the workshop (Smith *et al.*, 1981).

Since summer flounder spawn over half the year, the workshop considered a 1 January birthday for uniformity. Thus, fish were not considered one year old unless they passed their first summer, thereby eliminating the possibility of an October hatched fish being considered one year old the following January (Smith *et al.*, 1981). Under normal conditions, the minimum observed mean length frequency of one and two year old January fish should be approximately seven inches and eleven inches.

Although Poole's (1961) results show faster growth than the others, all studies showed that females grow more quickly than males and are consistently larger than their male counterparts at any given age except for the first few months after hatching.

The length-weight relationship for summer flounder has been well described by Morse (1981). The results of this study showed that there are both seasonal and slight sexual differences in the relationship (Table 12). This difference between the sexes was also noted by Smith and Daiber (1977), Eldridge (1962), Lux and Porter (1966), and Wilk *et al.* (1978).

Parameters of the von Bertalanffy growth equation (Table 13) were determined for summer flounder (USDC, 1986c) using length at age data for males and females collected from bottom trawl surveys between 1976 and 1983. Age determinations for 1947 males and 2030 females were available. The maximum size of male and female summer flounder was estimated as 26" and 33", respectively. Previous estimates of the maximum size for summer flounder ranged from 35 to 37 inches (Smith and Daiber, 1977; Richards, 1970). Henderson (1979) provided an estimate of 36" for both sexes combined based on analysis of commercial samples. Bigelow and Schroeder (1953) reported a maximum verified length of 37". Recent values (USDC, 1986c) of the Brody growth coefficient (k) are comparable to those calculated in Fogarty (1981) using data which included both inshore and offshore collections.

5.3.3. Catch at Age

The stratified mean number per tow at age for the spring offshore surveys from 1976 through 1986 was dominated by ages 1, 2, and 3 (Table 14 and Figure 7). The proportion of one year olds (0.51) was high in 1986 suggesting the possibility of a strong year class. In 1985, the proportion of age one fish was very low (0.05), suggesting poor recruitment of the 1984 year class (USDC, 1986c).

Estimates of catch at age for commercial landings were available for 1976 through 1983 (Table 15 and Figure 8). Ages 1 through 4 comprised 94% of the landings, with ages 2 and 3 predominating (45% and 29% of the total catch, respectively). During 1980 through 1983, the contributions of age 3 and age 4 fish declined from 49% to 28%, while the proportions of age 1 and age 2 fish increased from 46% to 66% (USDC, 1986c).

5.3.4. Sex Ratio

No significant difference from a 1:1 sex ratio was found by Morse (1981) in his examination of 4,551 summer flounder greater than eight inches collected during 1974 through 1979 (Table 16). However a significant trend was evident when sex ratios were calculated in roughly two inch intervals. Males dominated the intervals between eight and fourteen inches and were essentially absent in samples greater than twenty two inches. Females were more abundant in all groups greater than eighteen inches.

Morse (1981) calculated sex ratios by year and season to determine possible variations related to sampling intensity or differential distribution of sexes during the spring and fall migrations. There appeared to be no annual or seasonal effects on observed sex ratios (Table 16) even though sample sizes varied greatly between years and seasons.

The observed size related trend in sex ratios does not appear to be the result of behavioral differences between the sexes or gear selectivity according to Morse (1981). Similar results were found in Great South Bay (Poole, 1966) and Delaware Bay (Smith and Daiber, 1977) where different collecting gear were used. There is no evidence to suggest segregation of the sexes during any phase of their annual cycle of distribution (Morse, 1981). The paucity of males greater than twenty two inches is the result of a differential growth rate between the sexes and a greater maximum age for females (Poole, 1964; Smith and Daiber, 1977). Female summer flounder may live up to 20 years, but males rarely exceed 7 years (USDC, 1986c).

5.3.5. Length at Maturity

The length at which 50% of the fish are mature (L_{50}) was estimated by Morse (1981) as 9.7" for males and 12.7" for females (Table 17). The smallest mature male was 7.5" and the largest immature was 15.7". Females began maturing at 9.8" and the largest immature was 17.3". The range of L_{50} for males and females indicate sexual maturity is attained at age 2 (Morse, 1981).

The L_{50} of males and females varied during the six year study of Morse (1981). No consistent general trend in L_{50} was evident as males and females appeared to exhibit independent changes (Table 17).

5.3.6. Fecundity and Reproductive Strategy

Fecundity of summer flounder is relatively high. Morse (1981) calculated fecundity estimates ranging from 463,000 to 4,188,000 eggs for fish between 14" and 27". Fecundity and length exhibit a curvilinear relationship, but with logarithm transformations, Morse (1981) expressed the relationship as:

$$\log_{10} \text{Fecundity} = \log_{10} a + b (\log_{10} \text{length})$$

The relationships between fecundity and weight and ovary weight were expressed by Morse (1981) as:

$$\text{Fecundity} = a + bX$$

The intercept (a) and slope (b) values for the equations are listed in Table 18.

Morse (1981) found no significant differences in summer flounder fecundity relationships among the six years of his study. The correlation coefficients indicate both length and weight provide adequate predictions of fecundity. Approximately 75% of the variation in fecundity was associated with changes in length or weight.

The relative fecundity, number of eggs produced per gram of total weight of spawning female, ranged from 1,077 to 1,265 in Morse's (1981) study. The increase of variability in fecundity estimates as weight increases tends to obscure the true relationship. The high egg production to body weight is maintained by serial spawning, i.e. batches of eggs are shed rather than all eggs shed at one time. In fact, the weight of annual egg production, assuming an egg diameter of 0.04" and 1.0 specific gravity, equals approximately 40 to 50 percent of the biomass of spawning females (Morse, 1981).

The reproductive strategy of summer flounder tends to maximize reproductive potential and avoid catastrophe. The strategy is a combination of extended spawning season with variable duration, early maturation (age 2 or 3), high fecundity, serial spawning, and extensive migrations across the continental shelf during spawning. The half year spawning season reduces larval crowding and decreases the impact of predators and adverse environmental conditions on egg and larval survival. The migration pattern disperses the eggs over large areas of the shelf and probably aids in maintaining spawning fish in areas where bottom temperatures are between 54 and 66° F (Smith, 1973). The October/November spawning peak coincides with the breakdown of thermal stratification on the continental shelf and the autumn plankton production maximum which is characteristic of temperate ocean waters of the northern hemisphere. Thus the timing of peak spawning assures a high probability of adequate larval food supplies (Morse, 1981).

5.3.7. Mortality

Knowledge of mortality is essential for management of most fisheries. In practice, mortality is generally divided into fishing mortality (removals by man) and natural mortality (predation, disease, accident and everything else). Natural mortality is extremely difficult to measure in oceanic fishes and is generally derived by subtraction of fishing mortality estimates from the total mortality estimate.

Fogarty (1981) estimated that the instantaneous rate of mortality from NMFS survey data ranged from 0.67-1.35 for females and from 0.87-2.85 for males. The instantaneous rate of mortality estimate for males collected in 1978 (2.85) appeared unreasonably high and probably was due to sampling variability. To reduce the effect of variable year class strength, age composition data were pooled over years of collection. Calculated pooled instantaneous mortality rates for females and males were 0.93 and 1.11, respectively. The higher estimate for males is of interest since it has been suggested that the absence of male fish older than age 7 may be due to higher natural mortality rates (Poole, 1966 and Chang and Pacheco, 1976). Henderson (1979) reported estimates of Z for summer flounder ranging from 0.53-1.42.

More recently, age composition of survey and commercial catch of summer flounder sampled during 1973 through 1981 was employed to derive estimates of the instantaneous rate of total mortality (USDC, 1986c). Age composition data were available for spring surveys from 1976 through 1983; provisional age determinations also have been made for a limited number of samples from fall surveys conducted in 1984 (n = 154) and 1985 (n = 147). Mean catch per tow was calculated using the smoothed (Pennington, 1986) survey index. The smoothed index was used to minimize fluctuations between years caused by random changes in catchability and thus allow more reliable tracking of cohorts. Catch per tow at age for spring offshore surveys from 1976 through 1983 was calculated by expanding length frequency data from a given cruise using age length keys derived from the same cruise. Length frequencies for 1984, 1985, and 1986 spring surveys were expanded using age length keys from the previous year's fall survey on the assumption that minimal growth occurred during the fall and winter spawning season. To test this assumption, the age length keys for 1, 2, and 3 year olds were compared between the fall 1982 survey and the spring 1983 survey using an analysis of variance (USDC, 1986c.) No effect of season was found, nor was mean length at age significantly different between the fall and subsequent spring. In contrast, significant effects of year were found when fall age length keys for 1983, 1984, and 1985 were compared.

To standardize for annual variations in effort in the commercial fishery, commercial catch at age data for each year were divided by total effort (tonnage classes 2, 3, and 4 otter trawlers in which at least 5% of the catch was summer flounder) for the year. This provided an estimate of catch per unit effort at age which was used in the catch curve analysis (USDC 1986c).

Assuming an M, or instantaneous rate of natural mortality (the instantaneous rate of deaths attributable to all causes except fishing) of 0.2 (USDC, 1986c) current levels of F, or the instantaneous rate of fishing mortality are on the order of 0.65 to 0.70 (USDC, 1986c). In general, estimates of total mortality based on commercial and survey data corresponded well (Table 19). Mortality has been highest on the 1975, 1979, and 1980 year classes (USDC. 1986c). The estimate of Z, or the instantaneous rate of mortality (the ratio of numbers of deaths per unit of time to the population abundance during that time) for 1976 based on survey data (Z = 0.375) appears unreliable, as the coefficient of determination was low relative to the other years (r^2 = 0.58).

Available mortality estimates derived from tagging studies yield estimated instantaneous rates of fishing mortality (F) for two experiments conducted off southern New England of 0.48 and 0.62 for Nantucket Sound and Pt. Judith releases respectively; where recovery rates were 41% for Nantucket Sound and 50% for Pt. Judith. A total of 6,669 summer flounder were tagged in four experiments off New Jersey during 1960-67 with an overall recovery rate of 28%. Estimates of F ranged from 0.24-0.58 in these experiments (Table 20). Examination of the seasonal pattern of tag recoveries for experiments conducted in southern New England and New Jersey clearly indicate the influence of migratory activity and the seasonal distribution of fishing effort on tag returns. Summer flounder were tagged in Nantucket Sound and Block Island Sound immediately prior to the offshore autumn migration (Lux and Nichy, 1980). Return rates declined sharply after the initial 30 day interval for Block Island Sound releases while recoveries remained uniformly low for Nantucket Sound fish during the first 90 days at large. Returns subsequently increased in both experiments as fish became available to the offshore winter trawl fishery (January through April) and again after 270 days at large, following the inshore migration when the fish were vulnerable to inshore trawlers and recreational fishermen.

5.3.8. Yield Per Recruit

Calculations of YPR, or yield per recruit (per unit weight of recruits) were made using the Thompson-Bell (Ricker, 1975) method for each sex (USDC,1986c). Mean weight at age was estimated using the growth rate information from NEFC spring and fall bottom trawl surveys from 1976-1983. Estimates of spawning biomass per recruit for females were made using maturity estimates of Morse (1981). A constant natural mortality rate of 0.2 was used for both sexes. For all calculations, it was assumed that age two fish are fully recruited to the fishery and that 25% of age 1 fish are recruited. Yield per recruit was maximized at F = 0.44 for male summer flounder ($F_{0.1}$ = 0.26, where $F_{0.1}$ is the rate of fishing mortality for a given method of fishing at which the increase in yield per recruit for a small increase in fishing mortality results in only one-tenth the increase in yield per recruit for the same increase in fishing mortality from a virgin fishery) and F = 0.26 for females ($F_{0.1}$ = 0.16). The decrease in yield per recruit as the instantaneous rate of fishing mortality increases, is much less for males (Figure 9) than it is for females (Figure 10).

Spawning stock biomass per recruit declined markedly with increasing fishing mortality on females (Figure 11). The spawning stock biomass per recruit concept allows egg production for the population to be directly linked with F. Egg production is highest without any F and can be increased by decreasing or delaying mortality. —The spawning stock biomass per recruit consistently increases with increases in the minimum legal size limits at the $F_{0.1}$ level (Table 21). Both F and the minimum size change concurrently at both F_{max} and $F_{0.1}$ (Fogarty, pers. comm.). The pattern for $F_{0.1}$ is more consistent because $F_{0.1}$ is not changing as rapidly as F_{max}, and, therefore, the changes in minimum size have a greater influence on the pattern of spawning stock biomass per recruit (Table 21). Given the current F estimate of 0.65, a minimum size limit of 13" would produce a YPR estimate for males of 0.8220 lb and a 14" minimum size would yield a YPR of 0.8651 lb. For females, with an F estimate of 0.65, the YPR estimates would be 1.0959 lbs for a 13" minimum size and 1.1541 lbs for a 14" minimum size. The corresponding spawning stock biomass per recruit estimates for females would be 2.6610 lbs and 2.8808 lbs for 13" and 14" minimum sizes, respectively (Fogarty, pers. comm.).

Estimates of F_{max} for males and females presented in USDC (1986c) were generally consistent with the ranges specified in Fogarty (1981) in a sensitivity analysis for summer flounder based on a more restricted set of growth data. Fogarty (pers. comm.) evaluated yield per recruit for summer flounder with various minimum legal size limits (Table 22). The optimal levels (as defined in Gulland and Boerema (1973) (as occurring when the value of the marginal yield is equal to the marginal costs of a unit of effort) of fishing mortality ($F_{0.1}$) are considerably lower for females than for males. At a minimum size of 14" the $F_{0.1}$, or optimal level of fishing, for females is 0.16 (Fogarty, pers. comm.).

5.3.9. Predator/Prey and Species Coexistence

Summer flounder are active, voracious feeders with fish making up a very significant part of their diet. They are most active during daylight hours and may be found well up in the water column as well as on the bottom (Olla *et al.*, 1972). Included in their diet are: winter flounder, northern pipefish, Atlantic menhaden, bay anchovy, red hake, Atlantic silverside, American sand lance, bluefish, weakfish, mummichog, rock crabs, squids, shrimps, small bivalve molluscs, small crustaceans and snails, marine worms and sand dollars (Bigelow and Schroeder, 1953 and Poole, 1964).

All of the natural predators of adult summer flounder are not fully documented, but larger predators such as large sharks, rays, and goosefish probably include summer flounder in their diets. Larval and juvenile summer flounder undoubtedly are preyed upon until they grow large enough to fend for themselves. Results of food habit studies by NMFS from 1969-72 showed that Pleuronectiformes occurred in the stomachs of the following fish eating species: spiny dogfish, goosefish, cod, silver hake, red hake, spotted hake, sea raven, longhorn sculpin, and fourspot flounder (Bowman *et al.*, 1976). These data do not indicate the proportion of summer flounder among the flatfish prey but it is likely they are represented.

A brief review of dealer sales slips for New England and New Jersey by Henderson (1979) showed that summer flounder catches also included mixed groundfish, winter flounder, *Loligo*, scup, black sea bass, conchs, tilefish, and witch flounder. Similarly, the major species in the catch from the Virginia winter trawl fishery for the years 1929-59 were: summer flounder, black sea bass, scup, and croaker (Eldrige, 1962).

The composition and distribution of fish assemblages in the Middle Atlantic Bight was described by Colvocoresses and Musick (1979) by subjecting NMFS bottom trawl survey data to the statistical technique of cluster analyses. Summer flounder, scup, northern sea robin, and black sea bass, all warm temperate species, were regularly classified in the same group during spring and fall. In the spring this group was distributed in the warmer waters on the southern shelf and along the shelf break at depths of approximately 500 ft. During the fall this group was distributed primarily on the inner shelf at depths of less than 200 ft where they were often joined by smooth dogfish.

The ecological relationship between juvenile summer flounder and southern flounder was studied by Powell and Schwartz (1977) in North Carolina estuaries. The spatial distribution of the two species relative to each other appeared to be related to the salinity gradient. Southern flounder were dominant at low salinities (less than 11 ppm) while summer flounder were dominant at intermediate to high salinities (12-35 ppm). In a study of meroplankton in North Carolina estuaries, Williams and Deubler (1968) found that the distribution of gulf flounder was also controlled by salinity to some degree, finding the species only in salinities ranging from 22-35 ppm. Benthic substrate also appeared to influence summer flounder and southern flounder distributions. Summer flounder were dominant in sandy substrates while southern flounder were dominant in muddy substrates (Powell and Schwartz, 1977).

5.3.10. Parasites, Diseases, Injuries, and Abnormalities

The parasites of the summer flounder have not been studied extensively (MacPhee, 1975), but Wilson (1932) mentions that they are afflicted with the fish lice *Argulus laticauda* and *Argulus megalops* and the copepods *Acanthocandrea galerita* (Rathbun) and *Lepioptheirus edwardsi*.

Mahoney *et al.* (1973) described a fin rot disease which affected summer flounder in the New York Bight. External signs of the disease were fin necrosis, skin hemorrhages, skin ulcer, and occasional blindness. In summer flounder necrosis usually began on dorsal and anal fins. The agent of the disease was apparently bacterial. Summer flounder in captivity also suffer from vibriosis, occurring when they are exposed to stressful conditions such as high temperatures, overcrowding, and dirty water (MacPhee, 1975).

Abnormalities in summer flounder include incomplete ambicoloration, total ambicoloration, incomplete eye rotation, and hooked dorsal fin (Hussakof, 1914; Gudger, 1935 and 1936; Pearson, 1932; Deubler and Fahy, 1958; White and Hoss, 1964; and Powell and Schwartz, 1972).

5.4. MAXIMUM SUSTAINABLE YIELD

There are no generally accepted, current, numeric estimates of maximum sustainable yield (MSY) for summer flounder. According to the Magnuson Act the contents of FMPs are to include estimates of MSY (section 303.a.3) and MSY is defined as: "MSY, a theoretical concept, is the largest average annual catch or yield that can be taken over a period of time from each stock under prevailing ecological and environmental conditions. It may be presented as a range of values. One MSY may be specified for a related group of species in a mixed-species fishery. Since MSY is a long-term average, it need not be specified annually." (48 *FR* 7409). Usually MSY is perceived as a numeric point estimate but the National Standards Guidelines (48 *FR* 7409) state: "The determination of OY requires a specification of MSY. However, where sufficient scientific data as to the biological characteristics of the stock do not exist, or the period of exploitation or investigation has not been long enough for adequate understanding of stock dynamics, or where frequent large-scale fluctuations in stock size make this concept of limited value, the OY should be based not on a fabricated MSY but on the best scientific information available." National Standard 2 of the Magnuson Act states: "Conservation and management measures shall be based upon the best scientific information available."

An MSY estimate based on stock size estimates for summer flounder north of Cape Hatteras was calculated by Chang and Pacheco (1975). This estimate does not seem appropriate for this FMP mainly because of the numerous weaknesses in the data: (1) the lack of good effort data in the recreational surveys prior to 1979, (2) the lack of complete identification of summer flounder in some of the commercial catch for some States until as recently as 1978, (3) the availability of the NMFS spring bottom trawl survey only since 1968, (4) the very restricted age composition data that were available and (5) the current general belief that summer flounder abundance was very low during 1967 through 1974 which was the period for analyses. Chang and Pacheco (1975) were aware of the many difficulties and label their analysis "preliminary". This numeric estimate was not used in the ASMFC (Scarlett, 1981) summer flounder FMP where it was stated: "At the present time, adequate information is not available to determine stock size." Several of the reasons for not fully supporting the 20,000 mt MSY estimate (Chang and Pacheco, 1975) developed more than a decade ago will be addressed below.

First, there appears to be significant variability in year class strength of summer flounder as detected in the official government commercial landing statistics (Table 1). In an historical summary of the flounder fisheries of New York Bight, McHugh (1977) noted that the summer flounder, which is the principal species in New Jersey flounder landings, had reached peak levels in the 1950s and then declined drastically in the 1960s. Although population estimates are not available for that period, it is apparent that abundance estimates had declined significantly, particularly in the northern part of the Bight. For example, landings in Massachusetts showed a precipitous decline, from 6 million lbs in 1957 to only 41,000 lbs in 1970 (Table 1). Total landings, especially for a limited area like a State, are not completely useful in identifying year class strengths because of annual potential variability in effort. It is, however, very important to note that commercial landings for North Carolina and north between 1967 and 1974 averaged 12.5 million lbs whereas for the same area for the most recent eight year time period averaged 31.9 million lbs (Table 1). The 1979 commercial landings reached an all time high of nearly 42 million lbs, which by itself approaches the Chang and Pacheco (1975) numeric estimate of MSY (44 million lbs). (Commercial landings comprise 50 to 60% of the total harvest annually.) Chang and Pacheco (1975) conclude their paper with the speculation that: "The 1974 combined fishery harvest of 27 thousand metric tons is over our estimate of a sustainable level." (Twenty seven thousand metric tons equals 60 million lbs) It must be remembered that MSY represents a long-term average and that landings are expected, therefore, to fluctuate both above and below MSY.

Significant fluctuations in year class strength also appear detectable in the NEFC spring bottom trawl surveys, which began in 1968 (Table 5). The number per tow from the spring survey (spring surveys are considered the most reliable indicators of biomass because summer flounder are concentrated in offshore areas during spring surveys and are more consistently available to the gear than in the fall) averaged 0.30 individuals per tow during the time period the numeric MSY was developed, but increased to an average of

1.67 individuals per tow for the four year period immediately after 1974 (Table 5). The seven year mean prior to 1985 was 0.93 individuals per tow (Table 5). The key point is that for species with variable recruitment data are needed from periods covering both highs and lows, and these were not available at the time of Chang and Pacheco's assessment (1975) and a long and varied time series is just now beginning to become available.

Chang and Pacheco (1975) used the 1965 and 1970 national recreational fishing surveys and interpolated the annual recreational catch estimates from those two surveys. Fogarty (1981) cautioned evaluating the MSY estimate based upon these recreational data. Since 1979 the Marine Recreational Fishery Statistics Survey (MRFSS) has been conducted annually. These newer estimates of recreational catch and effort have only recently become available and need to be fully explored and incorporated into any new calculations of the status of summer flounder.

Data were lacking or limited for several of the critical life history characteristics of summer flounder before the Chang and Pacheco paper. Many of these features did not become well defined until the fairly definitive paper by Morse in 1981. For example, the age composition of the catch used by Chang and Pacheco (1975) was derived from samples collected from 1966 through 1968 in Delaware Bay only. There are now extensive age composition data for summer flounder commercial landings available from 1976 through 1983 and 1984 through 1986 samples are being analyzed. It now also appears possible to incorporate the age composition of the recreational catch for the first time ever. With adequate age composition data, more robust stock assessment methodologies such as virtual population analysis can be attempted. Chang and Pacheco (1975) fully recognized these limitations to their data because in their discussion section they recommended: "Better information of effort and age characteristics from both commercial and recreational landings is needed".

Although no attempts are being made here to totally dismiss the general concept of MSY, there is no merit in embracing the only published numeric estimate of MSY (Chang and Pacheco, 1975). Methodologically, Chang and Pacheco (1975) used a valid stock assessment approach and used the only data available to them, however with the data that will be developed from some of the efforts currently underway, a more robust methodology such as virtual population analysis will be possible. Better commercial landings data and a longer series of NEFC bottom trawl surveys are now available for the detection of year class strength. Extensive annual recreational catch data are now available and need to be used in any assessment. In addition to the better catch estimates from the recreation survey, there are estimates of effort which may require a substantial amount of further exploration in order to detect any trends. Evaluation of the impacts caused by the changes in the trawl gear in 1985 and 1986 is underway and should be completed within a year. To the extent possible, ageing of scales collected from the recreational surveys and the 1984 through 1986 commercial fishing sampling program will be undertaken during the next year and should provide invaluable information for assessment methodologies. Thus, it is possible that a valid quantification of the summer flounder MSY can be developed. However, because of the problems in the fishery (section 4.2), the Council has concluded that management of the summer flounder fishery must be considered as soon as possible. Since no valid estimate of MSY currently exists, the Council will proceed without an estimate of MSY and will reexamine this issue and amend the FMP as appropriate.

5.5. PROBABLE FUTURE CONDITION

In a very general, simplistic sense the future condition of a stock is dependent upon the recruitment, growth, natural mortality and fishing mortality that the current stock is undergoing. The following paragraphs will summarize the germane parameters from the above discussion and project where the future stocks will be in relation to the current fishery.

Total US commercial landings of summer flounder from North Carolina and north peaked in 1979 at nearly 42 million lbs (Table 1). The reported landings in 1984 of slightly over 40 million lbs, were the second highest landings ever and even though the landings in 1985 declined nearly 5 million pounds from the previous year, they were still among the 5 highest landings ever. Since 1979, 70 percent of the reported commercial landings of summer flounder have come from the EEZ (Table 2).

Estimated recreational catch of summer flounder in 1985 was 20.6 million lbs (Table 3). Estimated recreational catch derived from MRFSS has averaged 32 million pounds and has ranged from 16.7 to 54.5 million lbs. No consistent annual pattern is discernible.

Bottom trawl surveys conducted by NMFS during the spring are used to provide indices of abundance. Stratified mean catch per tow was relatively low during the late 1960s and early 1970s, increased during the mid 1970s and then declined again during the late 1970s and early 1980s (Table 4). Considerable fluctuations have been evident since 1978.

Spring biomass indices were significantly correlated with commercial landings. Catch per effort for tonnage class 2 vessels ranged from a low of 0.44 in 1970 to a high of 1.20 in 1974. The CPUE remained relatively constant from 1977 through 1982, increased slightly in 1983 and 1984, and then declined to its lowest level since 1972 in 1985 (Table 8).

Estimates of catch at age for commercial landings were available for 1976 through 1983 (Table 15). Ages 1 through 4 comprised 94% of the landings, with ages 2 and 3 predominating. During 1980 through 1983, the contributions of age 3 and 4 fish declined from 49% to 28%, while the proportions of age 1 and 2 fish increased from 46% to 66%.

Female summer flounder grow more quickly than their male counterparts and are consistently larger than males at any given age except for the first few months after hatching. Recent estimates of parameters of the von Bertalanffy growth equation yield maximum size of male and female summer flounder as 26 and 33 inches respectively. No significant difference from a 1:1 sex ratio was found by Morse (1983) in his examination of 4551 summer flounder greater than 8" (Table 16). The length at which 50% of the fish are mature (L_{50}) was estimated as 9.7" for males and 12.7" for females (Table 17). Fecundity of summer flounder is relatively high with some estimates exceeding 4 million eggs. At the current population levels of summer flounder, there is no detectable stock recruitment relationship (Musick, pers. comm.).

The reproductive strategy of summer flounder tends to maximize reproductive potential and avoid catastrophe. The strategy is a combination of extended spawning season with variable duration, early maturation (age 2 or 3), high fecundity, serial spawning, and extensive migrations across the continental shelf during spawning. The half year spawning season reduces larval crowding and decreases the impact of predators and adverse environmental conditions on egg and larval survival. The migration pattern disperses the eggs over large areas of the shelf and probably aids in maintaining spawning fish in areas where bottom temperatures are ideal. The timing of peak spawning assures a high probability of adequate larval food supplies.

Knowledge of mortality is essential for management of most fisheries. Assuming an instantaneous rate of natural mortality of 0.2, current levels of the instantaneous rate of fishing mortality are on the order of 0.65 to 0.70.

Yield per recruit is maximized at $F = 0.44$ for male summer flounder ($F_{0.1} = 0.26$) and $F = 0.26$ for females ($F_{0.1} = 0.16$). The optimal levels of fishing mortality ($F_{0.1}$) are considerably less for females than for males. Spawning biomass per recruit declines markedly with increasing fishing mortality on females (Figure 11).

Analyses indicate that yield per recruit and long term yield can be increased significantly by increasing the minimum size of fish caught and reducing fishing mortality. The $F_{0.1}$ level of fishing mortality for females (0.16) corresponds to a 14" size limit (Table 22).

In summary, summer flounder are characterized by apparent large natural fluctuations in year class strength. The complete causes of these fluctuations are uncertain. Current harvesting of summer flounder is at or near the all time high, with more and more effort directed at this species annually (Section 7). The age composition of the catch is becoming greatly compressed around very young fish. A stock recruitment relationship has not been detected. Without question, yield per recruit and long term yield can be increased significantly. Increasing the minimum size of fish caught and reducing fishing mortality would provide some stability to the fishery by insuring more than one year class in the catch.

6. DESCRIPTION OF HABITAT

6.1. HABITAT REQUIREMENTS AND HABITATS OF SUMMER FLOUNDER

6.1.1. Habitat Requirements

Summer flounder range from the Gulf of Maine south to Florida with the greatest concentration of fish south of Cape Cod (section 5.1). Morphometric and meristic characteristics of summer flounder provide evidence of two distinct populations (Wilk *et al.*, 1980 and Fogarty *et al.*, 1983). The Middle Atlantic Bight population includes fish found between New England and Cape Hatteras whereas the South Atlantic Bight population consists of fish south of Cape Hatteras. Cape Hatteras provides a natural zoogeographical barrier that minimizes intermixing of the two populations (Turek, pers. comm.).

The adult summer flounder migrate seasonally, occupying both deeper waters of the Outer Continental Shelf and coastal, estuarine areas along the Atlantic coast. During late fall and winter months, summer flounder remain in shelf waters ranging in depth from 150 to 500 ft (Bigelow and Schroeder, 1953). Primary wintering grounds occur between Baltimore and Veatch Canyons east of New Jersey and Rhode Island, respectively, although they are known to migrate as far northeast as Georges Bank. Summer flounder in their southern range are believed to undertake less extensive offshore migrations due to the relative proximity (30 miles) of the continental shelf break and less drastic temperature extremes (Fogarty *et al.*, 1983). Tagging studies have also revealed that some adult fish remain permanent residents in the northern segment of the Mid-Atlantic Bight (Lux and Nichy, 1980), as well as year round residents in Delaware Bay (Smith and Daiber, 1977).

Adult summer flounder migrate to coastal, inshore waters in April through June. In Delaware Bay, the greatest number of fish were captured from the shoreline to a maximum depth of 75 feet in May and September (Smith and Daiber, 1977). Optimal habitat areas are shallow coastal waters with higher salinities and sandy sediments, where they prefer inlets and locations of transitional current velocity or wave action (Powell and Schwartz, 1977).

Tagging studies conducted by Lux and Nichy (1981) on summer flounder released off southern New England coastal waters revealed that fish began seaward migrations in September and October. Recaptures demonstrated that adults migrated as far as 140 miles eastward to Veatch Canyon and 210 miles southward to the Baltimore Canyon area.

Spawning habitat is located offshore between Cape Cod, Massachusetts, and Cape Lookout, North Carolina, with the most productive areas off New York and New Jersey. Spawning begins in September in the northern segment and progresses through February south of Chesapeake Bay (Smith, 1973). Optimal spawning areas have bottom water temperatures between 53 and 66 F and salinities between 32 and 35 ppt (Smith,1973). Summer flounder eggs occurred in greatest concentrations during October approximately 30 miles off the New Jersey coast (Smith *et al.*, 1975). Centers of egg production also were found 35 miles off the Virginia coast in December (Smith, 1973).

Summer flounder larvae enter estuarine areas soon after hatching from February through April. Larvae are usually found at salinities greater than 8 ppt and temperatures greater than 50 F (Rogers and Van Den Avyle, 1983). Bay areas along the Virginia and North Carolina coastline are believed to be principal nursery habitat for young of year flounder. Orth and Heck (1980) determined that post larvae utilize eel grass (*Zostera*) beds of the lower Chesapeake Bay as principal habitat areas. Juvenile flounder were found to concentrate in sea grass beds during late summer and fall, whereas earlier in the year the fish were more randomly dispersed in the bays (Weinstein and Brooks, 1983). Post larval summer flounder, collected in North Carolina estuaries, have been found in waters ranging in salinities from 0.02 to 35 ppt, with optimal conditions at 18 ppt, and temperatures from 46 to 59 F (Williams and Deubler, 1968). Juveniles remain in estuarine habitats for approximately 18 to 20 months before migrating into oceanic waters after their second autumn (Turek, pers. comm.).

6.1.2. Habitats of Summer Flounder

Open ocean areas of the continental shelf that are used for spawning (Figure 1) are critical for summer flounder survival. Estuaries and inshore oceanic water habitats are also critically important to the life cycle of summer flounder. Since these areas are utilized for summer feeding by adults and as nurseries by juveniles, any major alteration of these habitats could disrupt the life cycle of summer flounder.

Summer flounder larvae begin development at sea, then move into estuaries (Williams and Deubler, 1968). Poole (1966) stated that published and unpublished reports indicate primary nursery grounds for juveniles are the sounds of North Carolina, Chesapeake Bay, and the bays of the eastern shore of Virginia; however, they are distributed in spring, summer, and fall in estuaries from Massachusetts to North Carolina. Early juvenile stages of summer flounder have been captured only in estuaries, suggesting estuarine-dependence. Their tolerance to wide ranging temperatures and salinities further suggests that they are physiologically adapted to estuarine nursery grounds (Smith, 1973).

The Council, attempting to coordinate and obtain the best information available, requested each State from North Carolina to Maine to identify the critical summer flounder habitat under their jurisdiction. The following paragraphs are paraphrased from the responses of the States' summer flounder experts.

Summer flounder habitats vary with life stage; the most important habitats are the spawning areas on the continental shelf (Figure 1) and coastal areas that also serve as nursery and feeding areas. Migratory pathways are recognized as important habitat because of the range of environmental conditions and contaminants to which summer flounder are exposed.

Important habitat in North Carolina for summer flounder was identified by Street (pers. comm.), who agreed with the studies of Powell and Schwartz (1977). They found that summer flounder were most abundant in the relatively high salinities in the eastern and central parts of Pamlico Sound, all of Croatan Sound, and around inlets. Powell and Schwartz (1977) also noted that summer flounder were most abundant in areas with a predominantly sandy substrate, or where there was a transition from fine sand to silt and clay. Street (pers. comm.) mentioned that summer flounder distribution changes in response to salinity changes. In dry years the area of higher salinity greatly expands in Pamlico Sound, and nursery areas similarly expand.

The most important nursery areas for summer flounder in Virginia appear to be in the lagoon system behind the barrier islands on the seaside of the Eastern Shore, and the shoal water flat areas of higher salinity (greater than 18 ppm) in lower Chesapeake Bay (Musick, pers. comm.). Young of the year enter these nursery areas in early spring (March and April) and remain there until fall when water temperatures drop. Then these yearlings move into the deeper channel areas and down to the lower Bay and coastal areas. In most winters these age 1+ fish migrate out in the ocean but in warmer years some may remain in deep water in lower Chesapeake Bay (Musick, pers. comm.). In addition to the use of Virginia habitats by summer flounder for nursery areas, sub-adults and adult flounder use the Eastern Shore seaside lagoons and inlets and the lower Chesapeake Bay as summer feeding areas. These fish usually concentrate in shallow warm water at the upper reaches of the channels and larger tidal creeks on the Eastern Shore in April, then move toward the inlets as spring and summer progress. They are most abundant in the ocean near inlets by July and August. In Chesapeake Bay, the summer flounder first arrive in numbers in mid-April then remain in the Bay till late September or early October (Musick, per. comm.).

Maryland's coastal bays, rich in benthic invertebrates which form the bulk of young of year food sources, are excellent summer flounder habitat (Casey, pers. comm.). Casey (pers. comm.) indicated that in areas where notable pollution exists, a lack of proper food sources preclude the presence of summer flounder. Areas which lack sufficient water circulation appear to have considerably reduced populations. Shoreside development and resultant runoff also appear to have reduced some local populations (Casey, pers. comm.). Since the early 1970s, Maryland has been conducting trawl and seine surveys around Ocean City inlet. Casey (pers. comm.) reports that in 1986, catches have been larger than previous years by a factor of at least 50%. The majority of the summer flounder taken in this sampling are between 3" and 4", with larger fish basically absent. Summer flounder are sometimes found in Maryland's portion of the Chesapeake Bay with the majority of these fish in the 8" to 12" range.

Delaware Bay is an important nursery and summering area for both juvenile and adult summer flounder (R. Smith, pers. comm.). When post- larvae are carried into Delaware's waters during early spring, they remain and grow, sometimes into their second year. Juvenile summer flounder (ages 1 and 2) have been captured in Delaware Bay during all months of the year, however they are most common from April to November, as are the adults (R. Smith, pers. comm.). Delaware's coastal bays are used by summer flounder as nursery and summering areas, but their overall importance is not well documented. Young of year flounder are often found in shallow shore zones, and, thus, shoreline development potentially could have negative impacts.

The total contribution of New Jersey's estuaries from Sandy Hook Bay to Delaware Bay as nursery areas cannot presently be estimated, but it is assumed that these estuaries do provide viable nursery habitat during some years (Freeman, pers. comm.). Tagging studies by Murawski (1970) provided recaptured summer flounder from the entire New Jersey coastline (Figure 12). Summer flounder overwinter offshore of New Jersey in 100 to 600 ft of water. Freeman (pers. comm.) therefore states that all of the ocean waters off New Jersey to the 600 foot line should be considered critical habitat for migratory pathways, spawning, and overwintering.

Poole (pers. comm.) reports that the estuarine areas of New York are not critical to the summer flounder. Young of year and one year olds occur very infrequently or in extremely limited locations. Adult summer flounder use New York's waters extensively for summer feeding.

Summer flounder migrate from offshore, overwintering grounds to inshore waters of Connecticut in late April and early May (E. Smith, pers. comm.). During the summer months, summer flounder inhabit shallow tidal inshore areas, such as bays, coves and river mouths.

Rhode Island waters provide summer feeding and nursery grounds (Lynch, pers. comm.). Summer flounder begin arriving in coastal waters in mid to late April. As water temperatures increase, summer flounder move into Narragansett Bay, the Sakonnett River, and Little Narragansett Bay. Emmigration from Rhode Island waters occurs during October (Lynch, pers. comm.).

Summer flounder in Massachusetts migrate inshore in early May to their spring and summer feeding grounds that consist of the entire shoal area south of Cape Cod and Buzzards Bay, Vineyard Sound, Nantucket Sound, and the coastal waters around Martha's Vineyard (Figure 13). In some years summer flounder are found along the eastern side of Cape Cod and as far north as Provincetown by early May. Summer feeding grounds also include the shoal waters in Cape Cod Bay (Howe, pers. comm.). Massachusetts considers the shoal waters of Cape Cod Bay and the region east and south of Cape Cod, including all estuaries, bays, and harbors thereof, as critically important habitat (Howe, pers. comm.). Summer flounder begin moving off shore in late September and October. Howe (pers. comm.) believes that spawning occurs within territorial waters south of Cape Cod because occasional ripe and running fish have been taken there (Figure 13). Summer flounder are regularly taken in southern Massachusetts waters as late as December, presumably as fish are dispersing to offshore wintering grounds. In most years the wintering grounds are well out on the continental shelf from approximately Veatch's Canyon to Baltimore Canyon. The winter of 1985-86 was unusual with anomalous overwintering occurring nearshore (Figure 13). Howe (pers. comm.) states that in years following a build up in the local adult summer flounder population (1974-76 and 1982-85), comparatively "strong" cohorts, represented by age 0+ flounder, have been captured in early summer in estuaries along the southern shore of Cape Cod and in Buzzards Bay. Thus local nursery grounds are recipients of young fish from a northern spawning. Massachusetts considers their coastal embayments as primary nursery grounds and of critical importance in augmenting the more traditional sources of recruits from the "offshore stock".

Summer flounder in New Hampshire are not abundant (Nelson, pers. comm.). New Hampshire does consider various estuaries important as food sources for visiting adults, and possibly as nursery areas for juveniles.

In Maine, summer flounder is regarded as a straggler in the Gulf of Maine (Honey, pers. comm.).

6.2. HABITAT CONDITION

Summer flounder are exposed to a range of environmental conditions and contaminants during their life history. Recent assessments made by the Ocean Pulse and Northeast Monitoring Programs indicate extensive, detrimental amounts of toxic organic and inorganic contaminants, such as heavy metals, PCBs, and petroleum hydrocarbons in the various physical compartments of the marine ecosystem (Boehm and Hirtzer, 1982; Boehm, 1983; Pearce, 1979; Reid *et al.*, 1982). This is particularly true for sediments in the Mid-Atlantic Bight that receive contaminated dredged materials, sewage sludge, and industrial wastes. Elevated levels of petroleum hydrocarbons have even been found in small estuaries as far north as Maine. Elevated PCB levels have been found in sediments and biota in Buzzards Bay, in the New York Bight apex, and other places (Reid *et al.*, 1982).

PCBs are suspected carcinogens to humans; however, comprehensive research has not yet been done on the significance of elevated body burdens to the fish themselves, or to reproductive processes and subsequent recruitment of larval, juvenile, and prerecruits to adult fish and shellfish stocks. Laboratory and field effects of a range of organic contaminants have been measured; however, how contaminants such as PCBs affect the behavior, biochemistry, genetics, or physiology of these fish at either the lethal or sublethal levels is not well understood. It is significant that where elevated levels of PCBs have been reported in the marine environment, they have generally been associated with elevated levels of toxic heavy metals, petroleum hydrocarbons, and other contaminants and thus the deleterious effects may be more pronounced.

Most research on the toxicological effects of various contaminants in fish is recent. Many anomalies probably have not been described or their magnitude documented. The Councils encourage fishermen to report or provide fish with tumorous type growths to: Dr. John C. Harshberger, Director, Registry of Tumors in Lower Animals, Smithsonian Institution, Museum of Natural History, Washington, DC 20560 (202-357-2647) or to Mr. Martin Newman, NMFS, Oxford Laboratory, Railroad Ave., Oxford, MD 21654 (301-226-5193).

Coastal areas are vitally important as feeding and nursery grounds for summer flounder. However, population shifts to coastal areas and associated industrial and municipal expansion have accelerated competition for use of the same habitats. It is projected (48 *FR* 53142-53147) that by 1990, 75% of the US population will live within 50 miles of the coastlines (including the Great Lakes). As a result, these habitats have been substantially reduced and continue to suffer the adverse effects of dredging, filling, coastal construction, energy development, pollution, waste disposal, and other human related activities. In the case of wetlands, from 1954 to 1978 there was an average annual loss of 104,000 acres which was a ten fold annual increase in acreage lost between 1780 and 1954 (48 *FR* 53142- 53147). The pressure on coastal and ocean habitats is nowhere greater than in the densely populated, industrialized Northeast. It is obvious that new systems are needed to conserve habitats and living marine resources, while facilitating the completion of necessary, compatible economic developments. Toward this goal, NMFS issued its formal Habitat Conservation Policy in November 1983 (48 *FR* 53142-53147). The goal of the policy is: "to maintain or enhance the capability of the environment to ensure the survival of marine mammals and endangered species and to maintain fish and shellfish population which are used, or are important to the survival and/or health of those used, by individuals and industries for both public and private benefits - jobs, recreation, safe and wholesome food and products". The Habitat Conservation Policy provided impetus to NMFS's Regional Action Plan (RAP) process which is to foster coordinated management and research responses to major habitat conservation issues and problems, and to develop better steps to address them in the future (USDC, 1985b).

The RAP process identified six water management units in the Northeast region (Figure 14). The boundaries of each water management unit (WMU) were established on the basis of the biogeographic consistency of the entire WMU and its distinctness from other WMUs. Each WMU is relatively consistent in its physical and chemical characteristics with normal latitudinal and seasonal variations in temperature, salinity, and nutrient content. The biota include both endemic and migratory species that exhibit normal seasonal fluctuations in species composition, individual population size, and geographic distribution. These six units are: Coastal Gulf of Maine, Gulf of Maine, Georges Bank West to Block Channel, Coastal Middle Atlantic, Middle Atlantic Shelf, and Offshelf (USDC, 1985b).

The Coastal Gulf of Maine WMU encompasses an area bounded seaward by the observable limits of coastal processes, including riverine and estuarine plumes, coastal upwelling and diurnal tidal fluxes. Geographically, the area is bounded on the northeast by the Canadian Border and on the southwest by Cape Cod. This zone is generally marked by steep terrain and bathymetry, joining at a rock bound coastline with numerous isles, embayments, pocket beaches, and relatively small estuaries. Circulation is generally to the southwest along Stellwagen Bank, and finally offshore at Cape Cod. The habitats are presently affected by ocean disposal and effluents from major urban areas, along with significant nonpoint source pollution associated with the various rivers. Continued pressure to fill already depleted marsh and shallow water areas occurs in most parts of the area (USDC, 1985b).

The Gulf of Maine is a semi-enclosed sea of 55,000 square miles separated from the Atlantic Ocean by Browns and Georges Banks. It is an area of five major basins, floored with clays and gravelly silts, and broken by rocky outcroppings, numerous ledges and banks. The circulation is only generally understood: a seasonal clockwise gyre swings around the Gulf and joins the clockwise gyre on the northern edge of Georges Bank. Presently, threats to the area are from the coastal Gulf of Maine and from ships transiting the area (USDC, 1985b).

The Georges Bank West to Block Channel WMU includes Georges Bank, The Great South Channel, and Nantucket Shoals. These areas have similar habitats, biota and hydrographic regimes. Overall, this WMU is highly productive and heavy fishing pressure is exerted on its numerous fish and shellfish. It is threatened by OCS exploratory drilling and by nonpoint source pollution from atmospheric fallout, general circulation patterns, and marine transportation activities (USDC, 1985b).

The Coastal Middle Atlantic WMU encompasses a zone from Cape Cod southwest to Cape Hatteras. The area is characterized by a series of sounds, broad estuaries, large river basins and barrier islands. The predominantly sand bottom is characterized by a ridge and swale topography. The waters of the Coastal Middle Atlantic have a complex and seasonally dependent pattern of circulation. Seasonally varying winds and irregularities in the coastline result in the formation of a complex system of local eddies and gyres. Currents tend to be strongest during the peak river discharge period in late spring and during periods of highest winds in the winter. In late summer, when winds are light and estuarine discharge is minimal, currents tend to be sluggish, and the water column is generally stratified. The Coastal Middle Atlantic provides major habitats for anadromous, estuarine, and endemic species. Migratory species play a major role in this WMU, and make up the predominant stocks in various seasons. Estuaries provide major spawning and nursery areas for many of the endemic and migratory species. These species are presently affected by nonpoint and point sources of pollution from major rivers and urban areas, as well as by direct loss of habitat caused by filling of wetlands, damming and diversion of rivers, and mosquito ditching in marshes (USDC, 1985b).

The Middle Atlantic Shelf WMU covers the area from the Block Island Front southward to Cape Hatteras. The inshore boundary follows the observable limits of coastal processes, primarily estuarine plumes, and lies approximately 30 miles from the coast. This WMU generally is characterized as a sandy plain, with a ridge and swale topography. Numerous submarine canyons intersect this area. The surface circulation over the shelf can be divided into a two celled system, separated at the Hudson Valley. The subsurface and bottom circulation tends to flow in a westerly-southwesterly direction that varies with the passage of weather systems and offshore warm core rings. Hydrographic conditions vary seasonally from vernal freshening and warming, through summer stratification, to fall/winter breakdown and cooling. This WMU has a different faunal composition than the Gulf of Maine or Georges Bank. Fish populations are predominantly migratory, and species composition varies with season. It is threatened by OCS exploratory drilling; by nonpoint source pollution from atmospheric fallout, general circulation patterns, and marine transportation activities; and by ocean disposal of sewage sludge and industrial wastes (USDC, 1985b).

The Offshelf WMU encompasses the zone defined by the mean observable limits of the shelf-slope front seaward to the mean axis of the Gulf Stream. The area is overlain by the Slope Water Regime, a mass of relatively warm saline water having a generally weak circulation to the southwest. The upwelling area along the inner boundary of the shelf-slope front is high in productivity and rich in commercially valuable fish and shellfish. Offshore, the Gulf Stream undulates as it moves to the northeast, forming a dynamic boundary from which warm core rings are borne. These rings spawned at a rate of about eight per year, are about 50 to 100 miles in diameter; they break off east of the area and transit to the southwest, eventually coming in contact with the shelf at southwestern Georges Bank. The passage of each ring marks a major event in the hydrographic regime and may significantly affect the biota of the shelf-slope front and possibly of the shelf itself. Other than ring passages, impacts on the offshelf waters are primarily from nonpoint source pollution from atmospheric fall out, marine transportation, and from point source pollution from dumping at Deepwater Dumpsite 106 and ocean incineration (USDC, 1985b).

Each of the oceanic areas identified in Section 6.1 as important for summer flounder is subject to numerous man caused habitat threats. Rather than spend extensive efforts detailing degradation in individual oceanic systems (an effort generally already being performed by the individual States), this section will broadly address the major types of abuse (i.e., agricultural, urbanization, and industrialization) dominant in the largest, most important areas (i.e., Chesapeake Bay, Hudson River/Long Island Sound, and the New England coast).

Extensive urban development along the western shore of the Chesapeake has resulted in human population and industrial growth at the expense of the natural environment. The Baltimore-Washington-Norfolk corridor is a major demographic region where numerous commercial and industrial activities are centered. These activities have adversely affected the environment through habitat modification and destruction, and the introduction of contaminants in point and nonpoint source discharges. The eastern shore of the bay is primarily agricultural and residential. Uncontrolled agricultural and suburban runoff, however, also introduces significant quantities of sediments, trace metals, and chemicals that degrade water quality.

The Hudson River/Long Island Sound area is heavily urbanized and in parts industrialized or supportive of large-scale agriculture. The middle and upper Hudson River valley and eastern Long Island support extensive agricultural areas and large populations with the associated habitat abuses. The lower portion of the Hudson River area, northern New Jersey, and western Long Island are inhabited by the greatest concentration of people anywhere in the US as well as supporting extensive utility, petro-chemical, and other heavy industry.

The New England coast, since heavily developed, has some of all three major types of abuse. However, the areas are generally localized (i.e., an individual power generating station or urbanized center) and since the estuaries are only used on a limited basis, the abuses do not seem as detrimental as those in the previously mentioned systems.

In summary, the most concise synopsis of the health of the Nation's marine environments can be viewed as that presented in the findings of the Congressional Office of Technology Assessment report (1987):

"• Estuaries and coastal waters around the country receive the vast majority of pollutants introduced into marine environments. As a result, many of these waters have exhibited a variety of adverse impacts, and their overall health is declining or threatened.

• In the absence of additional measures, new or continued degradation will occur in many estuaries and some coastal waters around the country during the next few decades (even in some areas that exhibited improvements in the past).

• In contrast, the health of the open ocean generally appears to be better than that of the estuaries and coastal waters. Relatively few impacts from waste disposal in the open ocean have been documented, in part because relatively little waste disposal has taken place there and because wastes disposed of there usually are extensively dispersed and diluted. Uncertainty exists, however, about the ability to discern impacts in the open ocean."

6.3. GENERAL CAUSES OF POLLUTION AND HABITAT DEGRADATION

6.3.1. General Habitat Degradation Threats

The Council, in efforts to coordinate with NMFS, has adopted the NMFS Regional Action Plan (USDC, 1985b) identified environmental threads as potential issues that may affect the summer flounder habitat.

Estuarine and coastal lands and waters are used for many purposes that often result in conflicts for space and resources. Some uses may result in the absolute loss or long term degradation of the general aquatic environment or specific aquatic habitats, and pose theoretically significant, but as yet unquantified, threats to the biota and their associated habitats. Issues arising from these activities, and the perceived threats associated with them, are of serious concern to the public.

Multiple-use issues are constantly changing, as are the real or perceived impacts of certain activities on living marine resources. The coastal and oceanic activities that generate these issues can threaten living marine resources and their habitats. Threats to resources occur when human activities cause changes in physical habitat, water and sediment chemistry, and structure and function of biological communities.

The Coastal Middle Atlantic and Coastal Gulf of Maine WMU share similar activities that threaten habitats and the well being of living marine resources in estuarine and nearshore areas (USDC 1985b). Likewise, the Gulf of Maine, Georges Bank, Middle Atlantic Shelf and Offshore WMUs share similar activities that threaten the welfare of biota and habitats in offshore areas.

The following discussion identifies and describes each multiple use issue and the potential threats associated with that issue (USDC, 1985b). For the purposes of this discussion, an "issue" is a point of debate or controversy evolving from any human activity, or group of activities, that results in an effect, product, or consequence. Environmental and socio-economic issues remaining to be resolved satisfactorily with regard to their impacts on marine organisms, their habitats, and man developed from the multiple, often conflicting uses of coastal lands and waters.

6.3.1.1. Waste Disposal and Ocean Dumping

The Atlantic Ocean off the northeastern United States has been and continues to be used for the disposal of wastes, including sewage sludge, dredged material, chemical wastes, cellar dirt, and radioactive material. Some waste treatment methods, such as chlorination, pose additional problems to aquatic species. Habitats and associated organisms have been degraded by long term ocean disposal, particularly of sewage wastes. Sewage pollution causes closure of shellfish beds,and occasionally, of public swimming areas. Additional research on the impacts of ocean disposal at deep water dump sites is urgently needed (USDC, 1985b). A very recent potentially serious problem is the at-sea incineration of toxic wastes.

Ocean disposal of sewage sludge, industrial waste products, dredged material, and radioactive wastes degrades water quality and associated habitats. There are three active dump sites for industrial chemical wastes, trace metals, suspended solids, and organic wastes in the New York Bight (Environmental Protection Agency, 1979). The Deep water dump site is 106 miles offshore. Concentrations of heavy metals, pesticides, insecticides, petroleum products, and other toxics all contribute significantly to degradation of waters off the northeastern States. Organic loading of estuarine and coastal waters is an emerging problem. Symptoms of elevated levels include excessive algae blooms, shifts in abundance of algal species, biological oxygen demand (BOD) increases in sediments of heavily affected sites, and anoxic events in coastal waters. Changes in biological components are a consequence of long-term ocean disposal. Harmful human pathogens and parasites can be found in biota and sediments in the vicinity of ocean dump sites. In addition, shellfish harvesting grounds have been closed because of excessive concentrations of pathogenic and indicator species of bacteria.

The deeper waters of the offshore WMUs present a different set of problems, compared with shallower waters, with respect to oceanic currents, warm core rings, and other physical and chemical oceanographic processes. Furthermore, less is known and understood about deep water ecosystems than their shallow water counterparts. It is imperative that studies be undertaken to reveal the fate and role of contaminants in deep water ecosystems, and to refine information about the shelf ecosystem through which these materials may be transported (USDC, 1985b).

6.3.1.2. Coastal Urbanization

Tremendous development pressures exist throughout the coastal area of the Northeast Region. More than 2000 permit applications are processed annually by the NMFS Northeast Region for commercial, industrial, and private marine construction proposals. The proposals range from generally innocuous, open pile structures, to objectionable fills that encroach into aquatic habitats thereby eliminating their productive contribution to the marine ecosystem. The projects range from small scale recreational endeavors to large-scale commercial ventures to revitalize urban waterfronts.

Associated with marine construction are a number of impacts which affect living marine resources directly, and indirectly through habitat loss or modification. Many of these projects are of sufficient scope to singly cause significant, long-term or permanent impacts to aquatic biota and habitat; however, most are small scale causing minor losses or temporary disruptions to organisms and environment. The significance of small scale projects lies in the cumulative effects resulting from the large number of these activities.

Urban construction is not limited to the shore, but upland development,too, which can adversely impact aquatic areas. One of the major problems arising from urban development is the increase in nonpoint source contamination of estuarine and coastal waters. Highways, parking lots, and the reduction in terrestrial vegetation and fringe marshes facilitate runoff loaded with soil particles, fertilizers, biocides,heavy metals, grease and oil products, PCBs, and other material deleterious to aquatic biota and their habitats. Atmospheric emissions resulting from certain industrial processes contain sulphurous and nitrogenous compounds that contribute to acid precipitation, a growing source of concern in some fresh water sections of tidal streams. Nonpoint pollution is incorporated in water, sediments, and living marine resources. Although nonpoint sources of pollution do not usually cause acute problems, they can contribute to subtle changes and increases of contaminants in the environment (USDC, 1985b).

As residential, commercial, and industrial growth continues, the demand for potable, process, and cooling water, flow pattern disruption,waste water treatment and disposal, and electric power increases. As ground water resources become depleted or contaminated, greater demands are placed on surface water through dam and reservoir construction or some other method of freshwater diversion. The consumptive use of significant volumes of surface freshwater causes reduced river flow that can affect down stream salinity regimes as saline waters intrude further upstream.

Water that is not lost through consumptive uses is returned to the rivers or streams as point source waste water discharges. Although the waste water generally is treated, it still contains contaminants. Domestic waste water contains residual chlorine compounds, nutrients, suspended organic and inorganic compounds, trace metals and bacteria. Industrial discharges may contain many dissolved and suspended pollutants, including metals, toxic substances, halogenated hydrocarbons, petroleum products, nutrients, organics and heat.

Construction in and adjacent to waterways often results in elevated suspended solids emanating from the project area. The distance the turbidity plume moves from the point of origin is dependent upon tides,currents, nature of the substrate, scope of work, and preventive measures employed by the contractor. Excessive turbidities can abrade sensitive epithelial tissues, clog gills, decrease egg buoyancy, reduce light penetration; thereby affecting photosynthesis of phytoplanktonic and submerged vegetation, and cause localized oxygen depression. Suspended sediments subsequently settle, which can destroy or degrade productive shellfish beds and nursery sites.

The effects of turbidity and siltation are generally, but not always,temporary and short-term. Other construction activities can result in permanent loss or long-term disruption of habitat. Dredging can degrade productive shallow water and destroy marsh habitat or resuspend pollutants, such as heavy metals, pesticides, herbicides, and other toxins. Concomitant with dredging is spoil disposal, which traditionally occurred on marshes or in open water. Shoreline stabilization can result in gross impacts, through filling of inter-tidal and sub-littoral habitat; or cause subtle effects, resulting in the elimination of the ecotone between shore and water, or through the scouring of benthic habitat by reflective wave energy.

Sewage treatment effluent produces changes in biological components as a result of chlorination and increased contaminant loading. Sewage treatment plants constructed where the soils are highly saturated often allow suburban expansion in areas that would have otherwise remained undeveloped, thereby exacerbating already severe pollution problems in some areas.

Another aspect of urban development is nonpoint source pollution, which is caused by land based activities that result in materials being transported to aquatic areas. Certain pollutants (pathogens, phosphorus, sediments, heavy metals, and acid precipitation) from nonpoint sources are demonstrable problems in Atlantic coastal and estuarine waters (USDC, 1985b). Nonpoint source pollution appears to be a chronic threat that will affect the Northwest Atlantic Ocean in the upcoming decades.

Diversion of freshwater to other streams, reservoirs, industrial plants, power plants, and municipalities can change the salinity gradient downstream and displace spawning and nursery grounds. Patterns of estuarine circulation necessary for larval and plankton transport could be modified. Such changes can expand the range of estuarine diseases and predators associated with higher salinities that affect commercial shellfish.

Industrial waste water effluent is regulated by EPA through permits. While the NPDES provides for issuance of waste discharge permits as a means of identifying, defining, and where necessary, controlling virtually all point source discharges, the problems remain due to inadequate monitoring and enforcement. It is not possible presently to estimate the singular, combined, and synergistic effects on the ecosystem impacted by industrial (and domestic) waste water.

6.3.1.3. Port Development and Utilization

All ports require shoreside infrastructure, mooring facilities, and adequate channel depth. Ports compete fiercely for limited national and international markets and continually strive to upgrade their facilities. Dredging and dredged material disposal, filling of aquatic habitats to create fast land for port improvement or expansion, and degradation of water quality are the most serious perturbations arising from port development. All have well recognized implications to living marine resources and habitat.

6.3.1.4. Agricultural Development

Agricultural development can affect fisheries habitat directly through physical alteration and indirectly through chemical contamination. Fertilizers, herbicides, insecticides, and other chemicals are washed into the aquatic environment with the uncontrolled nonpoint source runoff draining agricultural lands. These chemicals can affect the growth of aquatic plants, which in turn affects fish, invertebrates, and the general ecological balance of the water body. Additionally,agricultural runoff transports animal wastes and sediments that can affect spawning areas, and generally degrade water quality and benthic substrate. Excessive uncontrolled or improper irrigation practices often exacerbate the contaminant flushing as well as deplete and contaminate ground water. One of the most serious consequences of erosional runoff is that the frequent dredging of navigational channels results in dredged material that requires disposal, often in areas important to living marine resources (USDC, 1985b).

6.3.1.5. Coastal and Wetland Use and Modification

Intense population pressures have adversely affected many estuarine and marine habitats along the Atlantic coast. Demand for land suitable for home sites, resorts, marinas, and industrial expansion has resulted in the loss or alteration of large areas of wetlands through dredging, filling, diking, ditching, upland construction, and shoreline modification.

As residential and commercial use of coastal lands increased, so does the recreational use of coastal waters. Marinas, public access landings, private piers, and boat ramps all vie for space. Boating requires navigational space, a place to berth for some boat owners, and boat yards for repair and storage.

As population densities increase in these areas, greater pressures are exerted to develop remaining lands, and the demand for nuisance insect control on adjacent undeveloped wetlands either through chemical or physical (i.e., ditching) methods, also intensifies.

In addition to residential and recreational development, other competing uses further contribute to the destruction or modification of wetland areas. Agricultural development can significantly affect wetlands. Common flood control measures in low lying coastal areas include dikes, ditches, and stream channelization. Wetland drainage is practiced to increase tillable land acreage. Wildlife management techniques that also destroy or modify wetland habitat include the construction of dredged ponds, low level impoundments, and muskrat ditches and dikes (USDC, 1985b).

The NMFS priorities on the multiple use issues and threats to living marine resources were identified in the RAP document (USDC, 1985b). Activities identified as high priority included urban and port development,ocean disposal, dams and agricultural practices. Medium priority activities included industrial waste discharges, domestic waste discharges, and OCS oil and gas development (Table 23).

6.4. PROGRAMS TO PROTECT, RESTORE, PRESERVE, AND ENHANCE THE HABITAT OF THE STOCKS FROM DESTRUCTION AND DEGRADATION

The MFCMA provides for the conservation and management of living marine resources (which by definition includes habitat), principally within the EEZ, although there is concern for management throughout the range of the resource. The MFCMA also requires that a comprehensive program of fishery research be conducted to determine the impact of pollution on marine resources and how wetland and estuarine degradation affects abundance and availability of fish (section 6.5).

Other NMFS programs relative to habitat conservation are found in the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, and the Anadromous Fish Conservation Act of 1965. NMFS shares responsibilities with the FWS for conservation programs under these laws.

In addition to the above mentioned NMFS programs, other laws regulate activities in marine and estuarine waters and their shorelines. Section 10 of the River and Harbor Act of 1899 authorizes the Army Corps of Engineers (COE) to regulate all dredge and fill activities in navigable waters (to mean high water shoreline). Section 404 of the Clean Water Act of 1980 authorizes EPA to regulate the discharge of industrial and municipal wastes into waters and adjacent wetlands. EPA has delegated authority under Section 404 to the COE to administer all dredge and fill activities under one program. Section 401 of the Clean Water Act authorizes EPA, or delegated States with approved programs, to regulate the discharge of all industrial and municipal wastes. The EPA and COE also share regulatory responsibilities under the Marine Protection, Research, and Sanctuaries Act of 1972.

All of the activities regulated by these programs have the potential to adversely affect living marine resources and their habitat. NMFS, EPA, the FWS, and State fish and wildlife agencies have been mandated to review these activities, assess the impact of the activities on resources within their jurisdiction, and comment on and make recommendation to ameliorate those impacts to regulatory agencies. Review and comment authority is provided by the Fish and Wildlife Coordination Act of 1934 (as amended 1958) and the National Environmental Policy Act of 1969. Consultative authority extends to all projects requiring federal permits or licenses, or that are implemented with federal funds.

Other legislation under which NMFS provides comments relative to potential impacts on living marine resources, their associated habitats, and the fisheries they support include, but are not limited to, the Coastal Zone Management Act of 1972; the Marine Protection, Research, and Sanctuaries Act of 1972; and the Endangered Species Act of 1973 (Section 7 consultation).

A more detailed discussion of the pertinent legislation affecting their protection, conservation, enhancement, and management of living marine resources and habitat can be found in the NMFS Habitat Conservation Policy (48 *FR* 53142-53147).

In addition, NMFS and the other federal resource agencies are involved in other programs with the States (e.g., NMFS Saltonstall-Kennedy and Wallop-Breaux programs) that provide grants to conserve fish habitats and improve fisheries management.

Individual States also regulate wetlands, which complements federal habitat conservation programs.

6.5. HABITAT PRESERVATION, PROTECTION AND RESTORATION RECOMMENDATIONS

The Councils are deeply concerned about the effects of marine and estuarine habitat degradation on fishery resources. They have a responsibility under the MFCMA to take into account the impact of habitat degradation on summer flounder. The following recommendations are made in light of that responsibility.

1. All available or potential natural habitat for migratory summer flounder should be preserved by encouraging management of conflicting uses to assure access by the fish to essential habitat and maintenance of high water quality standards to protect summer flounders migration, spawning, nursery, overwintering, and feeding areas.

2. Filling of wetlands should not be permitted in or near nursery summering areas. Mitigating or compensating measures should be employed where filling is unavoidable. Project proponents must demonstrate that project implementation will not negatively affect summer flounder, its habitat, or its food sources.

3. Best engineering and management practices (e.g., seasonal restrictions, dredging methods, disposal options, etc.) should be employed for all dredging and in-water construction projects. Such projects should be permitted only for water dependent purposes when no feasible alternatives are available. Mitigating or compensating measures should be employed where significant adverse impacts are unavoidable. Project proponents should demonstrate that project implementation will not negatively affect summer flounder, its habitat, or its food sources.

4. The disposal of sewage sludge, industrial waste, and contaminated dredged material in summer flounder habitat including the New York Bight should not be allowed. Advanced garbage, industrial waste, and sludge handling techniques are now available and must be encouraged. The Mid-Atlantic Fishery Management Council at its January 1988 meeting adopted measures to address specific problems of ocean dumping and endorsed the positions taken by the New England Council on this issue. The combination of the Mid-Atlantic Council adopted measures and the endorsed New England Council measures present a reasonable course of action that should lead to resolution of the immediate illegal area dumping problems and the longer term environmental problems associated with ocean dumping.

The measures adopted or endorsed are:

a. (endorsed) The Council go on record in opposition to ocean dumping of industrial waste, sludge and other harmful materials.

b. (endorsed) The Council insists that appropriate agencies enforce all existing laws and regulations until ocean dumping ceases. Emphasis must be placed on prevention of short dumping and required release rates.

c. (adopted) The Mid-Atlantic Council request EPA to require each permitted ocean dumping vessel be required to furnish detailed information concerning each trip to the dump site. This might be in the form of transponders; locked Loran C recorder plots of trip to and from the dump site; phone call to EPA when vessel leaves and returns to port; or other appropriate method to ascertain that vessels dump only in the 106 area and take legal action to abate illegal (short or improper) material dumping.

d. (adopted) The Mid-Atlantic Council request fishermen and other members of the public to report to the EPA, Coast Guard and the Mid-Atlantic Council any observance of vessels dumping other than in the approved dump sites. A list of permitted vessels would accompany this request with the additional request for reporting of any vessel not on the approved list. The report should include date, time, location (longitude, latitude, Loran bearings), vessel name of the dumping vessel, the nature of the material dumped, name of reporting individual and vessel. This would enable EPA to take appropriate action against illegal dumping.

e. (adopted) Direct the Mid-Atlantic Council's Executive Director to contact necessary Congressional delegations relative to strengthening current measures being considered to cease ocean dumping by a date certain.

f. (endorsed) The Council strongly urges state and federal environmental agencies to reduce the amount of industrial waste, sludge and other harmful materials discharged into rivers and the marine environment, and for these agencies to increase their surveillance monitoring and research of waste discharge. The Council requests that the Environmental Protection Agency implement and enforce all legislation, rules and regulations with emphasis on the best available technology requirements and pre-treatment standards.

g. (endorsed) The Council take appropriate steps under the Magnuson Act and any other federal laws and regulations to assure the required responses to its concerns and opposition to dump site 106.

5. The siting of industries requiring water diversion and large volume water withdrawals should be avoided in summer flounder nursery areas. Project proponents must demonstrate that project implementation will not negatively affect summer flounder, its habitat, or its food supply. Where such facilities currently exist, best management practices must be employed to minimize adverse effects on the environment.

6. Dechlorination facilities or lagoon effluent holding facilities should be used to destroy chlorine at sewage treatment plants and power plants.

7. No toxic substances in concentrations harmful (synergistically or otherwise) to humans, fish, wildlife, and aquatic life should be discharged. The EPA's Water Quality Criteria Series should be used as guidelines for determining harmful concentration levels. Use of the best available technology to control industrial waste water discharges must be required in areas critical to the survival of summer flounder. Any new potential discharge into critical areas must be shown not to have a harmful effect on summer flounder.

8. The EPA and States should review their water quality standards relative to summer flounder nursery areas and make changes as needed.

9. The EPA and States should establish water quality standards for the coastal zone specifically with respect to the habitat requirements of summer flounder migratory passage and feeding.

10. The EPA should establish water quality standards for the EEZ sufficient to maintain edible summer flounder.

11. Water quality standards in nursery, feeding, and areas of migratory passage should be enforced rigidly by State or local water quality management agencies, whose actions should be carefully monitored by the EPA. Where State or local management efforts (standards/ enforcement) are deemed inadequate, EPA should take steps to assure improvement; if these efforts continue to be inadequate, EPA should assume authority, as necessary.

12. Appropriate measures must be taken as soon as possible to reduce acid precipitation and runoff into estuaries and nearshore waters.

13. EPA and appropriate agencies must establish and approve criteria for vegetated buffer strips in agricultural areas adjacent to summer flounder nursery areas to minimize pesticide, fertilizer, and sediment loads to these areas critical for summer flounder survival. The effective width of these vegetated buffer strips varies with slope of terrain and soil permeability. The Soil Conservation Service and other concerned Federal and State agencies should conduct programs and demonstration projects to educate farmers on improved agricultural practices that would minimize the wastage of pesticides, fertilizers, and top soil and reduce the adverse effects of these materials on summer flounder nursery areas.

6.6. HABITAT RESEARCH NEEDS

The new National Status and Trends Program of NOAA (USDC, 1987) should assist in making intelligent decisions involving the use and allocation of resources in the nation's coastal and estuarine regions. These decisions require reliable and continuous information about the status and trends on environmental quality in the marine environment. Four general objectives have been established for the early years of the National Status and Trends Program (USDC, 1987). Those objectives are (1) to establish a national data base using state of the art sampling, preservation, and analysis methodologies; (2) to use the information in the data base to estimate environmental quality, to establish a statistical basis for detecting spatial and temporal change, and to identify areas of the nation that might benefit from more intensive study; (3) to seek and validate additional measurement techniques, especially those that describe a biological response to the presence of contaminants; and (4) to create a cryogenic, archival specimen bank containing environmental samples collected and preserved through techniques that will permit reliable analysis over a period of decades. While the Council concurs with these objectives, efforts by this program or other NMFS programs also must look at specific issues which include:

1. It is necessary that scientific investigations be conducted on summer flounder to emphasize the long-term, synergistic effects of combinations of environmental variables on, for example, reproductive capability, genetic changes, and suitability for human consumption.

2. The Councils recommend the following areas for future habitat directed investigations: field studies on the direct and indirect effects of contaminants on mortality of summer flounder; studies on the interactive effects of pH, contaminants, and other environmental variables on survival of summer flounder; and continued studies on the importance of factors controlling the production and distribution of food items that appear in the diet of young summer flounder.

7. DESCRIPTION OF FISHING ACTIVITIES

7.1. DOMESTIC COMMERCIAL AND RECREATIONAL FISHING ACTIVITIES

The summer flounder is a highly prized food fish sought by both recreational and commercial fishermen throughout its range. At the price of roughly a dollar a pound, the 35 million lbs landed by U.S. commercial fishermen in 1985 were worth nearly $35 million in ex-vessel value alone. Summer flounder comprise the second largest catch (by weight) of all species caught by marine recreational anglers on average (1979-1985) along the entire Atlantic coast (Table 3). Millions of dollars are associated with the catch of this species every year.

Summer flounder support extensive commercial fisheries along the Atlantic Coast, principally from Massachusetts through North Carolina. Most commercial landings come from otter trawl vessels (Figure 16) while the second most important commercial gear is pound nets (section 7.1.1.1). Most of the fishing activity takes place in the EEZ during the winter (section 7.1.1.2). Summer flounder are part of an overall mixed bottom trawl fishery which generally also includes: winter flounder, yellowtail flounder, *Loligo*, scup, butterfish, and other species (section 7.1.1.8). According to 1985 weighout data, the average tow time for all otter trawl vessels that landed summer flounder was 1.9 hours.

Generally, the sorting of otter trawl caught fish brought on deck is begun immediately after redeployment of the net. Often the species and market categories to be retained are placed on ice as rapidly as possible. Once the valuable catch is stored, the undersized and bycatch is generally shoveled overboard. Several hours may lapse before the discards are returned to the sea.

Fishery discards are difficult to monitor accurately (USDC, 1986c). The amount of fishery discards in relation to landings is influenced by a variety of factors including: net mesh size, season, area fished, the age or size structure of the population, and the particular regulatory scheme in place. Factors significantly influencing the survival of discarded fish include: degree of net damage, duration of trawl tow, time on deck, handling stress, temperature, water depth and fish size (Murawski, 1985).

This very valuable fish is one of the mainstays (Table 3) of the sport fishery along the Atlantic coast (section 7.1.2), accounting for a proportionately large catch from bridges, jetties, and small boats. The use of live bait consisting of small fishes (killifish) is successful, and summer flounder are also taken on squids, clams, jigs, small spoons, and spinners. Although not as strong a fighter per pound as some other sport fishes, the summer flounder provides lively action, especially on light tackle.

7.1.1. Commercial Fishery

Total U.S. commercial landings of summer flounder from North Carolina and north peaked in 1979 at nearly 42 million lbs (Table 1). The reported landings in 1984 of slightly over 40 million lbs, are the second highest landings ever and even though the landings decreased in 1985 by 5 million lbs, 1985 landings are still among the 5 highest annual landings (Table 1). Landings have fluctuated widely over the last five decades, increasing from less than 10 million lbs per year prior to World War II to average around 20 million lbs during the 1950s. Landings consistently decreased during the 1960s until a low of only 6.7 million lbs was reported in 1969. Commercial landings have been consistently high since the mid 1970s. Increased commercial landings are attributable mainly to increased levels of effort in the southern winter trawl fishery.

Summer flounder have been identified to the species level rather than simply as "flounders" in all States from North Carolina and north since 1979 (Table 1). Thus the best commercial landings data base for summer flounder exists since 1979 which also corresponds to the year of the first Marine Recreational Fishery Statistics Survey. It is possible to estimate the composition of the North Carolina "flounder" landings prior to 1979 by using the offshore otter trawl fishery, which is comprised of an average of 85% of the total landings annually and consists solely of summer flounder (Gillikin, pers. comm.). The North Carolina inshore pound net fishery is comprised of an average of 7% of the total flounder landings annually and consists almost entirely of southern flounder. However, any allocations of "flounder" landings to a particular species prior to 1979 would be estimates, and thus it is felt that a seven year time series (1979 through 1985) which corresponds to the time of the MRFSS is adequate for full description of the fishery.

Since 1979, 70% of the commercial landings of summer flounder have come from the EEZ. The percentage of landings attributable to the EEZ was at its lowest in 1983 at 63% and was the highest in 1979 at 77% (Table 2). In 1979 over 32 million lbs of summer flounder were landed from the EEZ. In 1985, 75% of the landings were from the EEZ (26 million of the 35 million lbs total landings).

Tremendous variability in summer flounder landings exist among the States over time. In 1950, Massachusetts, New York and New Jersey accounted for significantly more than half the landings (Table 1). By 1960, Massachusetts and New Jersey alone accounted for more than half the landings. By 1970, the fishery had become a more directed southern one and Virginia and North Carolina accounted for 60% of the total landings (Table 1). The distribution pattern of 1970 continued between 1979 and 1985 where Virginia and North Carolina combined averaged 60% of the total commercial landings (Table 2).

Significant variability also exists within States relative to the distribution of landings from either the EEZ or the Territorial Sea and Internal waters (Table 2). Landings from North Carolina, Virginia, New Jersey and Rhode Island consistently were the four highest and accounted for 87% of the average since 1979 (Table 2). However, except for Rhode Island, the distribution between State controlled and EEZ landings varied considerably. Between 85 and 89% of Rhode Island's annual summer flounder landings were attributable to the EEZ. On average, 86% of the New Jersey landings, 79% of the Virginia landings, and 60% of the North Carolina landings came from the EEZ. New York and Delaware (average of only 5,000 lbs) are the only States where the majority of landings did not come from the EEZ. The percentage of EEZ caught fish in New York landings has been consistently increasing this decade and was 44% in 1985.

7.1.1.1. Landings by Gear

Ninety percent of the summer flounder landings between 1979 and 1985 came from fish otter trawls (Table 24). When all the landings from other otter trawls are added to the "fish" otter trawls, the average annual landings go from 29.7 million to 30.7 million lbs. On average, pound nets caught 1.3 million lbs and were the only other gear with average catches of more than 0.5 million pounds. Gill nets and dredges were the only other gear that average more than 100,000 lbs annually. Miscellaneous catches of summer flounder were made in: haul seines, floating traps, lines, spears, purse seines, pots and traps, midwater/ pair trawls, fyke nets and weirs (Table 24).

Between 1979 and 1985, on average, over 10 million lbs of summer flounder were landed annually from fish otter trawls in North Carolina (Table 25). Although this number comprises the majority of North Carolina's landings it is significant that 20% of the total landings came from alternate gears. Pound nets in North Carolina took nearly 1 million lbs and gill nets averaged nearly half a million lbs. Landings from these two gears were so significant in North Carolina that they comprised 72% of the pound net and 94% of the gill net catch for the entire Atlantic coast for those gear respectively (Table 25). Pound nets were also of some importance in the commercial landings for Virginia, where about 300,000 lbs were landed annually. However, by far the most important gear for all the States were fish otter trawls, which account for: 93% in Massachusetts, 96% in Rhode Island, 99% in Connecticut, 97% in New York, 98% in New Jersey, 97% in Maryland, and 92% in Virginia of the total State landings (Table 25).

More than two thirds (on average 22.7 of 33.1 million lbs) of all commercial landings of summer flounder between 1979 and 1985, were from the EEZ and caught with fish otter trawls (Table 26). Seventy seven percent of all fish otter trawl caught summer flounder came from the EEZ whereas only 17% of the landings from other gear were from the EEZ. Annually, 7.5 million lbs in North Carolina, 5.4 million lbs in Virginia, 4.4 million lbs in New Jersey and 3.2 million lbs in Rhode Island were caught in fish otter trawls in the EEZ. North Carolina with 2.7 million lbs, New York with 1.3 million lbs, and Virginia with 1.1 million lbs averaged more than a million lbs of summer flounder caught within their State controlled waters annually (Table 26).

7.1.1.2. Seasonality

More than 5 million lbs of summer flounder were landed in both December and January on average (Table 27). Greater than 2 million lbs of summer flounder were landed in September, October, November, February, March and April also. Landings of less than a million lbs only occurred in June and July (Table 27).

The pattern of the seasonality of the EEZ landings is also very evident from the monthly data, where during January, February, March and April more than 90% of the landings were EEZ derived (Table 27). During the first four months of the year, each State took more than three fourths of their landings from the EEZ. By June, July and August around 60% or more of the landings came from State controlled waters. The vast majority of landings from all States with significant landings, except New York, came from the EEZ (Table 27).

7.1.1.3. Landings by Water Area

Even though the vast majority of summer flounder were caught in the EEZ, the statistical reporting areas (Figure 15) which had the highest catches were nearly all adjoining the coast. Landings from areas 621 and 626 both averaged over 2 million lbs between 1979 and 1985 per year (Table 28). Areas 526, 537, 613, 622, 625, and 631 all averaged over a million lbs landed. It is very unfortunate that the North Carolina landings are not reported by water area of catch, but North Carolina landings are part of the Southeast Fisheries Center data collection system and are not directly comparable to those data collected by the Northeast Fisheries Center.

Major summer flounder landings in Massachusetts were made from areas 526, 537 and 538 or areas south of Cape Cod (Table 28). Rhode Island landings came mostly from the same areas as Massachusetts plus areas 525 and 539. The majority of New York's landings came from Long Island Sound (area 611) or the two areas, 612 and 613, adjoining the south shore of Long Island. The majority of New Jersey's landings came from their adjoining area, 614 or in the two areas immediately south (areas 621 and 622). The vast majority of Maryland's landings also came from area 621. Major landings for Virginia were made from areas surrounding the Chesapeake Bay, 625, 626, 631, and 632 (Figure 15).

7.1.1.4. Landings by Market Category

Classification of summer flounder into categories of "small", "medium", "large", "jumbo" and "unclassified" are available for nearly all States for the past several years. While there may not be absolute consistency across States and years in the precise length associated with each size category (Christensen, pers. comm.) attempts by the Port Agents for consistency allows discussion of average lengths for each size category. Further analysis of the General Canvas data in this section will be based upon the lengths of 13", 15", 17", and 19" corresponding to the "small", "medium", "large", and "jumbo" categories (New Jersey, 1985).

Only 19% of the average 22.7 million lbs of otter trawl caught EEZ summer flounder are classified as "small" or "peewees" (Table 29). If the "unclassified" category is excluded, then 28% of the classified fish were "small" or "peewees".

The New England States have a very high (range 71 to 87%) percentage of otter trawl caught EEZ fish of "medium" and larger size (Table 29) and the percentage generally decreased as one goes south along the coast. Overall, the percentage of "small" and "peewee" summer flounder do not vary greatly from State to State, but the percentage of" unclassified" does differ significantly.

Gear "other" than fish otter trawls in the EEZ show roughly the same patterns in the size composition of the catch, but since only three percent of the total EEZ landings are made by gear other than fish otter trawls, the landings are almost insignificant.

7.1.1.5. Weighout Data Subsets

Estimates of catch and fishing effort by area, gear, etc. are obtained by sampling fishing captains and the data are coded using a "weighout" form. Additional landings data (generally without associated trip type information) are incorporated with the weighout data to form the General Canvas statistics which become the official government statistics as reported in *Fishery Statistics of the U.S.* The General Canvas data provide landings for all States (section 7.1.1), by gear type (section 7.1.1.1), by month (section 7.1.1.2), by water area (section 7.1.1.3), and by market category (section 7.1.1.4), at least. The weighout data are a subset that even though limited in their geographical coverage, is extremely important because of the associated effort data (section 7.1.1.6) and the fact that species composition data on a tow by tow basis are available (section 7.1.1.7).

A year by year State by State comparison between the General Canvas and the weighout data demonstrates that there is significant variability across time and area (Table 2 versus Table 30). Overall comparisons of the seven year averages between 1979 and 1985 demonstrates that the weighout system picked up a little less than one half (46%) of the officially reported landings. However that figure is somewhat misleading because North Carolina is not included in the weighout system and thus over one third of the coastwide average annual landings were not to be picked up with the original design of the system. Even with the lack of North Carolina data being incorporated, the percentage of coastwide landings accounted for with the weighout system increased between 1979 and 1985 until by 1985, 60% of the official landings were accounted for in the weighout system.

Closer examination of only the States that are in the weighout system demonstrates that over 95% of the landings from Maine, New Hampshire, Massachusetts, Rhode Island, New Jersey, Maryland and Virginia were picked up in 1985. The important item to remember is that in all the following discussions relative to specific fishing effort, there are no data for Connecticut, New York, Delaware and North Carolina. These four preceding States account for nearly 40% of the total coastwide landings in 1985.

The weighout system is more effective at recording landings of summer flounder that were caught with otter trawls than the other gears. Over 97% of the summer flounder that were reported landed between 1979 and 1985 in the weighout system were landed by fish otter trawls (Table 31). According to the "official" statistics, 90% of those landings between 1979 and 1985 were from fish otter trawls (Table 24). Summer flounder landings with pound nets seem to be the least sampled and recorded in the weighout system.

7.1.1.6. Otter Trawl Directed Fishery

Data from all trips landing summer flounder and four levels of a "directed" fishery are presented (Tables 32 through 36). On average, 20 percent of all the fish landed by fish otter trawls that land some summer flounder, were summer flounder (Table 32). When the universe is restricted to fish otter trawls that land 100 or more lbs of summer flounder summer flounder comprise 38% of the catch and account for 97% of all summer flounder landed (Table 33). Restricting the universe to fish otter vessels that land more than 500 lbs of summer flounder, increases the percentage of summer flounder in the total catch to 48%, and still accounts for 96% of the total summer flounder landed (Table 34). When only trips where summer flounder comprise at least 25% of the landings are considered, summer flounder constitute 76% of the landings and still account for 90% of the total summer flounder landings (Table 35). Considering only trips where summer flounder are at least 60% of the total landings, summer flounder comprise 87% of the total but only 63% of the total summer flounder landings are accounted for (Table 36).

7.1.1.7. Species Composition of the Catch

Weighout data from 1985 were examined for species composition in the four categories considered for the directed summer flounder fishery (Tables 37 through 40). In general, the species that coexist with summer flounder (section 5.3.9) were also the species that commonly appeared in the directed summer flounder fishery.

When fish otter trawl trips that landed at least 100 lbs of summer flounder were considered (Table 37), silver hake, scup, Loligo, butterfish, winter flounder and yellowtail flounder were also landed in fair quantities. Restricting the analyses to trips where greater than 500 pounds were landed, produced the same major species in the same order (Table 38). With trips that landed at least 25% summer flounder considered, only Loligo were significantly caught (Table 39). Otter trawl trips in 1985 for those States in the weighout system that landed at least 60% summer flounder yielded very little other species catch (Table 40).

7.1.1.8. Description of the North Carolina Fishery

The North Carolina fishery has been extensively sampled during the winters of 1982-83, 1983-84, and 1984-85 by the North Carolina Division of Marine Fisheries (North Carolina, 1986). These data have just become available and are very useful in describing the species composition, effort and the importance of summer flounder to the North Carolina's three "winter trawl fisheries" (Table 41). An understanding of the importance of North Carolina's landings to the overall coastal summer flounder landings is critical, and thus efforts to incorporate these data where ever possible have been made, even though they are not directly comparable to the data collected in the weighout system.

The winter trawl fishery in North Carolina accounted for more than three quarters of all summer flounder landings in the State (Table 41). The fishery begins near shore in an otter trawl fishery targeting on summer flounder in November and by January has moved offshore into a mixed otter trawl fishery lasting until April (North Carolina, 1986). The size of the summer flounder caught north of Cape Hatteras seems to be larger (51.2% versus 62.5% less than 13.7") than those caught south of Cape Hatteras.

The nearshore directed otter trawl fishery accounts for nearly three quarters of the summer flounder landed in the North Carolina winter fishery (Table 41). An average trip in the near shore directed fishery consisted of 92% summer flounder weighing 18,000 lbs. The summer flounder averaged 1.2 pounds in both 1982-83 and 1983-84 and 1.3 pounds in 1984-85 when most captains stated that they were using 4.5" codend mesh (North Carolina, 1986).

The offshore mixed fishery occurred from January through April. Summer flounder was the second most important species caught and averaged 26% of the catch (Table 41). A three year average of 21% of the summer flounder caught in the total winter trawl fishery were landed in this portion of the fishery, although there was a 50% increase in the last two years. An average trip consisted of 26% summer flounder with a weight of over 6,000 lbs and the fish averaged one pound.

7.1.2 Domestic Recreational Fishing Activities

Recreational angler surveys identifying summer flounder were conducted in 1965 (Deuel and Clark, 1968), 1970 (Deuel, 1973), and 1974 (Deuel, pers. comm.). These surveys are comparable among themselves but, due to methodological differences, are not comparable to the 1979 through 1985 Marine Recreational Fishery Statistics Survey (MRFSS). The surveys of 1965 and 1970 were at a regional level. The two northern regions combined included the area from Maine to Cape Hatteras, North Carolina. The 1974 survey was on a state by state basis and was from Maine through Virginia. Consistent recreational angler surveys have been conducted by NMFS from 1979 through 1985. The seven years of data are averaged in Tables 42 and 43.

Random interviews were conducted with anglers at or near fishing sites throughout each year. Information collected included mode of fishing, area of fishing, species targeted, and species and quantity of catch. The raw data were then expanded to a state level. The data are usable at the state level but are considered to be more statistically valid at a regional level due to the expansion process (Holliday, pers. comm.).

Data are presented as total catch (types A, B1, & B2) and total landings (types A & B1). Type A catch was actually observed by the interviewers. Type B1 represents catch utilized but not available for measurement and catch discarded dead. Type B2 represents those fish released alive. Catch represents the summer flounder fishing experience (some satisfaction is gained from catching a fish and releasing it) while landings represent the associated summer flounder mortality. All total weights are based on the mean weight of type A fish multiplied by the total number of fish.

The method of estimating directed trips for summer flounder contains potential biases (Essig, pers. comm.). Marine Recreational Fishery Statistics Survey interviewers ask anglers, upon completion of their trip, which species they targeted. This approach introduces a bias of anglers reporting the species they caught, regardless of the species they originally sought.

The average annual number of coastwide trips (1979-85) targeting (directing) on summer flounder was 3.9 million, 87% of which were from the states of New York through Virginia, accounting for 12.3% of all recreational trips from Maine through North Carolina (Table 44). The number of trips is additive across states but the number of participants is not, due to out of state anglers. The total number of directed summer flounder trips is computed by multiplying the regional number of trips by the regional percentage of directed summer flounder trips. Directed summer flounder trips have accounted for between 8% (1985) and 17% (1982) of all recreational fishing trips coastwide, or a 7-year average of 12%.

In the North Atlantic and in North Carolina, summer flounder was not sought as often. The percentage of directed trips has ranged from 2% in 1981 to 3% in 1979 for an average of 3% in the North Atlantic and from 3% in 1981 to 11% in 1985 for an average of 7% in North Carolina. Based on MRFSS groupings, the Mid-Atlantic region had the highest percentage of trips directed at summer flounder, 17% on average, ranging from 10% of all trips in 1985 to 26% of all trips in 1982. Summer flounder were the second most popular species sought and account for 7% of the total coastwide catch by weight (Table 3).

Based on the 1979-1985 average, 27.3 million summer flounder were caught with a weight of 31.9 million pounds or 1.17 lbs/fish (Table 42). New Jersey caught the largest percentage (35%) followed by Virginia (30%), New York (18%), and the remaining states all caught less than 6% each (Table 42). The average number of summer flounder caught by mode was 18.9 million (69%) by private/rental boats, 3.8 million (14%) by party/charter boats, 2.8 million (10%) from beach/banks, and 1.7 million (6%) from man-made structures (Table 45). The yearly average weight of the catch by mode was 23.8 million lbs (75%) by private/rental boats, 5.1 million lbs (16%) by party/charter boats, 2.1 million lbs (7%) from beach/banks, and 1.4 million lbs (5%) from man-made structures. The average mean weight of the summer flounder caught by mode varied from .66 lbs (beach/bank) to 1.39 lbs (party/charter). The average number of summer flounder caught by water area was 13.9 million (51%) in interior waters, 10.8 million (39%) in the territorial sea, 1.4 million (5%) in unknown waters, and 1.2 million (4%) in the EEZ. The yearly average weight of catch by water area was 17.6 million lbs (55%) from interior waters, 11.4 million lbs (35%) from the Territorial Sea, and 1.7 million lbs (5%) from both the EEZ and unknown waters. The average mean weight of the summer flounder caught ranged from 1.40 lbs in EEZ waters to 1.01 lbs in Territorial Sea waters.

The EEZ catch (types A, B1, & B2) of summer flounder (1979-1985) averaged 1.2 million fish weighing 1.7 million lbs (1.40 lbs/fish; Table 46). Private/rental boats took an average of 72% of the summer flounder while party/charter boats took the remaining 28% (Table 46). EEZ landings (types A & B1) of summer flounder (1979 - 1985) averaged 1.o million fish weighing 1.5 million lbs (Table 46). The number of summer flounder landed from the EEZ has varied from 2% (1979 and 1980) to 16% (1985) of the total recreational landings and from 2% (1980) to 20% (1985) of the total recreational landings' weight (Table 47).

Total EEZ landings in numbers of fish has varied from 0.4 million summer flounder in 1980 to 2.4 million in 1985. The total weight of EEZ landed summer flounder has varied from 0.4 million lbs in 1980 to 3.4 million lbs in 1985. The mean weight has varied from 1.14 lbs in 1980 and 1982 to 2.09 lbs in 1981 (Table 47).

Individual summer flounder lengths by state from the MRFSS surveys of 1979-85 are summarized as percentages in Table 48. Each states' percentage of coastwide landings varies from the percentage of coastwide catch because of the number of summer flounder released alive (type B2). Lengths are taken from type A fish and are assumed to also apply to type B1 fish.

During the seven years of the MRFSS surveys, 23,151 usable summer flounder measurements were collected. These measurements were transferred into average percentages by state and then applied to the average percentage of coastwide landings (types A & B1) occurring in that state (Table 48). Coastwide, on average, summer flounder under 14" accounted for 56% of those landed while 24% were under 12" (Table 48).

A similar treatment for only those summer flounder landed from the EEZ results in 1,667 usable measurements. Coastwide, on average, 46% of those landed in the EEZ were under 14" while 12% are under 12" (Table 48).

7.1.2.1 State Catches

The following section examines summer flounder EEZ recreational catch on a state by state basis. All data are seven year averages from the 1979 through 1985 MRFSS interviews and reports. The average state EEZ data are presented in Table 46. Average overall state catch data by mode and area are presented in Tables 42 and 43.

There was no reported EEZ catch from Maine or New Hampshire.

The average yearly Massachusetts catch from the EEZ was 53,774 fish weighing 121,049 pounds (1.90 lbs/fish) for 5% of the average EEZ catch. Private/rental boats accounted for 61% of the EEZ at 1.85 lbs/fish and party/charter boats took the remaining 40% at 2.86 lbs/fish.

The average yearly Rhode Island catch from the EEZ was 37,432 fish weighing 53,296 pounds (1.42 lbs/fish) for 3.1% of the average EEZ catch. Private/rental boats accounted for 99% of the catch at 1.42 lbs/fish and party/charter boats took the remaining 1% at 1.32 lbs/fish.

The average yearly Connecticut catch from the EEZ was 11,386 fish weighing 26,240 pounds (2.30 lbs/fish) for 1% of the average EEZ catch. Private/rental boats accounted for 100% of the catch.

The average yearly New York catch from the EEZ was 66,816 fish weighing 101,035 pounds (1.51 lbs/fish) for 6% of the average EEZ catch. Private/rental boats accounted for 74% of the catch at 1.51 lbs/fish and party/charter boats took the remaining 26% at 1.52 lbs/fish.

The average yearly New Jersey catch from the EEZ was 473,118 fish weighing 662,488 pounds (1.42 lbs/fish) for 39% of the average EEZ catch. Private/rental boats accounted for 67% of the catch at 1.29 lbs/fish and party/charter boats took the remaining 33% at 1.62 lbs/fish.

The average yearly Delaware catch from the EEZ was 278,867 fish weighing 414,807 pounds (1.48 lbs/fish) for 23% of the average EEZ catch. Private rental boats accounted for 56% of the catch at 1.68 lbs/fish and party/charter boats took the remaining 44% at 1.25 lbs/fish.

The average yearly Maryland catch from the EEZ was 16,075 fish weighing 29,763 pounds (1.84 lbs/fish) for 1% of the average EEZ catch. Private/rental boats accounted for 76% of the catch at 2.00 lbs/fish and party/charter boats took the remaining 24% at 1.39 lbs/fish.

The average yearly Virginia catch from the EEZ was 250,454 fish weighing 270,339 pounds (1.09 lbs/fish) for 21% of the average EEZ catch. Private/rental boats accounted for 96% of the catch at 1.10 lbs/fish and party/charter boats took the remaining 4% at 0.69 lbs/fish.

The average yearly North Carolina catch from the EEZ was 11,818 fish weighing 14,526 pounds (1.40 lbs/fish) for 1% of the average EEZ catch. Private/rental boats accounted for 99% of the catch at 1.24 lbs/fish and party/charter boats took the remaining 1% at 0.66 lbs/fish.

7.2. FOREIGN FISHING ACTIVITIES

Two Sources of foreign catch data are available concerning the individual species catch: the foreign fleet observers' reports of total catch and total foreign reported catch of permitted fish categories. These data are combined to arrive at an adjusted weight of summer flounder taken by the foreign fleet (Table 49).

The weight of summer flounder taken by foreign fishing vessels has varied over the past 8 years (Table 49) from a low of 197,100 lbs in 1985 (0.24% of overall foreign catch) to a high of 877,500 lbs in 1984 (1.7% of overall foreign catch). No explicit foreign catch quota exists for summer flounder but it is permitted in the "other finfish" category. Some foreign vessels retain and process all summer flounder caught while others are less likely to process summer flounder (Haskell, pers. comm.).

The foreign catch of summer flounder is entirely incidental to other directed fisheries. Monthly catch data are only available for 1985. The catch of summer flounder closely followed the *Loligo* squid directed fishery in that year (Table 50). This is the overall trend for the period 1978 to 1985 with few summer flounder being caught in other foreign directed fisheries (Haskell, pers. comm.). Foreign *Loligo* directed fishing is being phased out and when it ends the foreign catch of summer flounder is expected to drop dramatically.

8. DESCRIPTION OF ECONOMIC CHARACTERISTICS OF THE FISHERY

8.1. HARVESTING SECTOR

8.1.1. Commercial Fishery

The ex-vessel value of summer flounder landings has increased steadily from $16.1 million in 1981 to $32.7 million in 1985. The ex-vessel value was $22.0 million in 1979 (Table 51). The inflation adjusted values (1985 dollars) were $32.7 million in 1979, $19.1 million in 1981, and $32.7 million in 1985 (Table 51).

During 1985 for the states of Maine through North Carolina, summer flounder accounted for 2% of the total quantity of commercial fish landed and 4.6% of their ex-vessel value (Table 52). Summer flounder commercial landings relative to total commercial landings by state varied from 1% or less of the total quantity landed (Maine, New Hampshire, Massachusetts, Delaware, Maryland, and Virginia) to over 5% of the total quantity landed (Rhode Island, New York, New Jersey, and North Carolina). The value of summer flounder landings relative to the value of total landings in 1985 varied from 1% or less (Maine, New Hampshire, and Delaware) to over 5% of the total value of landings (Rhode Island, New York, New Jersey, Virginia, and North Carolina). The trend of a higher percentage of value than quantity held throughout the coast with the exception of Connecticut. Large disparities between the two percentages occurred in Rhode Island, Virginia, and North Carolina. The extreme disparity in North Carolina is due primarily to the large quantities of low valued fish such as menhaden landed in that state. The same is true to a lesser extent and with a different species mix in the other two states.

The price per pound of all sizes of summer flounder reached highs in 1985 in both nominal and inflation adjusted (real 1985) dollars (Table 53). The coastwide average ex-vessel price per pound for jumbos was $1.27, $1.14 for larges, $.93 for mediums, $.61 for smalls, and $.99 for unclassified landings for a total average of $.95. The price per pound for all size categories has fluctuated over the past seven years with noticeable drops in 1982 - 84. In real terms (1985 dollars) all size categories experienced this drop in 1982 - 83 while some recovered slightly in 1984 (Table 53). The months with the highest average ex-vessel price tend to coincide with those months of lower landings, normally in June and July (Table 54).

The NMFS weighout system records (USDC, 1986f) can be used to determine the number of vessels landing summer flounder. Since 1982, between 716 and 784 different vessels have landed summer flounder on a year by year basis (Table 55). Finfish otter trawl vessels comprise the vast majority of the vessels covered by the weighout system. It is also apparent that some vessels which land summer flounder when using otter trawls also land them with other gear. This is understandable since some vessels will go trawling for some portion of the year and use different gear during other times of the year.

The average number of vessels, trips, and landings for various amounts of minimum summer flounder catch are shown in Tables 32 through 36. The 1985 specific effort and bycatch data for the same summer flounder minimums are presented in Tables 37 through 40. These data are from the weighout system so are not inclusive of all of the activity. In all 4 cases the 1985 percentage of value of summer flounder is greater than the percentage of weight, indicating that summer flounder is a more valuable fish than the associated bycatch.

There are vessels which land summer flounder in Connecticut, New York, and North Carolina which are missed by the weighout system. An estimated 160 otter trawl vessels land their catch only in New York and most if not all catch summer flounder (Hasbrook, pers. comm.). About 150 vessels participated in the 1985-6 North Carolina winter trawl fishery. Of these, about 80 landed fish north of North Carolina during the year (Ross, pers. comm.).

There are a substantial number of finfish otter trawl vessels which fish for summer flounder up and down the Atlantic coast. This mobile fleet is composed of vessels from North Carolina, Virginia, New Jersey, and other states (Stevenson, pers. comm.). Some of these vessels direct on summer flounder in the winter and direct on scallops or other species in the summer. Other finfish otter trawl vessels fish for summer flounder in mixed fisheries with squid or other species, on the basis of local availability, or land them as bycatch in other directed fisheries.

Vessel costs are composed of fixed costs (insurance, debt, depreciation, routine maintenance, etc.) and variable costs (fuel, maintenance, wages, ice, food, sale and unloading fees, etc.). A change in overall vessel landings will only affect the variable costs of vessels.

Vessel variable costs are proportionate to the hours traveling and fishing (operating maintenance, fuel, ice) and the quantity of fish landed (wages, sales and unloading fees, ice). Costs vary in different locations and the cost components have changed over the years. A general description based on unpublished NMFS data (Logan, pers. comm.) follows.

Wages are almost always in the form of a share or lay system. The captain, crew, and vessel owner split the net revenue based on a set ratio. The particular ratio of the lay system utilized varies between vessels. Often the fuel and ice are deducted from the gross revenues with the remainder divided about 50-50 between the vessel owner and the captain and crew (Logan, pers. comm). When one or the other of the parties is responsible for additional costs the share split normally reflects this.

Fuel costs have varied tremendously over the past decade. Diesel fuel was approximately $1 per gallon in recent years but had dropped to $.50 per gallon in New England in August, 1985 (Logan, pers. comm.). Fuel costs are directly proportional to the amount of time spent steaming and fishing and the size and drag of the fishing gear used.

Ice costs about $30 per ton in New England but varies among ports further south (Logan, pers. comm.). Ice costs are related to the amount of fish expected to be caught, the expected trip length, and the type and size of storage system utilized on board.

Variable maintenance costs are related to the hours the engines, fishing gear, etc. are used and the weather conditions. Much of the minor repair work is conducted by crew members and, on larger vessels, by an engineer. Since these crew members perform their labor as part of their normal responsibilities there is no added labor cost (Crutchfield, 1986). However, most major engine, electronics, and gear repairs are contracted to specialists.

Selling costs consist of lumpers (unloaders) fees, transportation costs, auction fees, etc. Lumpers fees are variable among ports. In Point Judith, RI the cost is $3 per 1,000 lbs, $6 per hour in Cape May, NJ, and over $4 per 1,000 lbs in Massachusetts (Logan, pers. comm.). There are no reports available regarding lumpers fees in Virginia. Almost all Long Island, NY landings are boxed at sea and shipped directly to Fulton market. The market charges about $.10 per pound for all costs. Some areas, notably in Massachusetts, also charge fees for lumpers pension funds, etc.

In addition to the shares earned from the sale of fish, crews often receive bycatch as "shack" (Gates, pers. comm.). This is fish which is not sold on the official vessel record and the gross receipts are divided among the captain and crew and, sometimes, the vessel owner. Shack varies by season, fishery, and port (Logan, pers. comm.). Otter trawlers often shack all or part of the finfish catch when scalloping. No records exist to estimate shack so it is not possible to consider it separately from wages.

The New England full time otter trawl fleet increased 66% between 1976 and 1985 while per vessel deflated gross revenue decreased 20% (Kurkul and Terrill, 1986). This appears to be a result of decreased landings per vessel rather than increased expenses.

Vessels which use otter trawls other than finfish otter trawls are expected to be similar in their characteristics to finfish otter trawl vessels. Scallop dredgers are predominately the same type of vessel (often the same vessels) as those which use finfish or other otter trawls. Therefore, these vessels' fixed costs, with the exception of gear costs, would be the same as finfish otter trawlers while their variable costs will vary somewhat depending on weather, bottom topography and drag, etc. Summer flounder is considered to be a bycatch for these vessels for the purpose of these analyses.

The costs for pound nets, fish traps, and hand line fishing operations are much less than costs for otter trawlers. Fish trap fishermen typically use 70 ft vessels with major expenditures for wages (41%) followed by nets (15%) and taxes (12%) . Rhode Island is the only state which lands summer flounder in fish traps and in 1980 approximately six firms had permits (Norton *et al.*, 1984). Hand line fishermen typically use a small boat (17 ft average), have major expenses of wages (35%), fuel (16%), and tackle (16%), and in past years made much of their income from striped bass (Norton *et al.*, 1984).

Summer flounder landed by all other means are considered to be incidental bycatch for the purposes of these analyses.

8.1.2. Recreational Fishery

The value of recreational fishing can be divided into actual expenditures and a non-monetary benefit associated with satisfaction (consumer surplus). Combined, these two values divide the area under a demand or willingness-to-pay curve up to the point of the quantity of trips taken at given levels of costs, catch rates, etc. (Figure 17). The demand for recreational fishing trips is determined by the costs of equipment, necessary expenditures, catch rates, social experiences, etc.

Holding all other factors constant (expenditures, weather ,etc.), a decrease in the catch (or retention rate) of fish should move the demand curve to the left (Figure 17). Likewise, an increase in the catch (or retention rate) of fish should move the demand curve to the right. Each move will have an associated decrease (increase) in expenditures and non-monetary benefits.

The overall amount of expenditures redirected from (or to) summer flounder recreational fishing can be estimated by determining the expenditure for an average trip and multiplying by the expected change in the number of trips. The overall change in non-monetary benefits can be estimated by determining the marginal value of recreational summer flounder landings and multiplying this by the expected change in recreational summer flounder landings.

Data concerning actual expenditures of recreational fishing were collected during the Marine Recreational Fisheries Statistical Surveys (MRFSS) of 1979 and 1980 (1986b) and a 1981 NMFS socioeconomic study (KCA, 1983). Information concerning the actual expenditures (not including fuel) and the distance traveled to the site on the interview day were collected by the MRFSS. The KCA study utilized a telephone follow-up interview to gather further information from anglers interviewed on site through the MRFSS. Information concerning purpose of the trip, where lodging occurred, satisfaction level of the trip, and probable alternative activities was collected in addition to catch, mode, and area information. Both of these surveys interviewed many types of fishermen but did not explicitly focus on summer flounder fishermen. Only one study, Agnello and Anderson (1987), has analyzed the marginal value of recreational caught summer flounder utilizing a travel cost approach and the 1981 KCA socioeconomic data.

The MRFSS and KCA data can be used to measure out of pocket expenditures for all fisheries combined, certain specific modes of fishing, and a subset of summer flounder fishermen. The actual expenditures for recreational fishing should include the bait costs, value of perishables consumed in excess of what would otherwise of been consumed, value of lodging expenses in excess of normal expenses, fuel costs, charter and rental costs, costs of special gear such as hooks and lures, prorated costs for multi-use equipment, private boats, etc., and other miscellaneous costs. The category of prorated costs has not been measured in any of the studies and therefore all expenditure determinations will be undervalued to an extent.

The studies determined expenditures of all fishermen to vary between $14 and $43 for each trip (in 1985 adjusted dollars) depending on the year, area and type of fishing included (Table 56). The expenditures of only summer flounder fishermen varied between $17 and $25 depending on the year and areas included (Table 56).

In order to estimate the marginal value with a travel cost method, the US Water Resource Council (1983) suggested using only variable cost figures for auto expenses. These variable costs reflect out of pocket expenses and do not include fixed costs which "would generally not affect the potential user's decision..." (US Water Resources Council, 1983). The Resources Council also cautioned to adjust for the number of people traveling in a vehicle thereby reducing the average variable cost per mile.

Using the 1984 US Department of Transportation (1984) averaged variable operating costs, the cost per mile is determined to be $0.14 (in 1985 dollars). The average number of anglers in a vehicle can be estimated from the number of persons in a fishing party. This estimate is 2.76 for an unweighted average in the Delaware Bay area (Seagraves and Rockland, 1983), 3.79 for all trips in the Atlantic area combined and unweighted (KCA, 1983), 2.76 for all but party/charter trips in the Atlantic area (KCA, 1983), and a minimum of one. An average estimate of 2.76 is used for the purposes of these analyses.

The average expenditures derived in Table 56 can be used in conjunction with the number of directed trips determined in Table 44 to approximate the total expenditures in the recreational summer flounder fishery (Table 57). Using the minimum average expenditure estimates for all fishing trips and totaling on an area basis, the total expenditures amount to $82.8 million. Utilizing the coastwide expenditure estimates from the KCA study, the total expenditures amount to $159.2 million. When the expenditure data from only those anglers targeting on or catching summer flounder is utilized the total expenditures amount to $83.3 million.

The number of trips used to determine total expenditures does not include those trips where summer flounder is caught but not targeted. Approximately 16% of all trips catching summer flounder are nontargeted and approximately 25% of the landings from these trips are summer flounder (Table 58). However, if these trips which target on other species are to be counted, then some allowance must be made for the 60% landings of other species during directed summer flounder trips (Table 58). Therefore, it is assumed for the purposes of this analysis that the total expenditure estimates (Table 57) are underestimated to an unknown but not great extent.

Annual MRFSS data were examined to determine the catch ratios of those who caught summer flounder or who directed their trip towards summer flounder (Table 58). From this group of anglers only 16% were not directing on summer flounder. Of the anglers directing on summer flounder, 74% did not land any summer flounder and 67% were totally unsuccessful in landing anything. The Mid-Atlantic region averaged 36% unsuccessful trips for all species combined during this period which was slightly higher than either the North Atlantic or South Atlantic regions (USDC, 1986b). Of the non-directed group, 43% landed only summer flounder. The successful summer flounder fishermen landed an average of 6.0 summer flounder per trip for directed trips and 4.2 summer flounder per trip for non-directed trips (Table 58).

8.2. DOMESTIC PROCESSING SECTOR

Almost all summer flounder are sold in fresh form. The catch is generally iced at the dock and then shipped to market. Some filleting is done by primary processors, for instance four processors in New Jersey and Virginia reported in 1980 that they filleted 5 to 25 % of the summer flounder they received (Scarlett, 1981). All Long Island landings are currently boxed at sea and then transported to market (Mason, pers. comm).

A study conducted in New England in 1982 (Hu *et al.*, 1983) showed that labor costs would be reduced approximately $0.05 per pound by filleting large flounder instead of small flounder. This is the result of more fillet weight per flounder and the reduced time involved in the fillet process. The species of flounder examined and the size differences were not mentioned. These results are probably more relevant to larger flounder such as halibut.

The cost of processing an average pound of New England groundfish was $0.67 in 1982 (Dressel and Hu, 1983). The percentage by units of production were: 45% labor, 8% energy, 10% packaging, 4% other variable costs, 3% interest, 12% administration, and 18% other fixed costs. The processing cost increases had risen slightly less than the producer price increases in the 5 years previous to 1982. The net profit was determined to be $0.05 to $0.10 per pound depending on species. Georgianna and Dirlam (1982) determined the pre-tax profit on flounder processed in New England in 1979 to be between $0.03 and $0.33 per pound. Since summer flounder are sold fresh the processing costs should be less for packaging and for labor when there is no filleting. Summer flounder processing costs in Virginia and North Carolina are expected to be less due to lower wage rates. The overall marginal costs of production in New England were determined to be constant over a wide range of production (Georgianna and Hogan, 1986).

The major central wholesale market for fresh fish in the Mid-Atlantic region is the Fulton fish market. Summer flounder were received at Fulton market in 1984 and 1985 from the states of Massachusetts through North Carolina. The market handles approximately 6 to 8 percent of the total summer flounder landings (Table 59). If only those summer flounder landed north of Maryland are considered then the percentage rises to approximately 11 percent. Almost none of the summer flounder entering Fulton market is in the fillet form and little filleting is done there (Petrovich, pers. comm.).

The development of the summer flounder fishery off of North Carolina in the late 1970's created a source of supply in an area with no centralized market. The distribution of summer flounder in this area is often handled by the primary processors. This eliminates at least one series of wholesale transactions and allows for greater ex-vessel price, greater profit and/or reduced retail price.

Summer flounder prices per pound for each size category vary from processor to processor and from day to day for each processor. The prices react to the market supply of summer flounder, other flounders available, imports, and wholesale/retail demand. The size categories of summer flounder are likewise not fixed. In the areas where more summer flounder less than 14" are landed there is a greater tendency to call smaller fish mediums than in areas where fewer summer flounder less than 14" are landed. What is encompassed by a size category is also known to vary from processor to processor and day to day. This variation in price leaves the fisherman with some sense of uncertainty in terms of what he will receive for his catch. Such uncertainty, however, is common in the fishing business.

In 1985 there were 20 processors handling flounder in North Carolina (USDC, 1986e). Since summer flounder is the primary flounder landed in that state, it is assumed that all processors handle summer flounder. There are 6 fish processors in Wanachese being supplied by 30 to 40 otter trawlers and 5 or 6 fish processors in Morehead City supplied by at least 10 to 15 full time otter trawlers (NCDNRDC, 1986).

The number of processing plants handling summer flounder is unknown. The number of processing plants handling all flounders from Maine through North Carolina was 138 in 1984 and 132 in 1985 (USDC, 1986e). The value of the flounder processed by these plants was $137 million in 1984 and $138 million in 1985.

8.3. CONSUMPTION

A demand function for nationwide flounder consumption was derived by Hu, *et al.*(1983). The linear regression equation considered annual per capita consumption of flounder as a function of a constant, the average price of flounder per pound, and the annual per capita disposable income in adjusted (real) dollars. The data covered the period 1960 thru 1980. The results indicated that a 10% increase in the price of flounder had no significant effect on the consumption of flounder. Also, a 10% increase in income caused an 11.9% increase in the consumption of flounder. Both of these results and the overall regression were statistically valid.

The summer flounder percentage of overall US commercial flounder landings over the past 26 years has varied from 4.1% in 1969 to 20.8% in 1976 (Table 60). The average percentage for this period is 12.2% of the total flounder landings. For the 21 years covered by the Hu *et al.* study (1983) the average percentage of summer flounder to total flounder was 11.5%.

Hu *et al.* (1983) results, if generalized to apply to summer flounder, suggest that demand is normal and is generally inelastic. An increase or decrease in the wholesale price of summer flounder would not affect sales significantly. The implication is that the major factor affecting sales appears to be disposable real income and this will affect sales regardless of the price level. As people's real income increases they will buy more summer flounder. However, if the real price of summer flounder increases, people's purchases of it will not decrease accordingly.

8.4. INTERNATIONAL TRADE

No summer flounder are imported into the US. However, several other species of imported flounders and flatfish are substitutes for summer flounder in the market place. These imports compete with and affect the price of summer flounder, winter flounder, yellowtail flounder, and other domestic flatfish species (Wang, 1984) .

Import statistics are not kept by species but only by group. The total imports of whole flatfish increased greatly in the immediate past, almost tripling in quantity from 1983 to 1985 (Table 61). Importation of flatfish fillets also increased although not as dramatically. Approximately 65% of all flatfish imports in 1984 were from Canada. This trend seems to have subsided in 1986 (Table 61) probably due to import restrictions on Canadian fish. Overall, edible fisheries imports have established value records for each year since 1976. The quantity of edible imports set records in 1984 and 1985 (USDC, 1986a). Flatfish imports increased 29% in 1985 and gained 0.5% of the overall edible fisheries imports (Table 61).

Canadian imports of flatfish directly compete with summer flounder in the market (Stevenson, pers. comm.). Tariffs enacted in 1985 to restrict importation of Canadian fish are reducing the supply. It is possible that imports from other countries will fill part of the market void. Indications of this trend are evident in the first half of 1986 (Table 61). Reports suggest that imports of flounder fillets from Argentina are being made in 1986 in direct response to a reduced supply of summer flounder in the southeast US (MAFMC, 1986). It is not known whether this is replacing Canadian imports or replacing domestically harvested flounder.

There are no known exports of summer flounder.

9. FISHERY MANAGEMENT PROGRAM

9.1. MEASURES TO ATTAIN MANAGEMENT OBJECTIVES

9.1.1. Specification of OY, DAH, DAP, JVP, and TALFF

Section 303(a)(3) of the MFCMA requires that FMPs assess and specify the OY from the fishery and include a summary of the information utilized in making such specification. OY is to be based on MSY, or on MSY as it may be adjusted for social, economic, or ecological reasons. The most important limitation on the specification of OY is that the choice of OY and the conservation and management measures proposed to achieve it must prevent overfishing. MSY (Section 5.4) has not been specified for summer flounder since there is no current valid quantified MSY estimate.

OY is all summer flounder harvested pursuant to this FMP. The conservation and management measures proposed in the FMP to achieve OY are designed to reduce current growth overfishing. OY cannot be specified as a quantity because (1) there is no current valid estimate of MSY, (2) current State management regimes do not rely on quotas, and (3) this FMP does not rely on quotas.

The Council has concluded that US vessels have the capacity to, and will, harvest the OY on an annual basis, so DAH equals OY. The Council has also concluded that US fish processors, on an annual basis, will process that portion of the OY that will be harvested by US commercial fishing vessels, so DAP equals DAH and JVP equals zero. Since US fishing vessels have the capacity and intent to harvest the entire OY, there is no portion of the OY that can be made available for foreign fishing, so TALFF also equals zero.

9.1.2 Specification of Preferred Management Measures

9.1.2.1. Permits and fees

Any owner or operator of a vessel desiring to take any summer flounder within the US EEZ, or transport or deliver for sale, any summer flounder taken within the EEZ must obtain an annual permit for that purpose. This section does not apply to fishermen taking summer flounder for their personal use, but it does apply to the owners of party and charter boats (vessels for hire).

The owner or operator of a US vessel may obtain the appropriate permit by furnishing on the form provided by NMFS information specifying, at least, the names and addresses of the vessel owner, the name of the vessel, official Coast Guard number, directed fishery or fisheries, gear type or types utilized to take summer flounder, gross tonnage of vessel, the permit number of any current or previous fishery permit issued to the vessel, radio call sign, length of the vessel, engine horsepower, year the vessel was built, type of construction, type of propulsion, navigational aids (e.g., Loran C), type of echo sounder, type of computer, crew size including captain, fish hold capacity (to the nearest 100 lbs), quantity of summer flounder landed during the year prior to the one for which the permit is being applied, principal port of landing, the home port of the vessel, and number of passengers (for party and charter boats). The permit shall be subject to inspection by an authorized official upon landing.

Permits expire on 31 December of each year. Permits may be revoked for violations of this FMP.

9.1.2.2. Time and area restrictions

Time and area restrictions are not proposed.

9.1.2.3. Catch limitations

The Council has adopted the following management measures for this FMP:

1. It is illegal to possess summer flounder less than 13" total length (TL) and it is illegal to possess parts of summer flounder less than 13" to the point of landing.

2. Vessels with permits issued pursuant to this FMP would be required to fish and land pursuant to the provisions of this FMP unless the vessels land in States with larger minimum fish sizes than those provided in the FMP, then the minimum fish sizes would be required to meet the State limits.

3. Foreign fishermen would not be permitted to retain summer flounder since US fishermen, by definition, would be harvesting the OY.

4. Vessels fishing commercially for summer flounder, either directly or as a bycatch in other fisheries, and vessels for hire in the recreational fishery (party and charter boats) would be required to obtain annually renewable permits.

5. States with minimum sizes larger than those in the FMP and minimum mesh regulations are encouraged to maintain them.

6. After three years of Plan implementation the Council would begin to annually examine fishing mortality estimates of age II summer flounder to measure the effectiveness of the size limit relative to the FMP's objectives. If the Council finds that the fishing mortality of age II summer flounder has increased, based on the following adjustment criteria, and if the NMFS Northeast Regional Director concurs with the Council, the minimum fish length would be increased by the NMFS Northeast Regional Director to a minimum fish length of 14" TL.

   The adjustment criteria are (1) estimated fishing mortality from the NEFC spring survey and (2) estimated fishing mortality from a virtual population analysis (VPA) which would be tuned using commercial and recreational fishery CPUE indices. If a three year trend of either of these mortality estimates increases, an increase in the minimum fish length would be required.

The trend in post-FMP fishing mortality rate (age II fish) estimated from the NEFC spring survey will be measured relative to the baseline level defined from pre-FMP fishing mortality rates (age II fish) from NEFC survey data (catch at age available from 1976-1988). Likewise, the trend in post-FMP fishing mortality rates (age II) estimated from virtual population analysis (VPA) will be measured relative to the baseline level defined from pre-FMP fishing mortality rates (age II) from VPA (catch at age also available from 1976-1988). Best estimates of discards will be incorporated into both the catch-at-age data and commercial catch per unit effort (CPUE) data. Catch per unit effort indices to be used to tune the VPA will be evaluated from standardized fishing power analyses of commercial and recreational fisheries data. Candidate data series for CPUE indices include (but are not limited to) NEFC commercial weighout (1976-1988), North Carolina winter fishery (1982/83 - 1988/19) and Marine Recreational Fishery Statistics Survey (MRFSS) (1979-1988) data.

9.1.2.4. Other measures.

The Council has adopted a recommended penalty schedule for violations of the regulations implementing this FMP (Appendix 2).

No foreign fishing vessel shall conduct a fishery for or retain any summer flounder. Foreign nations catching summer flounder shall be subject to the incidental catch regulations set forth in 50 CFR 611.13, 611.14, and 611.50.

9.1.3. Specification and Sources of Pertinent Fishery Data.

9.1.3.1. Domestic and foreign fishermen.

Section 303(a)(5) of the MFCMA requires at least information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, and number of hauls must be submitted to the Secretary. In order to achieve the objectives of this FMP and to manage the fishery for the maximum benefit of the US, it is necessary that, at a minimum, the Secretary collects on a continuing basis and make available to the Councils: (1) summer flounder catch, effort, and ex-vessel value and the catch and ex-vessel value of those species caught in conjunction with summer flounder for the commercial fishery provided in a form that analysis can be performed at the trip, water area, gear, month, year, principal (normal) landing port, landing port for trip, and State levels of aggregation; (2) catch and effort for the recreational fishery; (3) biological (e.g., length, weight, age, and sex) samples from both the commercial and recreational fisheries; and (4) annual and fully comparable NMFS bottom trawl surveys for analyses of both CPUE and age/size frequency. The FMP includes no requirements as to how these data are to be submitted to the Secretary. The Secretary may implement necessary data collection procedures through amendments to the regulations. It is mandatory that these data be collected for the entire management unit, including North Carolina, on a compatible and comparable basis.

Foreign fishermen are subject to the reporting and recordkeeping requirements in 50 CFR 611.50(d).

9.1.3.2. Processors. Section 303(a)(5) of the MFCMA requires at least estimated processing capacity of, and the actual processing capacity utilized by US fish processors must be submitted to the Secretary. The FMP includes no requirements as to how these data are to be submitted to the Secretary. The Secretary may implement necessary data collection procedures through amendments to the regulations.

9.2. ANALYSIS OF BENEFICIAL AND ADVERSE IMPACTS OF ADOPTED MANAGEMENT MEASURES

9.2.1. The FMP Relative to the National Standards

Section 301(a) of the MFCMA states: "Any fishery management plan prepared, and any regulation promulgated to implement such plan fishery conservation and management." The following is a discussion of the standards and how this FMP meets them:

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

A quantified MSY (Section 5.4) has not been specified for summer flounder because of various data difficulties and model inappropriateness. OY is all summer flounder harvested pursuant to this FMP.

Populations of most species oscillate due to natural causes. This can be imagined as a distorted sine wave. Many species are capable of reaching population levels low enough that reproduction is hindered and it becomes very difficult for population levels to rebuild (right whales, shortnosed sturgeon, and whopping cranes are examples).

At this time there is no detectable relationship between stock size and the recruitment of summer flounder. Environmental variations can have a tremendous impact on summer founder. The level of summer flounder harvest has increased dramatically during the past decade (Table 1) yet very high levels of young have been reported in 1986 (R. Smith, pers. comm., Howe, pers. comm., Casey, pers. comm., Musick, pers. comm.).

Since the regulations will be imposed at a time of high harvest, and possibly high population, their effectiveness in preventing recruitment failure will probably not be immediately tested. If the population falls, for any reason, then the regulations will help minimize the severity of the decline and thus speed up the rebuilding of the stock. Since the causes of such a decline and the relationships which would affect such a rebuilding are not fully known, it is beyond the scope of this analysis to model the process. Instead, the regulations are treated as a form of preventative insurance which will assist in stock recovery if it is needed.

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

This FMP is based on the best and most recent scientific information available. Future summer flounder research will be devoted toward both data collection and analysis in order to evaluate the effectiveness of this FMP.

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

The FMP's management unit is summer flounder throughout their range on the Atlantic coast from Maine through North Carolina, including the EEZ, territorial sea, and internal waters. This specification is considered to be consistent with National Standard 3.

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

The FMP does not discriminate among residents of different States. It does not differentiate among US citizens, nationals, resident aliens, or corporations on the basis of their State of residence. It does not incorporate or rely on a State statute or regulation that discriminates against residents of another State.

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

The management regime is intended to allow the fishery to operate at the lowest possible cost (e.g., fishing effort, administration, and enforcement) given the FMP's objectives. The objectives focus on the issue of administrative and enforcement costs by encouraging compatibility with State regulations since a substantial portion of the fishery occurs in State waters. The FMP places no restrictions on the use of efficient techniques of harvesting, processing, or marketing.

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

The management regime was developed to be compatible with and reinforce the management efforts of the States and ASMFC.

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

The management regime was developed to be compatible with and reinforce the management efforts of the States and ASMFC. The primary management measure, the minimum size limit, can be enforced on shore, thus eliminating the need for high cost at sea enforcement

9.2.2. Cost/Benefit Analysis.

9.2.2.1. Commercial fishery

Imposition of a 13" commercial size limit will preclude the landing of fish below that size. Only the States of Maryland (12"), Virginia (12"), and North Carolina (11") currently have size limits which allow landings of summer flounder from the EEZ less than 13" (Section 4.2.2). Under this alternative, however, there would be no tolerance for possession of undersized summer flounder by Federally permitted vessels. Landings of summer flounder below 13" will thus be reduced in these States despite the lower state minimum sizes. The Virginia Marine Resources Commission has expressed interest in increasing its summer flounder minimum size limit to 13". North Carolina has expressed interest in raising its minimum size to conform to EEZ standards

The reduction in the catch of the "small" market category fish in the three affected States can be estimated from historical landings. The 1979-85 coast wide yearly average landings of summer flounder from the EEZ was 23.3 million pounds (Table 2). The proportion of EEZ landings from Maryland, Virginia and North Carolina averaged 3.4%, 24.0% and 32.6%, respectively. Of these state average annual EEZ landings, 34.2%, 42.0% and 33.4%, respectively, were made up of smalls assuming unclassifieds were distributed similarly to classified landings (Table 29). Multiplying the above percentages by the EEZ total landings, and assuming an average weight of 0.68 lb per small (a 12" fish), estimates of the annual number of smalls landed by state are: 400,000 for Maryland, 3,480,000 for Virginia, and 3,720,000 for North Carolina.

Since the small category is composed of summer flounder less than 14" all along the coast and, since no means to separate those less than 13" exists, only a rough estimation is possible. The states that have a minimum size of 13" or more are assumed to land smalls which are 13" or larger. The states which have a 12" minimum size are assumed to land half their smalls by number less than 13" and North Carolina, which has an 11" minimum size is assumed to land 2/3 of their smalls by number less than 13". The above estimates of smalls landed annually were adjusted by these factors to determine the landings reduction likely to result from the 13" size limit:

State	Size limit	Number	Discards (000's) Weight (lbs)	Value ($)
Maryland	12"	200	136	60
Virginia	12"	1,740	1,183	517
No Carolina	11"	2,490	1,693	748
Total		4,430	3,012	1,325

Based on the above assumptions, it can be estimated that EEZ landings will be reduced by 3.01 million lbs in the three states with minimum sizes less than 13". Using the seven year average value of $0.44 per lb for smalls (Table 53), the ex-vessel value will be reduced by $1.325 million. It is expected that there will be a reduction in the catch of undersized summer flounder since fishermen will likely alter their fishing practices to reduce discarding simply to reduce the time and labor costs associated with discarding. In addition, the extent to which summer flounder fishing mortality is actually reduced due to the size limit depends on the survivability of discarded fish. Based on a survey taken during the public hearings, discard mortality rates are thought to lie within the range of 60% to 100% (see Appendix 5 for survey tabulation), depending on handling and the speed of sorting trawl contents.

9.2.2.2. Recreational fishery

The states where anglers would be directly impacted by a 13"minimum size limit in the recreational fishery are Maryland (12"), Virginia (12"), and North Carolina (11") (Section 4.2.2). However, it is necessary to examine the recreational EEZ fishery on a coast wide basis to analyze the full impacts.

The seven year average for EEZ recreational summer flounder landings was 1 million fish (Table 45) and the average estimated number of directed summer flounder trips in the EEZ was 348,000 (Table 58). In the EEZ, an average of 1.8 summer flounder were landed from each directed trip, 5.7 from each successful directed trip (approximately 64% of all directed summer flounder trips result in no summer flounder landed), and 4.2 from each non-directed trip which lands summer flounder (Table 57). Therefore, an estimated average of 125,000 directed trips and 79,000 non-directed summer flounder trips in the EEZ landed summer flounder. In addition, on average, 26% of the EEZ summer flounder landings were less than 13" in length (Table 48). Assuming similar size distribution of landed summer flounder between directed and non-directed trips, this results in approximately 272,000 summer flounder less than 13" in length being landed from the EEZ: 186,000 from directed trips and 86,000 summer flounder from non-directed trips.

A number of studies have been conducted which attempt to determine the satisfaction components and their relative weights for recreational fishing. Reviews of these studies (Fedler, 1984; Holland, 1985) show that the components of escape (perceived freedom), experiencing nature, relaxation, and companionship seem to be the highest components ranked throughout these studies. The component of catching fish has a "relatively low priority" (Fedler, 1984). Holland (1985) surveyed fishermen from the Gulf Coast Conservation Association and found that only 4% of those responding placed the highest emphasis on catching fish. Interestingly, this responding group had twice the rate of fishing trips of any other emphasis group. A study by Dawson and Wilkins (1981)examined the preferences of boating anglers in New York and Virginia in 1980. They found that catching fish was important but consistently ranked below most of the less quantifiable results of a fishing trip. A large percentage of anglers in New York (93%) and Virginia (88%) did not feel they had to catch a lot of fish to be satisfied with a trip as long as they caught something. Nearly half of the New York anglers (47%) and 39% of the Virginia anglers felt they could be satisfied if they did not catch anything.

The 1981 Marine Recreational Socioeconomic Survey concluded that "about half (of the anglers) reported a preferred species while fishing, and most of these said they would continue to fish if they knew their preferred species was not available." (USDC, 1986a). The survey results showed that two thirds of those who caught no fish were satisfied with their fishing trip (KCA, 1983).

Agnello and Anderson (1987) examined fishing success for summer flounder as a predictor of satisfaction. The formula used consisted of the respondents' level of satisfaction explained by the number of fish kept (summer flounder and other fish or total fish) and the trip cost. They found that the number of fish kept contributed to satisfaction but the analysis failed to explain 91% of the variability.

Theoretically, a reduction in landings would have an impact on angler behavior. It is expected that a drop in catch per unit effort would lead to a decrease in the number of trips (Anderson, 1977). However, the seven year average EEZ success rate for fishermen targeting on summer flounder was only 34% (Table 57). Since so many fishermen do not catch summer flounder, but a like number try the next year anyway, the reduction in catch attributable to a size limit would be expected to affect only the directed anglers who are successful. These successful anglers have expressed the greatest support for the size limit during the public hearings, however, so it is not clear that participation in the fishery by this group would actually be reduced. The anglers who take summer flounder, but were not targeting on them must also be considered. Summer flounder represents a bycatch and therefore is important even if the anglers were targeting on other species.

Since the regulations impose a *de facto* catch and release policy in the fishery, the actual catch rate for participating fishermen will not decrease. In fact, over time, a catch and release policy is expected to increase the catch rate since the same fish can be caught by more than one angler. The only rate that will change is the retention rate. Schaefer (pers. comm.) stated that one rationale for enacting New York's summer flounder minimum size limit (14") was to allow summer flounder to be caught and released in the spring and landed at a larger size in the fall. He felt that the minimum size achieved this objective and also encouraged a longer season for party and charter boats.

A 1980 survey of Virginia anglers fishing from boats (Dawson and Wilkins, 1981) determined that 93% would maintain their participation rate if faced with a minimum size limit. Of the other 7%, 5% said they would decrease their participation and 2% said they would stop fishing. The absence of a more substantial impact is not surprising, since the majority of the summer flounder caught in the recreational fishery are taken by a small number of relatively more highly skilled anglers.

In the analyses which follow, it is assumed that the decrease in effort or curtailment of fishing is related only to the species (summer flounder) with the size limit. Additionally, it is assumed that each trip is conducted by a different participant. This is somewhat inaccurate and overestimates the number of individual anglers fishing for summer flounder in the EEZ. The 2% of participants who would stop fishing will be reflected by canceling 2% of the directed trips. The 5% decreased participation will be reflected by assuming 2.5% of both directed and non-directed trips being canceled. These assumptions will overestimate the impacts of the regulation to some unknown but small extent. The losses estimated below for foregone landings, catch, and consumer surplus are for summer flounder only. For trips that are canceled there is an associated consumer surplus loss for the other fish which would have been caught and landed. These fish will also be available for other anglers to land, thus the loss may be a transfer within the recreational fishery and possibly to the commercial fishery. It is unknown to what extent this will occur. Summer flounder not landed are assigned a marginal value loss of $1.13 for the first summer flounder of a trip and $0.61 for the average summer flounder (Section 8.1.2). Each trip is valued at $42.92 (Table 58).

The value of a caught and released summer flounder has not been explicitly determined but, for the purposes of these analyses, is assumed to be half that for one kept. Therefore, the loss in value associated with a minimum size must be halved to reflect the marginal value associated with the catch and release of undersized summer flounder.

Note, however, since many of the States currently have minimum size possession laws greater than 13", or are considering such regulations, the actual number of trips canceled will be less than that estimated below. In addition, new recreational anglers are not as likely to be impacted by the size limit that established anglers (that is, the size limit will be an established fact for new anglers). All EEZ participation and landings will be used to estimate the impacts.

		Trips lost	Flounder not landed	Expenditures redirected	Value lost
Directed:	2% canceled	2,500	14,300	$107,300	$ 8,700
	2.5% reduced	3,100	17,800	$134,100	$ 10,850
Non-directed	2.5% reduced	2,000	8,300	$ 84,800	$ 5,100
Released summer flounder		-	261,500	-	$ 79,750
Total		7,600	301,900	$326,200	$104,400

Revenues will be lost to the recreational fishing business sector if fishing trips are canceled or not taken due to changes in catch per unit effort or retention per unit effort. However,the money not spent on canceled fishing trips will be spent elsewhere in the economy on other goods and services. Executive Order 12291 (46 FR 34263) states that regulatory actions shall consider benefits and costs *to society* (emphasis added). Therefore, while the recreational fishing industry may lose this revenue, society as a whole will not and the redirection cannot be considered a cost, but simply a transfer.

Since the States from Massachusetts through North Carolina already have size limits, the change in the number of trips due to an increase in the size limit is unknown. It is expected that those anglers fishing from States already having a size limit of 13" would not change the number of their trips due to an EEZ size limit of 13". In addition, the actual response of anglers to a size limit may not be a reduction in trips but rather a redirection of effort. The assumptions made above concerning lost trips were based on Dawson and Wilkins (1981) and are considered to be conservative.

Increases in future catch because of decreased mortality of small fish will stimulate new interest in fishing for summer flounder. It is difficult to determine how many more summer flounder need be taken to actually motivate one more trip, but it is likely that the release of small fish will increase the catch rates for all anglers. This will augment the value of the fishing experience, regardless of whether the fish are retained.

9.2.2.3. Enforcement

Enforcement of this measure for the commercial fishery would be entirely dockside with increased surveillance of all EEZ landings and finfish otter trawl landings in particular. Since sale of EEZ landed smalls would be illegal, the surveillance could occur at the dock or at the processor, thereby centralizing effort. Based on the joint NMFS/Coast Guard enforcement document (1985) and the assumption of 900 vessels affected by the regulation (Section 8.1.1 and Table 33) approximately 2,300 contacts would be necessary per year (each vessel contacted 2.5 times per year). This would require approximately 2.6 man-years of enforcement effort at $50,000 per year or $130,000. The Council believes that this measure is designed for dockside enforcement only. In order to cut costs, efforts to include state enforcement officers, many of whom are already inspecting summer flounder for a minimum size, could be utilized.

The joint enforcement document (USDC, 1985c) does not address the enforcement costs of recreational fishing. Therefore, an estimate will be made based on the number of trips involved and the area covered. There were an estimated 427,000 recreational trips in the EEZ that land or direct on summer flounder. This number is misleading, however, since there was an average of 2.8 participants per party (Section 8.1.2). Therefore, an estimated 155,000 vessel trips are involved in the EEZ summer flounder recreational fishery. Even this may be an overestimate since party and charter boats landed 28% of the summer flounder from the EEZ (Table 46). It must be remembered that only approximately 17% of the EEZ landings are in states that have a possession or landing limit less than 13" (Table 46). Therefore, assuming that landing rates are constant along the coast, only 17% of the trips need to be intercepted by federal enforcement efforts. Federal responsibilities would be further reduced if the States of North Carolina and Virginia carry out their intentions to implement a 13" minimum size limit.

This analysis is conducted assuming an arbitrary 5% coverage of the trips and an average of 15 contacts per day. There requirements become 0.6 man years of effort costing $30,000. To the extent that trips are monitored in states already having a 13" minimum size, assistance is given to state agencies, or state regulations change, this requirement will vary.

To the extent that enforcement resources must be drawn from existing assignments the actual cost increases will be zero, and considered as transfers. The internal agency opportunity costs of such transfers would be the cost of the previous assignment. The cost to society would be the difference between the combined enforcement and avoidance costs in the current assignment and those in the summer flounder fishery. Since the societal costs are not quantifiable at this time all enforcement costs will be considered transfers.

9.2.2.4. Summary of selected costs and benefits

The costs and benefits during the first year of the regulations are estimated as follows:

Costs:	Commercial fishery lost revenue	$ 1,325,000
	Recreational marginal value	104,400
	Total	$ 1,429,400
Loss of:	Commercial landings	- 3.01 million pounds
	Recreational trips	- 7,600 trips
Benefits:	Reduced mortality	1.98 million summer flounder saved

9.2.2.5. Commercial, and Recreational Summer Flounder Revenues and Increased Landings Over Time due to Decreased Mortality

Assumptions:

- The best estimate of current fishing mortality rate (F) is 0.65.
- The future fishing mortality rate (F) is assumed to be 0.65.
- The best estimate of natural mortality rate (M) is 0.20.
- The proportion of landings by fishery is assumed to continue and is described by the seven year average of 59% commercial and 41% recreational.
- A commercial discard mortality rate of 60% is used.
- An annual discount rate of 3% is applied.
- The following commercial fishery 1979 - 1985 average price per pound, coast wide were used to calculate future benefits:

Small	$0.44	S,M,L & J	$0.77
Medium	$0.75	Unclassified $0.78	
Large	$0.94	Overall	$0.78
Jumbo	$1.22		

- All fish of the same age are assumed to be the same weight.
- The marginal values for recreationally caught fish as estimated by Agnello and Anderson (1987) are used.

Increased Landings

	Recreational		Commercial
Year	(000 fish)	(000 lbs)	(000 lbs)
2	321	480	691
3	461	798	1,148
4	521	987	1,421
5	547	1,092	1,571
6	558	1,149	1,653
7	563	1,179	1,697
8	564	1,194	1,718
9	565	1,194	1,718
10	565	1,194	1,718

Increased Revenues Due to Regulation Change (in 000's of $)

Year	Commercial	Recreational	Total
2	502	190	692
3	884	265	1,150
4	1,167	291	1,458
5	1,300	296	1,596
6	1,350	294	1,643
7	1,356	287	1,644
8	1,338	280	1,618
9	1,299	272	1,571
10	1,261	264	1,525

Note: All values are adjusted to 1985 dollars.

9.2.2.6. Comparisons of Discounted Yearly Costs and Benefits

The costs are listed above. Total yearly costs are determined to be $1,429,400.

Discounted Benefits and Costs (in millions of $)

Year	Benefits	Costs	Net Benefits
1	-	1.4	- 1.4
2	0.7	1.4	- 0.7
3	1.1	1.3	- 0.2
4	1.5	1.3	0.2
5	1.6	1.3	0.3
6	1.6	1.2	0.4
7	1.6	1.2	0.4
8	1.6	1.2	0.4
9	1.6	1.1	0.5
10	1.5	1.1	0.4
Total	12.8	12.5	0.3

Given the assumptions stated above, the net benefit of moving to a size limit of 13" for EEZ caught summer flounder amounts to $0.3 million in 1985 dollars for a ten year horizon discounted at 3%. If the commercial discard mortality rate is in fact greater than 60%, a lesser increase in commercial revenue will occur (absent a behavioral or gear change to reduce the take of undersized fish). As a worst case scenario, the above analysis was repeated under the assumption of 100% commercial discard mortality. The results projected a loss of $11 million for the same ten year time horizon. To the extent that the true discard mortality rate lies somewhere between 60% and 100%, or changes in commercial fishing practices reduce discarding, the net benefits of the proposed 13" size limit will lie within a range of negative $11 million to positive $0.3 million.

It must be noted, however, that the benefits specified above do not include the value of increased reproductive stability of the population which will occur with decreased fishing mortality. Any increase in recruitment resulting from survival of more summer flounder to reproductive maturity will result in more highly valued commercial and recreational fisheries. To be sure, it is chiefly this increase in spawning potential which is the aim of the proposed size limit. Unfortunately, this benefit cannot be quantified given present knowledge of summer flounder recruitment dynamics.

Apart from potential gains in recruitment, an additional benefit will result from survival of more summer flounder to older age classes. The benefit of a balanced age structure is most apparent when one considers the risk associated with compressing the age composition of the catch to where only one or two year classes dominate. Such compression of the age structure increases the risk of a year class failure resulting in collapse of the fishery. The costs of closing the fishery to allow rebuilding of the summer flounder stock are likely to be far greater than costs incurred to maintain a stable and balanced age structure.

9.2.2.7. Other costs and benefits

Non-quantified benefits and costs are listed below. Based on a subjective analysis of available data, a comparative value of small, medium, or large was assigned to each.

	Cost	Benefit
Commercial fishermen's willingness to pay	Small	
Consumers' willingness to pay	Small	
Deck hands' income	Small-Medium	
Employment change	Small	
Enforcement and judicial expenses	Small	Small
Non-quantified direct expenses	Small	
Overall recreational experience	Small	Small
Preventing stock failure		Small-Large
Redirection of effort	Small	Small
Reduced fuel consumption		Small
Regional sociological effects	Small	
Overall potential costs and benefits	Small-Medium	Small-Large

As can be seen, the costs are numerous but of relatively small size each. The benefits are considered to be few and, with the exception of preventing stock failure, are also relatively small. Although not quantifiable at this time, the benefits of increased recruitment, a more balanced age structure, and reduced risk of stock failure are the most important.

9.2.2.8. Annual Permit System

9.2.2.8.1. Costs

The annual (recurring) costs of instituting an annual permit system for summer flounder are minimal. There will be no start-up costs since the NMFS Northeast Regional Office implemented an annual permit system in 1987 in response to amendments to the Atlantic Mackerel, Squid, and Butterfish FMP (by the Mid-Atlantic Council). The remaining Magnuson Act fisheries (multispecies, lobster, sea scallop, surf clam/ocean quahog were amended to include an annual permit requirement for 1988.

The process and costs of annual maintenance should be straight forward. A renewal application would be sent to each permit holder which contains all the standard information concerning his vessel. The permit holder would simply update the form by writing corrections directly on it (e.g. change in gear, owner's address, etc.) and noting the vessels' catch of summer flounder for the past year. NMFS would process the application upon its return and issue a renewed permit. In 1987 the total cost of issuing a permit was $12.00 (Wang, pers. comm.).

The cost to each respondent would simply be the value of his time in filling out the application/renewal form. The Council estimates that filling out a renewal form should require substantially less time than the 30 minute estimate made for the initial application form, however the more liberal estimate of 30 minutes will be utilized for the purpose of this analysis. This should be considered a maximum estimate however, since it is most likely that fishermen will fill out the form at home on a day experiencing poor weather conditions. Under these circumstances, the opportunity cost approaches zero.

9.2.2.8.2. Benefits

Under the Magnuson Fishery Conservation and Management Act (MFCMA), the Secretary of Commerce is authorized to adopt such regulations as may be necessary to carry out the fishery conservation and management objectives of Fishery Management Plans (FMPs). Effective management of the summer flounder fishery requires knowledge of the numbers of vessels as well as the quantity harvested by them. Since this information is currently unavailable to the Council, a request for an annual permit system has been incorporated into the Fishery Management Plan for Summer Flounder.

Prior to the FMP, fishing for summer flounder did not require a permit. It is the intent of the Council that each permit be renewed annually by the applicant, and an estimation of the applicant's previous year's landings of summer flounder be included on the application form.

The benefits of instituting an annual permit system are several. The first and most direct benefit is the value to managers of knowing how many participants are actively engaged in the fishery, as well as, basic information on how it is being executed (gear types, vessel sizes, etc.). Those who are familiar with the current permit system are aware that fishermen can obtain a permit for any permitted fishery (except surf clams) simply and conveniently by checking off boxes on the application form. (This minimizes the imposed costs to the public but also limits the value of the data.) The most common tendency is to check off all the boxes, regardless of whether a real interest exits for participation in any given fishery. This may be simply for the purpose of leaving all options open, or in some cases fishermen fear the prospect of a limited entry program being instituted at some point in the future, and wish to establish a record of having participated. There is no current provision for discovering if a given vessel did indeed exercise its right to fish for any particular species.

A second benefit from the new system is a vastly improved ability to conduct the Regulatory Impact Reviews of management plans which are required of the Councils by E.O. 12291. In order to assess the impacts of management measures on fishermen, it is clearly necessary to be able to identify who these fishermen are.

A third point of importance is that the three tier information collecting system used by NMFS is based on samples. The Permit File, theoretically, is the one data base available which covers 100% of the population in question. Clearly it would be beneficial to fishery managers to be able to utilize its full potential.

Finally, it should be recognized that the Permit Files have the potential for being an invaluable data base on the East Coast fishing fleet as a whole, not simply from the perspective of individual fisheries. If annual permits were required across all fisheries, a comprehensive and continually updated data base would be the resultant product.

9.2.2.8.3. OMB Approval

The FMP as a whole is projected to become effective by 1 January 1989, and for this reason supporting documents are being submitted at this time. Therefore, the estimates of burden hours presented below will be applied against the FY 1989 information budget when it is prepared in June of 1988. For the FY 1988 budget, only one burden hour is requested for the purpose of beginning the start up procedures.

The Office of Management and Budget has already approved the use of annual permits as requested on Standard Form 83. The current system allows for a total of 9,400 responses per year across all fisheries in the Northeast. With a mean response rate of 30 minutes per application, a total of 4,700 Public Burden Hours have been approved.

Since the greater part of permit renewal will be simply verifying and correcting information already printed on the renewal form, response time should require less than the approved 30 minutes. With the total number of permits issued for summer flounder fishery currently estimated at about 1000, the limit of 9,400 responses per year presents no increase in burden (1,000 responses x 0.5 hours per response = 500 public burden hours).

The only modification of the permit system proposed by this FMP which may require OMB approval is in providing space on the renewal form itself for the past year's landings of summer flounder. The Council believes that adding this question will not increase public response time beyond the approved 30 minutes.

9.2.2.9.2. Reporting costs

Reporting costs were not calculated since it is unknown whether NMFS will institute a mandatory reporting requirement.

9.2.2.9.3. Administrative, enforcement, and information costs

Enforcement of this measure for the commercial fishery would be entirely dockside with increased surveillance of all EEZ landings and finfish otter trawl landings in particular. Since sale of EEZ landed smalls would be illegal, the surveillance could occur at the dock or at the processor, thereby centralizing effort. Based on the joint NMFS/Coast Guard enforcement document (1985) and the assumption of 900 vessels affected by the regulation (Section 8.1.1 and Table 33) approximately 2,300 contacts would be necessary per year (each vessel contacted 2.5 times per year). This would require approximately 2.6 man-years of enforcement effort at $50,000 per year or $130,000. The Council believes that this measure is designed for dockside enforcement only. In order to cut costs, efforts to include state enforcement officers, many of whom are already inspecting summer flounder for a minimum size, could be utilized.

The joint enforcement document (USDC, 1985c) does not address the enforcement costs of recreational fishing. Therefore, an estimate will be made based on the number of trips involved and the area covered. There were an estimated 427,000 recreational trips in the EEZ that land or direct on summer flounder. This number is misleading, however, since there was an average of 2.8 participants per party (Section 8.1.2). Therefore, an estimated 155,000 vessel trips are involved in the EEZ summer flounder recreational fishery. Even this may be an overestimate since party and charter boats landed 28% of the summer flounder from the EEZ (Table 46). It must be remembered that only approximately 17% of the EEZ landings are in states that have a possession or landing limit less than 13" (Table 46). Therefore, assuming that landing rates are constant along the coast, only 17% of the trips need to be intercepted by federal enforcement efforts. Federal responsibilities would be further reduced if the States of North Carolina and Virginia carry out their intentions to implement a 13" minimum size limit.

This analysis is conducted assuming an arbitrary 5% coverage of the trips and an average of 15 contacts per day. There requirements become 0.6 man years of effort costing $30,000. To the extent that trips are monitored in states already having a 13" minimum size, assistance is given to state agencies, or state regulations change, this requirement will vary.

To the extent that enforcement resources must be drawn from existing assignments the actual cost increases will be zero, and considered as transfers. The internal agency opportunity costs of such transfers would be the cost of the previous assignment. The cost to society would be the difference between the combined enforcement and avoidance costs in the current assignment and those in the summer flounder fishery. Since the societal costs are not quantifiable at this time all enforcement costs will be considered transfers.

9.2.2.9.4. Prices to consumers

Recent upward trends in the price per pound of commercially caught summer flounder indicate that the demand and/or supply factors may be shifting. The 1985 price per pound for all size categories was the highest in seven years in both nominal and adjusted dollars (Table 53). Preliminary 1986 data indicate that the price per pound has risen even further for all market categories. The price rise can not be attributed to coastwide summer flounder landings in 1985 since they were relatively high that year (Table 1). It is possible that increased demand for fish in general (e.g., due to health concerns) and summer flounder in particular (e.g. increases in income, Section 8.3,and lower landings of substitutable species, Section 4.2) could be the cause for increased ex-vessel revenue. To the extent that these factors continue to influence the ex-vessel price, the FMP effects will be obscured.

It is expected that the reduction in landings and value attributable to this plan in its early years will not significantly increase overall ex-vessel summer flounder prices. To the extent that the supply of summer flounder is increased in future years by the reduction in mortality, higher average harvest weight, and stock stability, the price of summer flounder should stay steady or decrease only slightly, *ceteris paribus*.

9.2.2.9.5. Redistribution of costs

The FMP is designed to give fishermen the greatest possible freedom of action in conducting business and pursuing recreational opportunities consistent with the objectives. It is not anticipated that the proposed management measures will redistribute costs between users or from one level of government to another. In the short run federal government costs would increase, but as States adopt minimum size limits the same as the limits in the FMP, the federal government costs would decrease since primary enforcement would be by the States as it is now.

9.3. RELATION OF RECOMMENDED MEASURES TO EXISTING APPLICABLE LAWS AND POLICIES

9.3.1. FMPs

This FMP is related to other plans to the extent that all fisheries of the northwest Atlantic are part of the same general geophysical, biological, social, and economic setting. US fishermen often are active in more than a single fishery. Thus regulations implemented to govern harvesting of one species or a group of related species may impact on other fisheries by causing transfers of fishing effort.

Many fisheries of the northwest Atlantic result in significant non-target species fishing mortality. Therefore, each FMP must consider the impact of non-target species fishing mortality on other stocks and as a result of other fisheries.

Since 1 March 1977, the foreign, but not domestic, fishery for summer flounder has been managed by the Preliminary Fishery Management Plan for the Foreign Trawl Fisheries of the Northwest Atlantic (PMP). No other Federal management program for this species is known to exist now or to have existed in the past. The original PMP established an OY for 'other finfish' of 606 million lbs. Within that OY, separate OYs of 22 million lbs of river herring (alewife and blueback herring) and 40 million lbs of butterfish were established. The PMP established US Capacities (USCAP) of 28 million lbs of butterfish and 21 million lbs of river herring. The TALFF for these species were, therefore, 12 million lbs of butterfish (the Butterfish FMP had not been prepared in 1977) and 1 million lbs of river herring. Of the remaining 545 million lbs, 412 million lbs was reserved for USCAP, and 132 million lbs was allocated to TALFF. The overall TALFF for 'other finfish' for 1977 was, therefore, 146 million lbs (42 *FR* 9978).

The 'other finfish' TALFF was intended to take into account the incidental foreign catch of many species in other directed foreign fisheries for species managed under separate PMPs (hence 'other finfish'). The 1977 PMP also restricted the foreign bycatch of bluefish, scup, sea bass, weakfish, river herring, croaker, spot, American shad, and tautog individually to 1% or 5,500 lbs (whichever was greater) of all fish on board or collectively to 7.5% or 26,400 lbs (whichever was greater) of all fish on board. No directed fishery for, or retention of, summer flounder was permitted. Foreign fishing was also restricted to specific areas designated separately for each species for which foreign fishermen were allowed to conduct directed (i.e., large-scale) fisheries.

The PMP was implemented by 50 CFR Part 611, published in the *Federal Register* on 11 February 1977 (42 *FR* 8813-8845). These regulations also prohibited retention of Continental Shelf Fishery Resources (611.13a).

The final foreign fishing regulations for 1978 were published on 28 November 1977 (42 *FR* 60681- 60699). These established the 1978 TALFF as 8.8 million lbs of butterfish, 1 million lbs of river herring, and 103 million lbs of 'other finfish'. 'Other finfish' was defined to exclude all species with specific TALFFs (butterfish, red and silver hakes, river herring, Atlantic mackerel, and long-finned and short-finned squids) as well as American shad, Atlantic cod, Atlantic menhaden, Atlantic redfish, Atlantic salmon, billfish, black sea bass, bluefish, haddock, scup, sharks (except dogfishes), spot, summer flounder, tilefish, yellowtail flounder, weakfish, and Continental Shelf Fishery Resources. Directed fisheries for, and retention of, any of these species by foreign fishermen have thus been prohibited since 1 January 1978.

On 2 November 1978 NMFS published changes to the PMP for 1979 with proposed changes to the foreign fishing regulations to implement them (43 *FR* 51053-51109). The only substantive amendments were to change the butterfish OY from 40 to 35 million lbs and the butterfish DAH from 31 to 26 million lbs. In the accompanying regulations (611.50b), 'other finfish' was defined to include all species except silver and red hakes, short-finned and long-finned squids, Atlantic mackerel, river herring (including alewife, blueback herring, and hickory shad), butterfish, American shad, Atlantic cod, Atlantic herring, Atlantic menhaden, Atlantic redfish, Atlantic salmon, all billfish, black sea bass, bluefish, croaker, haddock, pollock, scup, sea turtles, sharks (except dogfishes), spot, summer flounder, tilefish, yellowtail flounder, weakfish, and Continental Shelf Fishery Resources and other invertebrates (except unallocated squids). (This list amounts to species covered by other FMPs or by other PMPs or which foreign fishermen were not allow to retain.) The final foreign fishing regulations for 1979 were published 19 December 1978 (43 *FR* 59291 -59325). Subsequent amendments to the Foreign Trawl PMP have taken place on 7 August 1979 (44 *FR* 46285), 27 December 1979 (44 *FR* 76539), 4 March 1980 (45 *FR* 14045), 8 December 1980 (45 *FR* 80845), and 4 January 1981 (45 *FR* 1738). No changes with respect to summer flounder were made by these amendments. The most recent change (1 January 1981) extended the PMP in perpetuity, unless otherwise amended. After this FMP is approved, the PMP will be amended to delete summer flounder from its text.

9.3.2. Treaties or international agreements.

No treaties or international agreements, other than GIFAs entered into pursuant to the MFCMA, relate to this fishery.

9.3.3. Federal law and policies.

9.3.3.1. Marine Mammals and Endangered Species.

The Regional Director has been requested to decide whether endangered or threatened species or critical habitat are present in the area affected by the proposed action; and, if present, that they will not be affected by the FMP.

Numerous species of marine mammals and sea turtles occur in the northwest Atlantic Ocean. The most recent comprehensive survey in this region was done from 1979-1982 by the Cetacean and Turtle Assessment Program (CeTap), at the University of Rhode Island (University of Rhode Island, 1982), under contract to the Minerals Management Service (MMS), Department of the Interior. The following is a summary of some of the information gathered in that study, which covered the area from Cape Sable, Nova Scotia, to Cape Hatteras, North Carolina, from the coastline to 5 nautical miles seaward of the 1000 fathom isobath.

Four hundred and seventy-one large whale sightings, 1547 small whale sightings and 1172 sea turtles were encountered in the surveys (Table 69). Also presented in Table 69 are the study team's "estimated minimum population number" for the area, as calculated, and those species currently included under the Endangered Species Act.

The study team concluded that both large and small cetaceans are widely distributed throughout the study area in all four seasons, and grouped the 13 most commonly seen species into three categories, based on geographical distribution. The first group contains only the harbor porpoise, which is distributed only over the shelf and throughout the Gulf of Maine, Cape Cod, and Georges Bank, but probably not southwest of Nantucket. The second group contains the most frequently encountered baleen whales (fin, humpback, minke, and right whales) and the white-sided dolphin. These are found in the same areas as the harbor porpoise, and also occasionally over the shelf at least to Cape Hatteras or out to the shelf edge. The third group "shows a strong tendency for association with the shelf edge" and includes the grampus, striped, spotted, saddleback, and bottlenose dolphins, and the sperm and pilot whales.

Loggerhead turtles were found throughout the study area, but appear to migrate north to about Massachusetts in summer and south in winter. Leatherbacks appear to have a more northerly distribution. The study team hypothesized a northward migration in the Gulf Stream with a southward return in continental shelf waters nearer to shore. Both species usually were found over the shoreward half of the slope and in depths less than 200 feet. The study area may be important for sea turtle feeding or migrations, but the nesting areas for these species generally are in the South Atlantic and Gulf of Mexico.

Studies of sea turtles in Chesapeake Bay (Musick *et al.*, 1985) found that loggerhead and some ridley turtles spend the summer in Chesapeake Bay. Mortalities were studied, with pound net related causes accounting for about 19%, all other identifiable causes accounting for 11%; with the cause of death undetermined for the remaining 70%. The capture of turtles in pound nets apparently depends on the position of the net and the type of net.

The fall trawl fishery, which takes place inshore from Cape Henry to Cape Hatteras, may contribute to the mortality of loggerhead sea turtles (classified as "threatened") and Kemp's ridley sea turtles (classified as "endangered"). Studies at the Virginia Institute of Marine Science (VIMS) (Musick, *et al.*, 1985; Bellmund, *et* *al*., 1987; Lutcavage and Musick, 1985) have shown that large juveniles of these two sea turtles use Chesapeake Bay as a foraging area during the summer. Both species emmigrate from the Bay with the onset of northeast storms and falling water temperatures, usually in October. These turtles then migrate south along the coast to the vicinity of Capt Hatteras, North Carolina. Migration south of the Cape usually occurs in early December. The fall flounder fishery usually operates from early November to December between Cape Henry and Cape Hatteras. Thus, there is a potential for incidental capture of sea turtles in the fishery during some years.

This problem may become acute when climatic conditions result in concentration of turtles and summer flounder in the same area at the same time. These conditions apparently are met when temperatures are cool in October but then remain moderate into mid-December and result in a concentration of turtles between Oregon Inlet and Cape Hatteras, North Carolina. In most years sea turtles leave Chesapeake Bay and filter through the area a few weeks before the flounder fishery becomes concentrated. Efforts are currently under way (by VIMS and the US Fish and Wildlife Service refuges at Back Bay, Virginia, and Pea Island, North Carolina) to more closely monitor these fall mortalities. Flounder fishermen are encouraged to carefully release turtles captured incidentally and to attempt resuscitation of unconscious turtles as recommended in the 1981 *Federal Register* (pages 43976 and 43977).

The only other endangered species occurring in the northwest Atlantic is the shortnose sturgeon (*Acipenser brevirostrum*). The Councils urge fishermen to report any incidental catches of this species to the Regional Director, NMFS, Federal Building, 14 Elm Street, Gloucester, MA 01930, who can forward the information to the active sturgeon data base.

The range of summer flounder and the above mentioned marine mammals and endangered species overlap and there always exists a potential for an incidental kill. Except in unique situations (e.g., tuna-porpoise in the central Pacific), such accidental catches should have a negligible impact on marine mammal or endangered species abundances, and the Councils do not believe that implementation of this FMP will have any adverse impact upon these populations.

The regulations implemented by this FMP should reduce the potential for the capture of endangered species.

9.3.3.2. Marine Sanctuaries.

There is one national marine sanctuary in the area covered by the FMP: the USS *Monitor* National Marine Sanctuary off North Carolina. The Sanctuary was officially established on 30 January 1975 under the Marine Protection, Research, and Sanctuaries Act of 1972. Rules and regulations have been issued (15 CFR 924) that prohibit deploying any equipment in the Sanctuary, fishing activities which involve "anchoring in any manner, stopping, remaining, or drifting without power at any time" (924.3 (a)), and "trawling" (924.3(h)). The Sanctuary is clearly designated on all National Ocean Survey charts by the caption "protected area". This minimizes the potential for damage to the Sanctuary by fishing operations. Details on sanctuary regulations may be obtained from the Director, Sanctuary Programs Office, Office of Coastal Zone Management, NOAA, 3300 Whitehaven Street NW, Washington, DC 20235.

9.3.3.3. Indian treaty fishing rights

No Indian treaty fishing rights are known to exist in the fishery.

9.3.3.4. Oil, Gas, Mineral, and Deep Water Port Development

While Outer Continental Shelf (OCS) development plans may involve areas overlapping those contemplated for offshore fishery management, no major conflicts have been identified to date. The Councils, through involvement in the Intergovernmental Planning Program of the MMS, monitor OCS activities and have opportunity to comment and to advise MMS of the Councils' activities. Certainly, the potential for conflict exists if communication between interests is not maintained or appreciation of each other's efforts is lacking. Potential conflicts include, from a fishery management position: (1) exclusion areas, (2) adverse impacts to sensitive biologically important areas, (3) oil contamination, (4) substrate hazards to conventional fishing gear, and (5) competition for crews and harbor space. The Councils are unaware of pending deep water port plans which would directly impact offshore fishery management goals in the areas under consideration, and are unaware of potential effects of offshore FMPs upon future development of deep water port facilities.

We do know that around 70% of the commercial fishery occurs in the EEZ (Table 2). While the fishery varies among the States and targets on the concentrations of fish as they move inshore in the spring and offshore in the fall, the offshore winter fishery targets on large concentrations of fish that are overwintering along the shelf edge. Offshore (depths up to 500 ft.) areas (section 5.1), where overwintering occurs, and where spawning occurs in the spring, are areas where significant potential conflicts between this resource and offshore energy resources may occur.

9.3.3.5. Vessel Safety

Section 303(a)(6) of the MFCMA requires that FMPs consider access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safety of vessels. The proposed management measures of this FMP do not limit the times or places when or where vessels may fish. Therefore, the Council has concluded that the proposed FMP will not impact or effect the safety of vessels fishing in this fishery.

9.3.4. State, Local, and Other Applicable Law and Policies.

9.3.4.1. State management activities.

Maine, New Hampshire, and Pennsylvania have no specific laws relating to summer flounder (Squires, Dunlop, and Abele, pers. comm.). Massachusetts prohibits catching, landing, and possession of summer flounder less than 14" TL (Pierce, pers. comm.). Rhode Island prohibits harvesting and possession of summer flounder less than 14" TL (Sisson, pers. comm.). Connecticut prohibits possession, sale, and purchase of summer flounder less than 14" TL; recreational fishery minimum length is also 14" (E. Smith, pers. comm.). New York prohibits possession, sale, and transportation of summer flounder less than 14" TL and requires a mesh size equal to or greater than 4" in Long Island Sound (Mason, pers. comm.). New Jersey has a 13" minimum size limit for summer flounder in both the commercial and recreational fisheries; additionally, commercial fishermen engaged in a directed fishery must have a 4.5" stretched mesh codend (Freeman, pers. comm). Delaware prohibits possession (unless legally taken elsewhere) of summer flounder less than 14" TL (Lesser, pers. comm.). Maryland prohibits selling, buying, and possession of summer flounder less than 12" TL with a tolerance of 5% of the vessel load, by number, as indicated by a sample of not less than 200 fish, undersized (Casey, pers. comm.). There is also a 2.5" gill net minimum mesh size. Virginia prohibits taking and possession of any summer flounder less than 12" TL and requires a mesh equal to or greater than 4.5" (Travelstead, pers. comm.). North Carolina prohibits possession of summer flounder less than 11" TL (with a 5% undersized tolerance by weight) and also requires a 4.5" minimum mesh size when the load is 60% or more summer flounder (McCoy, pers. comm.). The Virginia Marine Resources Commission has expressed interest in increasing its summer flounder minimum size limit to 13". North Carolina has expressed interest in raising its minimum size to conform to EEZ standards.

In summary, Massachusetts, Rhode Island, Connecticut, New York, and Delaware have 14" minimum size limits. New Jersey has a 13" limit. The Maryland and Virginia limits are 12", while the North Carolina limit is 11". New York (4"), New Jersey (4.5"), Maryland (2.5" gill net), Virginia (4.5"), and North Carolina (4.5") have mesh regulations for some or all of their waters.

9.3.4.2. State action necessary to implement measures within State waters to achieve FMP objectives, consequences of State inaction or contrary action, and recommendations.

The FMP's objectives are basically designed to make Federal management in the EEZ compatible with State management. To the extent that certain management measures in the FMP differ from State management measures, successful implementation will require the cooperation of the States, ASMFC, and the Federal government. To the extent that management measures differ between State waters and the EEZ, management and enforcement costs could be higher. However, the provision of the FMP that requires that federal permit holders land under the more stringent of the State or federal minimum fish sizes should minimize conflicts.

The fishery directors of the States that are associated with this FMP are voting members of the three Councils preparing the FMP. To the extent they are supportive of the FMP it is anticipated that they would work to have compatible measures implemented in their States.

9.3.4.3. Impact of Federal regulations on State management activities.

Massachusetts, Rhode Island, Connecticut, and New York all have 14" minimum size possession laws and New Jersey has a 13" minimum size possession law. The FMP will have no impact on these states.

Maryland and Virginia have a 12" minimum size possession laws and North Carolina has an 11" minimum size possession law . Most of the landings in these states have been from the 13"minimum size, 4.5" mesh fishery areas. Virginia has a 4.5" mesh regulation for otter trawling in state waters. The Virginia Marine Resources Commission has expressed interest in increasing its summer flounder minimum size limit to 13". North Carolina has expressed interest in raising its minimum size to conform to EEZ standards. To the extent that the State and EEZ minimum sizes differ, landing regulations will be compromised.

9.3.4.4. Coastal Zone Management Program Consistency.

The CZM Act of 1972, as amended, provides measures for ensuring stability of productive fishery habitat while striving to balance development pressures with social, economic, cultural, and other impacts on the coastal zone. It is recognized that responsible management of both coastal zones and fish stocks must involve mutually supportive goals.

The Councils must determine whether the FMP will affect a State's coastal zone. If it will, the FMP must be evaluated relative to the State's approved CZM program to determine whether it is consistent to the maximum extent practicable. The States have 45 days in which to agree or disagree with the Councils' evaluation. If a State fails to respond within 45 days, the State's agreement may be presumed. If a State disagrees, the issue may be resolved through negotiation or, if that fails, by the Secretary.

The FMP was reviewed relative to CZM programs of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina. Letters were sent to all of the States listed above. The letters to all of the States except New Hampshire and Pennsylvania stated that the Councils concluded that the FMP would affect the State's coastal zone and was consistent to the maximum extent practicable with the State's CZM program as understood by the Councils. For New Hampshire, the evaluation was that the FMP might affect the coastal zone and was consistent. For Pennsylvania, the evaluation was that the FMP would not affect the coastal zone. The letters were mailed to the States along with a copy of the hearing draft of the FMP on 21 December 1987. As of 25 April 1988 all of the States had concurred with the Council's finding except Maine and Rhode Island, which States did not respond [since Rhode Island has a minimum size (14") larger than provided by the FMP (13") and Maine has no regulations, here are no apparent reasons to believe that those States should dispute the Council consistency findings].

9.4. COUNCIL REVIEW AND MONITORING OF THE FMP

The Councils will monitor the fishery using the best available data, including that specified in Section 9.1.3. The commercial, recreational, biological, and survey data specified in Section 9.1.3 are critical to the evaluation of the management measures adjustment mechanism. It is necessary that NMFS incorporate all of the above data types from North Carolina summer flounder into the overall NEFC data bases. Additionally, improved stock assessments are necessary for FMP monitoring. As a result of that monitoring, the Councils will determine whether it is necessary to amend the FMP.

It is also necessary that NMFS evaluate the efficiency of square mesh nets.

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Table 1. Summer Flounder Commercial Landings (thousands of lbs) by State, 1936-1985.

Year	ME	NH	MA	RI	CT	NY	NJ	DE	MD +	VA +	NC +	Total
1936	na	na	na	na	na	na	na	na	30	425	1175	1630
1937	0	0	1960	91	407	2098	2152	0	30	500	404	7642
1938	0	0	1955	173	282	2452	2083	3	66	772	501	8287
1939	0	0	1400	211	248	2666	2604	11	44	1098	978	9260
1940	0	0	2847	258	149	1814	3554	3	444	1247	498	10814
1941	na	na	na	na	na	na	na	na	183	764	na	947
1942	0	0	193	235	126	1286	987	2	143	475	498	3945
1943	0	0	122	202	220	1607	2224	11	143	475	498	5502
1944	0	0	719	414	437	2151	3159	8	197	2629	498	10212
1945	0	0	1730	467	270	3182	33102	2	460	1652	1204	12297
1946	0	0	1579	625	478	3494	3310	22	704	2889	1204	14305
1947	0	0	1467	333	813	2695	2302	46	532	1754	1204	11146
1948	0	0	2370	406	518	2308	3044	15	472	1882	1204	12219
1949	0	0	1787	470	372	3560	3025	8	783	2361	1204	13570
1950	0	0	3614	1036	270	3838	2515	25	543	1761	1840	15442
1951	0	0	4506	1189	441	2636	2865	20	327	2006	1479	15469
1952	0	0	4898	1336	627	3680	4721	69	467	1671	2156	19625
1953	0	0	3836	1043	396	2910	7117	53	1176	1838	1844	20213
1954	0	0	3363	2374	213	3683	6577	21	1090	2257	1645	21223
1955	0	0	5407	2152	385	2608	5208	26	1108	1706	1126	19726
1956	0	0	5469	1604	322	4260	6357	60	1049	2168	1002	22291
1957	0	0	5991	1486	677	3488	5059	48	1171	1692	1236	20848
1958	0	0	4172	950	360	2341	8109	209	1452	2039	892	20524
1959	0	0	4524	1070	320	2809	6294	95	1334	3255	1529	21230
1960	0	0	5583	1278	321	2512	6355	44	1028	2730	1236	21087
1961	0	0	5240	948	155	2324	6031	76	539	2193	1897	19403
1962	0	0	3795	676	124	1590	4749	24	715	1914	1876	15463
1963	0	0	2296	512	98	1306	4444	17	550	1720	2674	13617
1964	0	0	1384	678	136	1854	3670	16	557	1492	2450	12237
1965	0	0	431	499	106	2451	3620	25	734	1977	272	10115
1966	0	0	264	456	90	2466	3830	13	630	2343	4017	14109
1967	0	0	447	706	48	1964	3035	0	439	1900	4391	12930
1968	0	0	163	384	35	1216	2139	0	350	2164	2602	9053
1969	0	0	78	267	23	574	1276	0	203	1508	2766	6695
1970	0	0	41	259	23	900	1958	0	371	2146	3163	8861
1971	0	0	89	275	34	1090	1850	0	296	1707	4011	9352
1972	0	0	93	275	7	1101	1852	0	277	1857	4655	10117
1973	0	0	506	640	52	1826	3091	*	495	3232	7365	17207
1974	*	0	1689	2552	26	2487	3499	0	709	3111	11812	25885
1975	0	0	1768	3093	39	3233	4314	5	893	3418	11510	28273
1976	*	0	4019	6790	79	3203	5647	3	697	3303	11452	35193
1977	0	0	1477	4058	64	2147	6566	4	739	4540	11137	30732
1978	0	0	1433	3204	64	1947	5413	4	676	5940	12316	30997
1979	5	0	1175	2825	30	1427	6279	0	1712	10019	18420	41897
1980	4	0	366	1277	48	1246	4805	1	1324	8504	16882	34456
1981	3	0	598	2861	81	1985	4088	7	403	3652	9776	23373
1982	18	*	1665	3983	64	1865	4318	8	360	4332	8440	25053
1983	84	0	1648	4092	129	1435	4826	5	937	8134	9813	32303
1984	2	*	1488	4479	131	2295	6364	9	813	9673	15086	40341
1985	3	*	2224	7533	183	2517	5634	10	577	5036	10965	34673

* = less than 500 lbs.; na = not available; + = NMFS did not identify flounders to species prior to 1978 for NC and 1957 for both MD and VA and thus the numbers represent all unclassified flounders (North Carolina reports that the 1973-1986 data include all *Paralichthys*, not just *P. dentatus*, inflating NC landings by 15-20%).

NOTE: numbers may not total due to rounding.

Source: 1936-1977 USDC, 1984; 1978- 1985 USDC, 1986e.

Table 2. Summer Flounder Commercial Landings (thousands of lbs) by State by Distance from Shore (miles) and Percent of Total Summer Flounder Landings Taken from the EEZ, 1979-1985

Year	Distance	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	NC*	Total
1979	0-3	-	-	465	383	10	1069	472	6	164	770	6421	9760
	3-200	5	-	710	2443	21	357	5807	-	1549	9249	11999	32137
	Total	5	-	1175	2825	30	1427	6279	6	1712	10019	18420	41897
	EEZ %	100	-	60	86	69	25	92	-	90	92	65	77
1980	0-3	-	-	218	186	4	1091	494	1	65	1238	6562	9858
	3-200	4	-	147	1091	45	155	4312	-	1259	7265	10320	24598
	Total	4	-	366	1277	48	1246	4805	1	1324	8504	16882	34456
	EEZ %	100	-	40	85	92	12	90	-	95	85	61	71
1981	0-3	-	-	406	353	22	1727	853	7	9	441	3140	6958
	3-200	3	-	192	2508	60	257	3155	-	395	3211	6636	16416
	Total	3	-	598	2861	81	1985	4008	7	403	3652	9776	23373
	EEZ %	100	-	32	88	73	13	79	-	98	88	68	70
1982	0-3	-	-	855	475	8	1283	402	8	60	463	4229	7782
	3-200	18	*	810	3508	56	583	3916	-	301	3869	4212	17271
	Total	18	*	1665	3983	64	1865	4318	8	360	4332	8440	25053
	EEZ %	100	100	49	88	88	31	91	-	83	89	50	69
1983	0-3	1	-	693	507	33	977	485	5	125	2757	6393	11978
	3-200	83	-	1648	4092	97	458	4341	-	811	5377	3419	20326
	Total	84	-	2341	4599	129	1435	4826	5	937	8134	9813	32303
	EEZ %	99	-	70	89	75	32	90	-	87	66	35	63
1984	0-3	-	-	722	617	59	1572	1343	9	125	3618	5667	13731
	3-200	2	*	766	3862	72	723	5022	-	688	6055	9420	26610
	Total	2	*	1488	4479	131	2295	6364	9	813	9673	15086	40341
	EEZ %	100	100	52	86	55	32	79	-	85	63	62	66
1985	0-3	2	-	506	822	133	1419	1188	10	79	928	3753	8831
	3-200	1	*	1719	6711	50	1098	4447	-	498	4108	7212	25842
	Total	3	*	2224	7533	183	2517	5634	10	577	5036	10965	34673
	EEZ %	28	100	77	89	27	44	79	-	86	82	66	75
7 Year Mean	0-3	*	-	552	478	38	1306	748	5	90	1459	5166	9842
	3-200	16	*	856	3459	57	517	4428	-	786	5590	7603	23314
	Total	17	*	1408	3937	95	1824	5176	5	875	7050	12769	33157
	EEZ %	98	100	61	88	60	28	86	-	90	79	60	70

- = zero
* = less than 500 lbs.
Note: numbers may not total due to rounding.
Source: USDC, 1986e.

Table 3. Estimated Total Weight (millions of lbs)+ of Several Substitutable Species Caught by Marine Recreational Anglers, US East Coast, 1960 - 1985

	Summer Flounder		Bluefish		Weakfish and Seatrout		Striped Bass		Scup/ Porgies		Sea Bass/ Groupers		Total Weight of Recreational Total	
	lbs	%	lbs	%	lbs	%	lbs	%	lbs	%	lbs	%	lbs	%
1960	53.0	7	50.6	7	26.9	4	37.5	5	36.7	5	12.6	2	731.9	100
1965	34.8	4	90.5	11	20.5	2	56.9	7	37.6	4	10.9	1	836.5	100
1970	28.3	3	119.2	13	40.7	4	73.3	8	28.5	3	19.7	2	917.6	100
1974#	34.9	10	127.8	36	20.1	6	39.8	11	6.1	2	3.5	1	357.1	100
1979	25.1	5	136.9	26	19.6	4	8.9	2	13.0	2	10.4	2	534.4	100
1980	33.1	7	148.6	29	48.0	9	2.2	*	12.0	2	12.7	2	476.1	100
1981	16.7	4	123.2	29	17.8	4	1.5	*	7.5	2	9.5	2	426.4	100
1982	27.9	7	104.2	26	14.3	4	12.9	3	19.0	5	27.0	7	396.1	100
1983	54.5	11	144.2	29	15.4	3	5.2	1	9.5	2	13.2	3	494.5	100
1984	47.9	13	88.4	24	8.8	2	4.8	1	5.9	2	15.1	4	365.8	100
1985	20.6	5	100.3	25	9.4	2	5.0	1	9.8	2	10.9	3	397.4	100
1960-78 Mean	34.2	6	112.2	21	22.0	4	22.5	4	16.9	3	13.2	2	539.4	40
1979-85 Mean	32.3	7	120.8	27	19.4	4	5.8	1	11.0	2	14.1	3	441.5	46

+ = total number of fish (Types A, B1, and B2) multiplied by mean weight of Type A fish.

* = less than 0.5%.
# = 1974 survey covered Maine through Virginia only.

In 1960, summer flounder was listed with other species under "flatfishes".
In 1979, black sea bass was listed with other species under "sea basses".

Sources: 1960: Clark, 1962. 1965: Deuel and Clark, 1968. 1970: Deuel, 1973. 1974: Deuel, pers. comm. 1979 - 1985: USDC, 1986b.

Table 4. Stratified Mean Weight (kg) per Tow (delta distribution estimates) of Summer Flounder from NMFS, NEFC Spring Bottom Trawl Surveys in the Middle Atlantic (Strata 61-76), Southern New England (Strata 1-12), and on Georges Bank (Strata 13-25), Standard Deviation of the Mean (S.D.) and Coefficient of Variation (C.V.) are Provided as Indices of Variability. Catches Adjusted to No. 36 Trawl (1968-1986).

Year	Georges Bank Mean	S. New England Mean	Mid-Atlantic Mean	All Mean	All S.D.	All C.V.
1968	0.00	0.08	0.26	0.10	0.04	37.8
1969	0.00	0.00	0.35	0.10	0.04	38.2
1970	0.00	0.00	0.19	0.06	0.03	44.2
1971	0.00	0.31	0.25	0.18	0.06	35.3
1972	0.00	0.02	0.44	0.14	0.04	26.7
1973	0.00	0.50	0.54	0.33	0.06	19.0
1974	0.08	1.29	1.24	0.85	0.21	24.6
1975	0.04	2.38	0.59	1.05	0.27	25.9
1976	0.02	2.32	1.44	1.25	0.39	31.0
1977	0.07	1.38	2.39	1.21	0.22	18.2
1978	0.32	1.07	2.01	1.08	0.21	19.7
1979	0.00	0.26	0.44	0.22	0.06	25.8
1980	0.07	0.59	1.03	0.54	0.08	14.7
1981	0.22	0.79	0.82	0.60	0.11	17.4
1982	0.19	1.19	1.09	0.81	0.13	16.4
1983	0.25	0.56	0.47	0.43	0.08	17.6
1984	0.04	0.32	0.45	0.26	0.06	24.0
1985	0.10	1.32	1.09	0.82	0.15	18.5
1986	na	na	na	0.56	0.09	16.1
Mean	0.08	0.77	0.84	0.56	0.12	24.8

Note: Indices are presented in metric (kg) and not converted because of variability calculations. Conversion of Kg to lbs: (kg)(2.2046) = lbs.

na = not available.

Source: USDC, 1986c.

Table 5. Stratified Mean Number per Tow (delta distribution estimates) of Summer Flounder from NMFS, NEFC Spring Bottom Trawl Surveys in the Middle Atlantic (Strata 61-76), Southern New England (Strata 1-12), and on Georges Bank (Strata 13-25), Standard Deviation of the Mean (S.D.) and Coefficient of Variation (C.V.) are Provided as Indices of Variability. Catches Adjusted to No. 36 Trawl (1968-1986).

Year	Georges Bank Mean	S. New England Mean	Mid-Atlantic Mean	All Mean	All S.D.	All C.V.
1968	0.00	0.05	0.27	0.10	0.04	37.8
1969	0.00	0.00	0.42	0.12	0.04	34.0
1970	0.00	0.00	0.20	0.06	0.02	35.0
1971	0.00	0.13	0.33	0.14	0.04	28.1
1972	0.00	0.01	1.01	0.30	0.08	27.1
1973	0.00	0.38	1.19	0.49	0.09	19.4
1974	0.11	1.28	1.54	0.94	0.23	24.5
1975	0.03	2.36	1.45	1.26	0.40	31.6
1976	0.04	2.72	2.72	1.77	0.50	28.5
1977	0.07	1.93	3.89	1.85	0.29	15.7
1978	0.35	1.20	4.23	1.79	0.36	19.9
1979	0.00	0.16	0.69	0.26	0.06	22.8
1980	0.04	0.37	2.42	0.86	0.15	17.2
1981	0.13	0.85	2.25	1.01	0.15	14.7
1982	0.16	1.73	2.84	1.50	0.26	17.5
1983	0.20	0.65	1.30	0.68	0.10	14.3
1984	0.04	0.30	1.09	0.44	0.13	28.3
1985	0.04	2.03	2.81	1.56	0.35	22.3
1986	na	na	na	1.40	0.22	15.7
Mean	0.07	0.40	1.70	0.87	0.19	23.9

na = not available.

Source: USDC, 1986c.

Table 6. Stratified Mean Weight (kg) per Tow (delta distribution estimates) of Summer Flounder from NMFS, NEFC Autumn Bottom Trawl Surveys in the Middle Atlantic (Strata 61-76), Southern New England (Strata 1-12), and on Georges Bank (Strata 13-25), Standard Deviation of the Mean (S.D.) and Coefficient of Variation (C.V.) are Provided as Indices of Variability. Catches Adjusted to No. 36 Trawl (1963-1985).

Year	Georges Bank Mean	S. New England Mean	Mid-Atlantic Mean	All Mean	All S.D.	All C.V.
1963	0.00	0.54	na	0.27	0.10	36.1
1964	0.00	0.92	na	0.46	0.22	48.1
1965	0.00	0.06	na	0.03	0.02	74.1
1966	0.00	0.01	na	0.01	0.01	96.8
1967	0.00	0.10	2.08	0.65	0.20	31.0
1968	0.00	0.16	1.54	0.51	0.14	28.1
1969	0.00	0.25	0.77	0.31	0.10	31.8
1970	0.00	0.15	0.05	0.07	0.04	58.4
1971	0.00	0.04	0.41	0.14	0.04	32.9
1972	0.00	0.25	0.16	0.13	0.03	25.4
1973	0.01	0.60	0.34	0.32	0.12	37.4
1974	0.04	2.00	0.85	0.97	0.21	21.4
1975	0.21	1.19	3.03	1.39	0.24	17.6
1976	0.16	0.75	0.56	0.49	0.09	17.7
1977	0.34	1.70	1.10	1.04	0.28	26.8
1978	0.18	0.52	0.05	0.26	0.06	24.2
1979	0.13	0.85	0.66	0.54	0.15	27.1
1980	0.29	0.60	0.28	0.40	0.11	28.4
1981	0.02	0.65	0.45	0.37	0.11	31.5
1982	0.01	0.77	0.63	0.46	0.13	28.9
1983	0.10	0.35	0.39	0.27	0.07	24.6
1984	0.24	0.43	0.61	0.41	0.14	33.9
1985	0.05	0.89	0.46	0.47	0.12	25.8
Mean	0.08	0.60	0.76	0.43	0.12	35.1

Note: Indices are presented in metric (kg) and not converted because of variability calculations. Conversions of Kg to lbs: (kg)(2.2046) = lbs.

na = not available.

Source: USDC, 1986c.

Table 7. Stratified Mean Number per Tow (delta distribution estimates) of Summer Flounder from NMFS, NEFC Autumn Bottom Trawl Surveys in the Middle Atlantic (Strata 61-76), Southern New England (Strata 1-12), and on Georges Bank (Strata 13-25), Standard Deviation of the Mean (S.D.) and Coefficient of Variation (C.V.) are Provided as Indices of Variability. Catches Adjusted to No. 36 Trawl (1963-1985).

	Georges Bank	S. New England	Mid-Atlantic		All	
Year	Mean	Mean	Mean	Mean	S.D.	C.V.
1963	0.00	0.06	na	0.29	0.10	34.9
1964	0.00	0.59	na	0.21	0.09	43.8
1965	0.00	0.41	na	0.03	0.02	74.0
1966	0.00	0.02	na	0.01	0.01	96.8
1967	0.00	0.02	2.37	0.70	0.21	30.0
1968	0.00	0.04	1.86	0.56	0.15	27.1
1969	0.00	0.10	0.91	0.30	0.10	31.6
1970	0.00	0.08	0.17	0.08	0.04	47.6
1971	0.00	0.02	0.69	0.21	0.06	30.8
1972	0.00	0.21	0.42	0.20	0.05	23.1
1973	0.01	0.43	0.95	0.43	0.10	23.3
1974	0.03	1.25	1.36	0.85	0.17	20.1
1975	0.15	1.02	3.96	1.58	0.26	16.4
1976	0.10	0.69	1.14	0.61	0.11	18.1
1977	0.35	1.38	2.21	1.26	0.36	28.4
1978	0.12	0.34	0.13	0.20	0.05	22.8
1979	0.07	0.43	1.56	0.64	0.24	38.2
1980	0.13	0.33	1.18	0.51	0.13	25.7
1981	0.02	0.48	0.98	0.46	0.14	30.1
1982	0.02	0.87	1.66	0.80	0.31	38.8
1983	0.07	0.23	1.27	0.48	0.18	38.1
1984	0.10	0.31	1.33	0.53	0.27	51.3
1985	0.04	0.70	1.28	0.64	0.17	26.4
Mean	0.05	0.44	1.33	0.50	0.14	35.5

na = not available.

Source: USDC, 1986c.

Table 8. Summer Flounder Commercial Catch per Unit Effort (lbs/trip) for Tonnage Classes 2, 3, and 4 Vessels for Trips in which Summer Flounder Comprised Greater than 5% of the Catch, 1967-1985.

	Commercial CPUE (lbs/trip)		
Year	Class 2 (5-50 GRT)	Class 3 (51-150 GRT)	Class 4 (151-500 GRT)
1967	1,477	1,588	922
1968	1,720	1,720	1,014
1969	1,301	1,918	1,367
1970	970	1,610	1,610
1971	1,257	1,698	1,257
1972	1,323	1,257	1,323
1973	1,742	1,389	221
1974	2,646	2,227	2,381
1975	1,786	1,852	2,337
1976	2,161	2,866	3,616
1977	1,786	3,065	3,263
1978	2,095	3,440	6,924
1979	1,874	4,013	6,174
1980	1,896	4,388	6,262
1981	1,632	3,528	5,468
1982	1,808	3,793	7,387
1983	2,117	3,506	5,270
1984	2,073	3,396	4,542
1985	1,433	2,448	3,396

Source: USDC, 1986c.

Table 9. Maturity Indices (% Ovary Weight of Total Fish Weight) for Summer Flounder, June 1974-October 1976.

Month	Year	n	Mean	SD	Range
June	1974	58	0.65	0.33	0.31-2.26
	1975	100	0.76	0.55	0.34-3.34
July	1974	64	0.56	0.19	0.27-1.27
August	1974	43	0.57	0.17	0.21-1.01
September	1974	95	1.34	1.30	0.23-5.59
	1975	81	1.38	1.40	0.34-7.77
October	1974	78	1.83	2.05	0.23-11.53
	1976	139	2.05	1.38	0.37-7.91
November	1974	39	1.87	1.39	0.41-6.35
December	1975	171	1.60	0.90	0.31-8.71
February	1975	14	1.26	2.29	0.43-9.23
March	1975	14	0.84	0.38	0.51-1.79
	1976	72	0.94	0.95	0.36-6.20
April	1975	12	0.81	0.38	0.46-1.91
May	1975	42	0.71	0.23	0.32-1.17

Source: Morse, 1981.

Table 10. Reported Length Frequencies of Young-of-the-Year and Age "1" Summer Flounder over its Range

Study	Location	YOY or age "1"	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
			Total Length (in)											
Pearcy & Richards (1962)	Connecticut - Mystic River	YOY	-	-	2-3	4-5	4-5	4-5	-	-	-	-	-	-
Poole (1961)	N.Y.- Great South Bay	YOY	-	-	-	-	6	7	9	-	-	-	-	-
NMFS	New York Bight	YOY	-	-	-	-	-	-	-	-	7	7	7	7
NMFS inshore spring cruises	New York - Cape Hatteras	"1"	7-8	7-8	7-8	-	-	-	-	-	-	-	-	-
Smith (pers. comm.) & DeSylva, Kalber & Shuster (1962)	Delaware Bay	YOY	-	-	-	4	4	5	-	-	-	-	7	-
Smith (pers. comm.)	Del.-Indian River Bay	YOY	-	-	-	3	-	-	-	-	-	-	-	-
Casey (pers. comm.)	Maryland - Coastal Bays	YOY	-	-	3	4	5	6	6	7	-	-	-	-
		"1"	-	-	11	11	12	12	14	14	-	-	-	-
Hildebrand & Schroeder (1928)	Chesapeake Bay	YOY	-	-	1-2	1-2	3-5	-	-	-	-	5-7	-	-
Eldridge (1962)	Chesapeake Bay	YOY	-	-	-	4	6	6	6	7	7	7	-	-
	Va.-York River	YOY	-	-	-	4	-	-	-	-	-	-	7	-
Powell (1974)	N. Carolina - Pamlico Sound	YOY	-	-	-	4	5	6	6	6	7	7	-	-
		"1"	7	7	8	8	9	-	-	-	11	-	-	-
Summary*		YOY	-	-	1-3	3-4	4-6	5-6	6	6-7	7	-	7	-
		"1"	-	8	-	-	9	-	-	-	11	11	-	-

*Does not include Poole (1961) data for August and September.

Source: Smith *et al.*, 1981.

Table 11. Comparison of Summer Flounder Age Studies (Otoliths used for aging except as noted)

Study	Study Area	Location of Annulus and Estimated Time of Annulus Formation	Estimated Age at Distinct Annulus	Mean Calculated Total Length (in) at Successive Annuli 1	2	3	4	5	6	7	8	9
								Male				
Poole (1961)	Great South Bay Long Island, NY	Outer edge-opaque zone February - March	one	10	13	15	17	-	-	-	-	-
Eldridge (1962)	Winter Trawl Fishery Hampton, VA	Outer edge-opaque zone February - March	three	7[a]	9[a]	13	14	15	16	16	17	-
Powell (1974)	Pamlico Sound, NC	Outer edge-opaque zone January - February	one	7	-	-	-	-	-	-	-	-
Smith & Daiber (1977)	Delaware Bay, DE	Outer edge-opaque zone February - March	two	-	10	14	16	18	19	20	-	-
								Female				
Poole (1961)	Great South Bay Long Island, NY	Outer edge-opaque zone February - March	one	11	15	18	21	25	-	-	-	-
Eldridge (1962)	Winter Trawl Fishery Hampton, VA	Outer edge-opaque zone February - March	three	7[a]	9[a]	15	17	19	20	22	24	26
Powell (1974)	Pamlico Sound, NC	Outer edge-opaque zone January - February	one	7	11	15	-	-	-	-	-	-
Smith & Daiber (1977)	Delaware Bay, DE	Outer edge-opaque zone February - March	two	-	11	15	18	20	22	24	26	-
Shepherd (1980)	Martha's Vineyard Sound, MA	Outer edge-hyaline zone March (otolith)	two	5[b]	11[b]	15[b]	18[b]	20[b]	-	-	-	-
		Circuli scale crossover March - April (scale)		5[c]	10[c]	14[c]	18[c]	21[c]	23c	27[c]	-	-

a - lengths are estimates or means of observed length frequency.
b - lengths as calculated from otoliths.
c - lengths as calculated from scales.

Source: Smith et al., 1981.

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Table 12. Length-Weight Relationships for Summer Flounder, Expressed as Log10 Weight = Log10 a + b (Log10 Length), Correlation Coefficient (r), and Expected Mean Weight at 400 mm TL for Each Month by Sex.

Month	Year	Sex	n	Mean Wt.(g)*	Log10 a	Log10 b	r
June	1974	M	46	687	-5.565	3.229	0.97
		F	68	692	-5.810	3.324	0.99
July	1974	M	23	739	-5.827	3.342	0.99
		F	75	717	-5.495	3.207	0.98
August	1974	M	30	739	-5.826	3.341	0.97
		F	75	720	-5.398	3.170	0.98
September	1974	M	110	747	-4.675	2.901	0.96
		F	104	735	-5.477	3.206	0.98
October	1974	M	54	727	-4.719	2.914	0.99
		F	87	756	-5.111	3.070	0.99
November	1974	M	42	711	-5.98	3.055	0.99
		F	40	713	-5.421	3.180	0.99
February	1975	M	33	702	-5.178	3.084	0.99
		F	18	691	-4.848	2.953	0.98
March	1975	M	11	663	-4.617	2.859	0.98
		F	15	692	-5.287	3.123	0.98
April	1975	M	10	655	-5.230	3.092	0.99
		F	20	682	-5.408	3.167	0.99
May	1975	M	55	670	-5.886	3.339	0.98
		F	80	666	-5.498	3.198	0.99
June	1975	M	154	676	-5.700	3.278	0.99
		F	151	675	-5.584	3.233	0.99
Total		M	568	703	-5.289	3.126	0.98
		F	702	703	-5.548	3.226	0.99

* 1 gram = 0.035 ounces: 1 ounce = 28.35 g.

Source: Morse, 1981.

Table 13. Parameters of the von Bertalanffy Growth Equation Derived for Summer Flounder in the Middle Atlantic Bight.*

Parameter	Male	Female
L_{oo}	67.49 (9.26)	82.67 (8.68)
k	0.183 (0.068)	0.1731 (0.056)
t_o	-1.657 (0.649)	-1.039 (0.691)

* Asymptotic standard errors for each parameter in parentheses.

Source: USDC, 1986c.

Table 14. Catch per Tow at Age (numbers) of Summer Flounder from NMFS Spring Offshore Surveys, Georges Bank to Cape Hatteras, 1976-1986, Using the Smoothed Survey Index

	Age												Survey
Year	0	1	2	3	4	5	6	7	8	9	10	Total	Index
1976	-	.1867	.9172	.3472	.1163	.0622	.0082	-	-	-	-	1.6378	1.6879
1977	-	.3485	.7921	.4182	.0612	.0510	.0085	-	.0051	-	-	1.6846	1.6998
1978	-	.3470	.4617	.3375	.1593	.0230	.0108	.0108	-	-	.0027	1.3528	1.3501
1979	-	.0673	.2019	.0874	.0446	.0157	-	-	-	.0166	-	.4335	.4371
1980	.0046	.4238	.1821	.0899	.0139	.0271	.0170	-	-	-	-	.7584	.7747
1981	.0288	.3607	.3458	.1222	.0666	.0318	.0129	.0199	.0060	-	-	.9947	.9937
1982	.0036	.2431	.5020	.3314	.0835	.0157	.0169	.0048	-	-	-	1.2010	1.2098
1983	-	.1991	.1768	.2682	.0468	.0223	.0097	.0223	-	-	-	.7462	.7435
1984	.0143	.1486	.2847	.0776	.0298	.0275	.0275	-	.0054	-	-	.6154	.5968
1985	-	.0618	.7242	.3848	.0921	.0088	-	.0025	-	-	-	1.2742	1.2616
1986	-	.6992	.4439	.1652	.0396	.0205	-	-	-	-	-	1.3384	1.3657

Note: Discrepancies between the totals and the overall survey index are due to rounding errors.

Source: USDC, 1986c.

Table 15. Commercial Catch at Age in Numbers (hundreds) of Summer Flounder, 1976-1983*

	Age													
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13
1976	-	4,280	28,370	9,837	8,175	1,134	130	6	-	-	-	-	-	-
1977	-	452	11,909	11,257	1,597	1,031	190	25	31	-	-	-	-	-
1978	52	1,409	10,028	22,706	8,038	1,636	1,400	106	23	-	-	-	-	-
1979	74	4,857	20,272	14,921	7,251	2,945	681	204	178	55	9	20	-	-
1980	-	6,280	19,669	9,205	2,792	1,425	541	105	13	-	-	-	-	-
1981	931	13,620	32,243	13,692	2,866	2,510	903	395	46	221	133	-	-	-
1982	1,970	19,639	63,287	24,408	4,665	1,549	452	334	203	112	26	34	10	8
1983*	1,123	14,513	78,330	39,407	11,928	5,382	2,302	581	146	348	220	-	-	-

Note: Figures do not include summer flounder in the "unclassified" market category.

* Does not include market category 5 ("pee-wee's").

Source: USDC, 1986c.

Table 16. Sex Ratios (male:female) of Summer Flounder, Collected in NMFS Bottom Trawls Between Cape Cod and Cape Hatteras, 1974-1979.

Total Length interval (in)			1974-1979 (combined)		
	Spring	Summer	Fall	Winter	Total
8.1-10.0	15:7	12:4	175:63	49:12	251:86
10.1-12.0	76:32	90:31	298:84	38:16	502:163
12.1-14.0	93:56	213:93	430:205	31:24	767:378
14.1-15.9	80:94	139:137	284:456	28:42	531:729
16.0-17.9	22:90	50:115	71:204	16:32	159:441
18.0-19.9	7:41	7:63	31:138	4:20	49:262
20.0-21.9	2:16	4:28	3:77	2:10	11:131
22.0-23.8	0:10	0:6	1:36	0:5	1:57
>23.9	0:3	0:5	0:20	0:5	0:33
Total	295:349	515:482	1293:1283	168:166	2271:2280
%	46:54	52:48	50:50	50:50	50:50

Source: Morse, 1981 modified.

Table 17. Length at Maturity of Summer Flounder, Collected in NMFS Bottom Trawls, Between Cape Cod and Cape Hatteras, 1974-1979

Total Length (in)	Males 1974-75 # of Obs.	Males 1974-75 % Mature	Males 1976-77 # of Obs.	Males 1976-77 % Mature	Males 1978-79 # of Obs.	Males 1978-79 % Mature	Males 1974-76 (fall only) # of Obs.	Males 1974-76 (fall only) % Mature	Females 1974-75 # of Obs.	Females 1974-75 % Mature	Females 1976-77 # of Obs.	Females 1976-77 % Mature	Females 1978-79 # of Obs.	Females 1978-79 % Mature	Females 1974-76 (fall only) # of Obs.	Females 1974-76 (fall only) % Mature	Males 1974-79 # of Obs.	Males 1974-79 % Mature	Females 1974-79 # of Obs.	Females 1974-79 % Mature
7.1	-	-	3	0	-	-	-	-	-	-	-	-	-	-	-	-	3	0	-	-
7.5	3	0	9	33	-	-	-	-	-	-	-	-	-	-	-	-	12	25	-	-
7.9	5	20	8	38	-	-	2	0	-	-	-	-	-	-	-	-	13	31	-	-
8.3	15	33	15	20	-	-	9	11	-	-	-	-	-	-	-	-	30	27	-	-
8.7	25	24	24	21	8	0	33	27	-	-	-	-	-	-	-	-	57	19	-	-
9.1	26	35	43	35	7	14	30	30	-	-	-	-	-	-	-	-	74	33	-	-
9.4	36	36	25	52	5	20	43	42	-	-	5	0	-	-	-	-	66	41	5	0
9.8	57	37	38	58	7	29	54	27	-	-	5	20	5	0	-	-	102	44	10	10
10.2	78	45	29	69	12	75	69	44	17	0	15	7	8	13	17	0	119	54	40	5
10.6	64	70	40	90	16	44	53	70	14	7	11	27	10	10	8	13	120	73	35	14
11.0	80	76	35	89	26	58	63	76	33	3	16	25	7	14	19	5	141	76	56	11
11.4	83	77	45	87	19	63	51	88	18	6	15	40	10	40	15	13	147	78	43	26
11.8	92	89	28	89	19	74	59	92	37	22	11	27	20	60	25	28	139	87	68	34
12.2	95	96	39	97	19	74	55	98	30	30	25	60	9	89	26	31	153	94	64	50
12.6	122	94	34	94	19	68	71	100	45	42	11	82	10	60	33	55	175	91	66	52
13.0	122	91	40	98	15	73	84	99	60	47	11	73	13	77	33	67	177	91	84	55
13.4	141	97	44	100	15	87	108	99	73	59	22	82	7	86	44	71	200	97	102	66
13.8	112	96	-	-	15	87	104	98	94	64	10	90	10	60	66	71	127	95	114	66
14.2	103	94	-	-	14	79	78	100	117	80	16	88	10	70	75	84	117	92	143	80
14.6	97	95	-	-	25	100	-	-	117	79	28	96	11	82	103	87	122	96	156	82
15.0	85	97	-	-	-	-	-	-	131	82	39	95	12	50	109	96	85	97	182	82
15.4	76*	99	-	-	-	-	-	-	124	84	34	97	12	58	97	95	76	99	170	85
15.7	48	98	-	-	-	-	-	-	93	90	28	100	11	82	70	96	48	98	132	90
16.1	45	100	-	-	-	-	-	-	87	91	-	-	10	90	61	95	45	100	97	91
16.5	-	-	-	-	-	-	-	-	68	93	-	-	10	100	41	98	-	-	78	94
16.9	-	-	-	-	-	-	-	-	74	87	-	-	-	-	45	100	-	-	74	87
17.3	-	-	-	-	-	-	-	-	70	99	-	-	-	-	-	-	-	-	70	99
17.7	-	-	-	-	-	-	-	-	32	100	-	-	-	-	-	-	-	-	32	100
Total	1610		499		241		966		1334		302		185		887		1821		2350	
Size at 50% Maturity		9.9		9		10.7		10		13		11.9		12		12.7		9.7		12.7
95% Confid. Interval		9.6-10		9-9.6		10-11		9.8-10		12.9-13		11.6-12		11-13		12.5-12.9		9.5-9.9		12.5-12.9

- = zero

Source: Morse, 1981.

3.14.89

Table 18. Fecundity Relationships of Summer Flounder, with Length Expressed as Log10 Fecundity = Log10 a + b, and Weight and Ovary Weight Expressed as Fecundity = a + bX. SE is Standard Error and r is Correlation Coefficient.

Years		n	a	SE of a	b	SE of b	r
1974-1977	Length (cm)*	134	-3.098	0.430	3.402	0.159	0.88
1974-1976	Weight (g)**	79	-101867.500	109445.000	908.864	58.894	0.87
1974-1976	Ovary weight (g)	79	552515.161	100552.620	10998.048	1031.153	0.77

* 1 cm = 0.394 inches: 1 inch = 2.540 cm.
** 1 gram = 0.035 ounces: 1 ounce = 28.35 grams.

Source: Morse, 1981.

Table 19. Estimates of Summer Flounder Instantaneous Rate of Total Mortality (Z). Estimates are Based on Catch Curve Analysis of Commercial Age-length Data Adjusted for Total Effort and on NEFC Survey Data. Males and Females are Combined. Std (Z) is the Standard Error of the Estimate of Z, r^2 is the Coefficient of Determination.

	Survey			Commercial		
Year Class	Z	Std (Z)	r^2	Z	Std (Z)	r^2
1973	-	-	-	.687	.116	.85
1974	.833	.275	.75	.838	.093	.94
1975	.975	.141	.94	1.090	.070	.98
1976	.375	.161	.58	.986	.186	.90
1977	.782	.089	.96	.700	.174	.89
1978	.889	.212	.85	.850	.336	.86
1979	.955	.249	.88	-	-	-
1980	1.708	.282	.97	-	-	-
1981	.629	.217	.81	-	-	-

Source: USDC, 1986c.

Table 20. Estimates of Annual Survival Rate and Instantaneous Fishing Mortality Rate for Summer Flounder Based on Tag-Recapture Experiments Using the Maximum Likelihood Method of Paulik (1963).

Area	Release Dates	Tag Type	Number Released	Number Recovered	S	F	Source
Nantucket Sound	Sept. 6-8, 21, 1962	Petersen Disc	600	245	0.307	0.482	Lux and Nichy 1980
Block Island Sound	Sept. 6-8, 1962	Petersen Disc	406	203	0.289	0.622	Lux and Nichy 1980
New Jersey	Sept. 23 - Oct. 19, 1960	Atkins Tag	692	96	0.174	0.244	Murawski 1970
New Jersey	July 31 - Aug. 10, 1961	Atkins Tag	613	133	0.102	0.496	Murawski 1970
New Jersey	July 18 - Aug. 31, 1961	Petersen Disc	2,767	949	0.314	0.397	Murawski 1970
New Jersey	June 20 - Aug. 29, 1966	Petersen Disc	1,392	420	0.147	0.580	Murawski 1970
New Jersey	June 12 - Aug. 22, 1966	Petersen Disc	1,205	296	0.192	0.407	Murawski 1970
North Carolina	Nov. 8, 1973 - Dec. 19, 1974	Petersen Disc	7,040*	178	0.343	0.107	Gillikin, Pers. Comm.
GREATER THAN 12" TL ONLY			2,300*	133	0.396	0.240	

* Adjusted total (see source)

Source: Fogarty, 1981.

Table 21. Spawning Stock Biomass per Recruit (kg) for Female Summer Flounder with Legal Size Limits of 10-18 inches and Fishing Mortality Rates at F_{max} and $F_{0.1}$.

	Spawning Stock Biomass	
Minimum Size	F_{max}	$F_{0.1}$
10	2.37	3.66
11	2.31	3.68
12	2.49	3.84
13	2.34	3.91
14	2.46	3.92
15	2.26	3.99
16	2.19	4.00
17	--	4.16
18	--	4.11

Source: Fogarty, pers. comm.

Table 22. Yield per Recruit (kg) for Summer Flounder for Minimum Legal Size Limits of 10-18". F_{max} is the Fishing Mortality Rate at which Yield-per-Recruit is Maximized, $F_{0.1}$ is the 'Marginal' Mortality Rate (Gulland and Boerema), Y_{max} is the Yield per Recruit at F_{max} and $Y_{0.1}$ is the Yield per Recruit at $F_{0.1}$.

Minimum	Female				Male			
Size	F_{max}	$F_{0.1}$	Y_{max}	$Y_{0.1}$	F_{max}	$F_{0.1}$	Y_{max}	$Y_{0.1}$
10	.18	.11	.43	.40	.44	.28	.29	.28
11	.19	.12	.45	.43	.53	.32	.32	.30
12	.26	.15	.51	.48	.62	.36	.35	.32
13	.29	.15	.54	.50	.77	.42	.38	.35
14	.32	.16	.55	.51	.95	.47	.40	.37
15	.40	.18	.59	.53	1.46	.58	.45	.39
16	.49	.19	.62	.55	1.50	.65	.45	.40
17	--	.21	--	.58	--	.85	--	.47
18	--	.22	--	.59	--	1.06	--	.48

-- no maximum

Source: Fogarty, pers. comm.

Table 23. Preliminary Ranking of Major Threats to Living Marine Resources and Habitats in the Northeast.

1. Urban and Port Development *
2. Ocean Disposal #
3. Dams
4. Agricultural Practices ●
5. Industrial Waste Discharges @
6. Domestic Waste Discharges @
7. OCS Oil and Gas Development
8. Insect Control
9. Water Diversion
10. Sand and Gravel Mining
11. Power Generation

* Includes dredge and fill and construction activities covered by Section 10/104 permits, as well as point source pollution covered by NPDES permits and non-point source pollution.

Includes dredged material disposal in State waters, as well as actual ocean dumping of dredged material, sewage sludge, etc., covered by Section 103 permits.

● Includes non-point source pollution (fertilizers, animal wastes, biocides, sediments, heavy metals, etc.) that affects coastal aquatic areas.

@ Point source pollution covered by NPDES permits.

Source: USDC, 1985b.

Table 24. Summer Flounder Commercial Landings Total and Average by Gear Type, 1979-1985.

Gear	Total Lbs	Annual Average Lbs
Otter Trawls:		
Fish	207,730,040	29,675,720
Shrimp	4,275,773	610,825
Crab	2,407,264	343,895
Scallop	316,842	45,263
Lobster	111,700	15,957
Other	135	19
TOTAL	214,841,754	30,691,678
Pound Nets		
Fish	9,255,097	1,322,157
Other	16,700	2,386
Gill Nets:		
Anchor	3,048,600	435,514
Drift	69,770	9,967
Runaround	3,424	489
Dredges:		
Scallop	2,263,452	323,350
Other	4,588	655
Conch	900	129
Haul Seines:		
Long	475,422	67,917
Common	85,394	12,199
Danish	4,800	686
Floating Traps	519,900	74,271
Lines		
Hand	587,945	83,992
Troll	11,200	1,600
Set	10,400	1,486
Spears	550,684	78,669
Purse Seines	238,700	34,100
Pots and Traps:		
Crab	36,916	5,274
Fish	19,603	2,800
Lobster	900	129
Eel	500	71
Midwater/Pair Trawls:		
Midwater Pair	15,100	2,157
Bottom Pair	8,700	1,243
Scottish Seine	5,600	800
Midwater	2,100	300
Beam Trawl	8,600	1,229
Fyke Nets and Weirs	8,800	1,257
TOTAL	232,095,849	33,156,549

Source: USDC, 1986e.

Table 25. Total and Seven Year Average of Summer Flounder Commercial Landings (thousands of lbs) by State and Gear Type, 1979-1985

State	Fish otter trawl	Other otter trawl	Pound Net	Gill Net	Scallop Dredge	Lines	Other	Total
ME								
Total	112	3	-	2	*	-	1	117
Mean	16	*	-	*	*	-	*	17
NH								
Total	1	*	-	*	-	-	-	1
Mean	*	*	-	*	-	-	-	*
MA								
Total	9,168	1	95	1	74	263	256	9,857
Mean	1,310	*	14	*	11	38	37	1,408
RI								
Total	26,581	1	-	2	284	148	539	27,556
Mean	3,797	*	-	*	41	21	77	3,937
CT								
Total	666	-	1	1	-	8	1	667
Mean	95	-	*	*	-	1	*	95
NY								
Total	12,3700	103	135	2	31	120	10	12,770
Mean	1,767	15	19	*	4	17	1	1,824
NJ								
Total	35,634	5	78	10	476	12	20	36,235
Mean	5,091	1	11	1	68	2	3	5,176
DE								
Total	-	-	-	35	-	-	-	35
Mean	-	-	-	5	-	-	-	5
MD								
Total	5,937	-	64	60	12	44	9	6,126
Mean	848	-	9	9	2	6	1	875
VA								
Total	45,571	80	2,181	71	1,366	14	68	49,350
Mean	6,510	11	312	10	195	2	10	7,050
NC								
Total	71,702	6,920	6,718	2,936	20	2	1,084	89,382
Mean	10,243	989	960	419	3	*	155	12,769
All								
Total	207,740	7,112	9,272	3,122	2,263	610	1,988	232,096
Mean	29,677	1,016	1,325	446	323	87	284	33,157

* = less than 500 lbs. - = 0.
Rows and columns may not sum to totals because of rounding.
Source: USDC, 1986e.

Table 26. Total and Seven Year Average of Summer Flounder Commercial Landings (thousands of lbs) by State and Distance from Shore for Fish Otter Trawls and Other Gear, 1979-1985

State/gear type		Internal Waters & Territorial Sea Total	Internal Waters & Territorial Sea Mean	EEZ Total	EEZ Mean	% EEZ
ME	Fish otter trawls	3	*	109	16	98
	Other	*	*	6	1	98
NH	Fish otter trawls	-	-	1	*	100
	Other	-	-	*	*	100
MA	Fish otter trawls	3,515	502	5,653	808	62
	Other	350	50	340	49	49
RI	Fish otter trawls	2,598	371	22,734	3,248	90
	Other	745	106	1,479	211	67
CT	Fish otter trawls	257	37	399	57	61
	Other	12	2	-	-	-
NY	Fish otter trawls	8,873	1,268	3,497	500	28
	Other	266	38	133	19	33
NJ	Fish otter trawls	5,135	734	30,499	4,357	86
	Other	101	14	500	71	83
DE	Other	35	5	-	-	-
MD	Fish otter trawls	464	66	5,474	782	92
	Other	164	23	26	4	14
VA	Fish otter trawls	7,905	1,129	37,665	5,381	83
	Other	2,311	330	1,468	210	39
NC	Fish otter trawls	18,873	2,696	52,829	7,5467	74
	Other	17,291	2,470	389	56	2
Total	Fish otter trawls	47,622	6,803	158,859	22,694	77
	Other	21,274	3,039	4,340	620	17

* = less than 500 lbs.
- = 0.
Note: "Other" gear include all landings from every gear except fish otter trawls.

Source: USDC, 1986e.

Table 27. Seven Year Average for the Total and EEZ Summer Flounder Commercial Landings (thousands of lbs) by State, by Month, 1979-1985

		MA	RI	NY	NJ	MD	VA	NC	Total
Jan	EEZ	23	301	64	691	101	991	2,392	4,564
	Total	24	302	65	691	101	998	2,872	5,052
	%EEZ	97	100	99	100	100	99	83	90
Feb	EEZ	17	526	80	619	69	899	1,046	3,255
	Total	17	526	80	619	69	899	1,178	3,389
	%EEZ	99	100	99	100	100	100	89	96
Mar	EEZ	51	717	100	513	53	745	724	2,903
	Total	51	717	100	513	53	746	929	3,110
	%EEZ	100	100	100	100	99	100	78	93
Apr	EEZ	46	463	63	220	39	596	430	1,857
	Total	46	465	70	221	40	610	567	2,018
	%EEZ	100	100	90	100	96	98	76	92
May	EEZ	52	245	30	198	19	109	180	833
	Total	85	349	419	217	22	138	262	1,492
	%EEZ	61	70	7	91	85	79	69	56
Jun	EEZ	69	71	20	146	8	40	45	398
	Total	213	143	205	199	11	64	157	992
	%EEZ	33	50	10	73	69	62	29	40
Jul	EEZ	86	36	11	53	2	40	42	269
	Total	234	112	152	116	24	157	200	994
	%EEZ	367	32	7	46	9	25	21	27
Aug	EEZ	81	41	29	334	8	27	30	549
	Total	187	138	233	473	30	167	244	1,472
	%EEZ	43	30	12	71	27	16	12	37
Sep	EEZ	73	226	36	497	31	179	35	1,076
	Total	133	320	288	784	35	227	354	2,141
	%EEZ	54	71	12	63	88	79	10	50
Oct	EEZ	230	489	48	460	36	346	139	1,749
	Total	243	516	163	638	3	496	864	2,959
	%EEZ	95	95	29	72	92	70	16	59
Nov	EEZ	87	196	19	405	80	838	617	2,243
	Total	93	202	31	413	81	1,413	1,824	4,055
	%EEZ	94	97	61	98	99	59	34	55
Dec	EEZ	35	125	19	291	119	783	1,923	3,296
	Total	37	126	19	291	119	1,137	3,319	5,048
	%EEZ	96	100	99	100	100	69	58	65
Total	EEZ	849	3,438	519	4,428	565	6	7,603	22,991
	Total	1,362	3,915	1,824	5,176	625	7	12,769	32,722
	%EEZ	62	88	28	86	90	79	60	70

Notes: ME, NH, CT, and DE were not included either because monthly data are not available or because of very limited landings.Landings on a monthly basis are slightly less than overall (i.e. Table 1) because not all data are reported monthly.

Source: USDC, 1986e.

Table 28. Seven Year Average Summer Flounder Commercial Landings (thousands of lbs) by State and Water Area of Catch, 1979-1985

	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	NC	Total
Internal	-	-	39	-	11	71	-	5	18	327	2,284	2,755
511	*	-	-	-	-	-	-	-	-	-	-	*
512	2	-	-	-	-	-	1	-	-	-	-	3
513	11	*	35	-	-	-	-	-	-	-	-	46
514	3	-	68	*	-	-	-	-	-	-	-	71
515	-	-	1	2	-	-	-	-	-	*	-	3
520	-	-	*	-	-	-	-	-	-	-	-	*
521	-	-	26	6	-	-	1	-	1	-	-	34
522	*	-	21	7	-	*	-	-	-	-	-	28
523	*	-	4	4	-	-	-	-	-	-	-	8
524	*	-	33	34	-	1	-	-	-	*	-	68
525	-	-	62	471	-	13	-	-	*	1	-	546
526	*	-	341	892	-	23	*	-	-	9	-	1,265
537	*	-	161	1,644	-	85	2	-	-	6	-	1,898
538	-	-	580	200	-	28	-	-	-	1	-	8089
539	-	-	4	367	39	*	-	-	-	-	-	410
611	-	-	*	32	45	444	*	-	-	-	-	521
612	-	-	1	1	-	307	328	-	1	13	-	650
613	*	-	16	118	-	631	433	-	*	19	-	1,217
614	-	-	-	-	-	-	553	-	1	2	-	557
615	-	-	*	1	-	1	204	-	10	38	-	254
616	-	-	10	156	-	219	532	-	2	30	-	950
621	-	-	-	1	-	*	1,568	-	54	471	-	2,583
622	-	-	6	1	-	-	1,532	-	118	221	-	1,877
623	-	-	-	*	-	-	17	-	-	-	-	17
624	-	-	-	*	-	-	-	-	-	-	-	*
625	-	-	-	*	-	-	-	-	10	1,245	-	1,255
626	-	-	*	*	-	-	6	-	167	1,882	-	2,056
627	-	-	-	-	-	-	*	-	4	-	-	4
631	-	-	-	-	-	-	-	-	-	1,769	-	1,769
632	-	-	-	-	-	-	-	-	*	925	-	925
633	-	-	-	-	-	-	-	-	-	*	-	*
635	-	-	-	-	-	-	-	-	-	80	-	80
636	-	-	-	-	-	-	-	-	-	11	-	11
637	-	-	-	*	-	-	-	-	-	-	-	*
639	-	-	-	*	-	-	-	-	-	-	-	*
NC Ocean	-	-	-	-	-	-	-	-	-	-	10,485	10,485
Total	17	*	1,408	3,936	95	1,824	5,176	5	875	7,050	12,769	33,157

- = zero.
* = less than 500 lbs.
# North Carolina landings data not reported by water area.
Rows and columns may not sum because of rounding.
Source: USDC, 1986e.

Table 29. Seven Year Average of the Summer Flounder Commercial Landings (lbs) and Percentage by Size Category*, by State and Distance from Shore for Fish Otter Trawls and Other Gear, 1979 - 1985

	Internal Waters & Territorial Sea				EEZ			
	Percentage			Average	Percentage			Average
State/gear	Small	Uncl	Other	Pounds	Small	Uncl	Other	Pounds
ME								
Fish otter trawls	18	-	82	386	16	-	84	15,543
Other gear	-	-	100	14	50	10	40	829
NH								
Fish otter trawls	-	-	-	-	-	29	71	100
Other gear	-	-	-	-	-	-	100	29
MA								
Fish otter trawls	6	3	91	502,114	8	11	81	807,529
Other gear	4	62	34	50,000	4	8	89	48,529
RI								
Fish otter trawls	11	7	82	371,171	11	2	87	3,247,729
Other gear	3	66	31	106,371	7	1	91	211,229
CT								
Fish otter trawls	-	100	-	36,657	-	100	-	57,014
Other gear	-	100	-	1,643	-	-	-	-
NY								
Fish otter trawls	-	100	-	1,267,514	-	100	-	499,614
Other gear	-	100	-	38,043	-	100	-	19,057
NJ								
Fish otter trawls	27	18	55	733,629	28	2	69	4,356,957
Other gear	1	92	7	14,471	17	7	76	71,414
DE								
Other gear	-	-	100	5,014	-	-	-	-
MD								
Fish otter trawls	25	46	29	66,229	15	56	29	781,957
Other gear	-	99	1	23,271	33	45	22	3,700
VA								
Fish otter trawls	23	18	60	1,129,329	22	48	30	5,380,743
Other gear	-	100	-	330,157	15	57	29	209,700
NC								
Fish otter trawls	17	41	42	2,696,185	18	46	36	7,546,949
Other gear	11	67	22	2,470,146	27	43	30	55,584
Average								
Fish otter trawls	15	42	44	6,803,214	19	32	49	22,694,135
Other gear	9	71	20	3,039,130	12	28	60	620,071

* Small = small and peewees. Uncl = unclassified. Other = medium, large and jumbo. Percentages may not total due to rounding.

Source: USDC, 1986e.

Table 30. Summer Flounder Commercial Landings (thousands of lbs) by State by Distance from Shore and Percent of Total Summer Flounder Landings Taken from the EEZ, 1979 - 1985

Year	Distance (miles)	ME	NH	MA	RI	NJ	MD	VA	Total
1979	0-3	-	#	349	383	473	#	#	1205
	3-200	5	#	674	2441	5717	#	#	8837
	Total	5	#	1022	2825	6189	#	#	10041
	EEZ %	100	#	66	86	92	#	#	88
1980	0-3	-	#	165	185	494	#	#	844
	3-200	4	#	143	1091	4302	#	#	5540
	Total	4	#	309	1276	4795	#	#	6384
	EEZ %	100	#	46	86	90	#	#	87
1981	0-3	-	#	369	353	853	#	#	1575
	3-200	3	#	189	2507	3152	#	#	5851
	Total	3	#	559	2860	4005	#	#	7427
	EEZ %	100	#	34	88	79	#	#	79
1982	0-3	-	*	834	480	402	57	347	2120
	3-200	18	*	809	3521	3916	300	3868	12432
	Total	18	*	1643	4001	4318	357	4215	14552
	EEZ %	100	89	49	88	91	84	92	85
1983	0-3	1	-	674	503	485	95	2451	4209
	3-200	83	*	1643	3958	4341	812	5371	16208
	Total	84	*	2317	4461	4826	906	7822	20416
	EEZ %	99	100	71	89	90	90	69	79
1984	0-3	-	-	479	383	1044	57	2583	4546
	3-200	7	*	376	2096	4427	550	5066	12522
	Total	7	*	854	2480	5471	607	7649	17068
	EEZ %	100	100	44	85	81	91	66	73
1985	0-3	2	-	506	823	1186	40	710	3267
	3-200	3	*	1719	6710	4448	498	4108	17486
	Total	4	*	2225	7533	5634	539	4818	20753
	EEZ %	58	100	77	89	79	93	85	84
Avg	0-3	*	*	482	444	705	50	1218	2900
	3-200	18	*	793	3189	4329	432	3683	12444
	Total	18	*	1276	3634	5034	482	4901	15344
	EEZ %	98	95	62	88	86	90	75	81

data not collected as part of weighout.
* = less than 500 lbs.

Note: Averages are 7 years for ME, MA, RI, and NJ. Averages are 4 years for NH, MD, and VA.

Source: USDC, 1986f.

Table 31. Total and Seven Year Average of Summer Flounder Commercial Landings (lbs) by State and Gear Type, 1979-1985

State		Fish otter trawl	Other otter trawl	Pound net	Gill net	Scallop dredge	Lines	Other	Total
ME	Total	414,383	3,476	-	2,204	350	-	2,984	423,397
	Mean	59,198	497	-	315	50	-	426	60,485
	% EEZ	60.7	97.1	.0	100.0	.0	.0	100.0	61.4
NH	Total	596	80	-	50	-	-	-	726
	Mean	149	20	-	13	-	-	-	182
	% EEZ	94.1	100.0	.0	100.0	.0	.0	.0	95.2
MA	Total	8,158,613	7,292	78,032	1,242	73,382	45,568	265,291	8,629,420
	Mean	1,165,516	1,042	11,147	177	10,483	6,510	37,899	1,232,774
	% EEZ	62.2	9.6	.0	100.0	100.0	6.8	92.5	62.6
RI	Total	24,556,874	24,243	-	1,610	240,093	134,184	477,513	25,434,517
	Mean	3,508,125	3,463	-	230	34,299	19,169	68,216	3,633,502
	% EEZ	89.4	86.2	.0	42.6	100.0	76.3	.5	87.8
NJ	Total	34,766,006	5,848	66,781	6,388	364,171	9,136	19,993	35,238,323
	Mean	4,966,572	835	9,540	913	52,024	1,305	2,856	5,034,045
	% EEZ	86.0	91.1	.0	13.7	100.0	8.2	85.9	85.9
MD	Total	2,391,822	-	-	2,635	1,138	13,311	20	2,408,926
	Mean	597,956	-	-	659	285	3,328	5	602,232
	% EEZ	89.7	.0	.0	8.5	100.0	95.1	100.0	89.6
VA	Total	23,929,833	23,999	-	539,183	-	11,389	22	24,504,426
	Mean	5,982,458	6,000	-	134,796	-	2,847	6	6,126,107
	% EEZ	74.6	46.4	.0	100.0	.0	100.0	100.0	75.1
All	Total	94,218,127	64,938	144,813	553,312	679,134	213,588	765,823	96,639,735
	Mean	16,279,974	11,857	20,687	137,103	97,141	33,159	109,408	16,689,327
	% EEZ	81.9	63.9	.0	98.4	99.9	61.0	35.0	81.6

Note: Mean for ME, MA, RI, and NJ is from 1979-1985. Mean for NH, MD, and VA is 1982-1985.

Source: USDC, 1986f.

Table 32 Average Fish Otter Trawl Landings (lbs) and Statistics by State, 1979 - 1985
All Trips Landing Any Summer Flounder

State	Average Number Vessels	Average Number Trips	Average Days Fished	Average Days Absent	Average Total Pounds	Average Total Value
ME	11	40	34	76	325,722	253,591
MA	246	1,769	2,730	5,157	13,118,835	10,523,674
RI	175	4,697	3,287	9,106	41,354,976	22,663,926
NJ	143	1,924	1,042	3,382	13,652,943	6,622,234
MD	16	485	185	581	1,885,686	717,564
VA	142	1,119	1,819	4,069	10,214,279	5,729,213
Total					80,552,441	

State	Average Summer Flounder Pounds Small	Unclass	Total	Value Dollars
ME	2,942	-	16,425	17,002
MA	88,727	59,309	1,208,288	1,608,407
RI	393,721	32,284	3,508,125	4,415,423
NJ	1,391,052	212,985	4,966,572	3,831,575
MD	195,979	134	597,956	446,605
VA	2,122,317	110,276	5,982,458	4,095,056
Total			16,279,840	

Average annual number of vessels landing in these states during 1982-85: 664.

Notes: All values are 4 year (1982-85) averages of 1985 adjusted dollars (CPI). State averages for ME, MA, NJ, and RI are for 7 years (1979-85). State averages for MD, NH, and VA are for 4 years (1982-85).

Source: USDC, 1986f.

Table 33. Average Fish Otter Trawl Landings (lbs) and Statistics by State, 1979 - 1985 Only Trips Landing 100 or More Pounds of Summer Flounder

State	Average Number Vessels	Average Number Trips	Average Days Fished	Average Days Absent	Average Total Pounds	Average Total Value
ME	9	27	25	55	235,997	196,432
MA	192	650	1,509	2,579	6,485,199	5,199,351
RI	160	1,761	1,743	4,223	16,324,009	10,716,119
NJ	137	1,223	824	2,430	8,305,656	4,774,098
MD	15	347	160	447	1,579,674	625,657
VA	141	943	1,680	3,607	8,829,882	5,147,010
Total					41,760,417	

	Average Summer Flounder			
	Pounds			Value
State	Small	Unclass	Total	Dollars
ME	1,870	-	14,727	9,656
MA	74,417	53,651	1,102,399	1,110,361
RI	359,989	29,704	3,278,882	3,322,641
NJ	1,334,814	206,906	4,820,987	3,849,333
MD	191,521	134	587,750	437,398
VA	2,093,878	109,610	5,924,854	4,050,054
Total			15,729,599	

Average annual number of vessels landing in these states during 1982-85: 606.

Notes: All values are 4 year (1982-85) averages of 1985 adjusted dollars (CPI). State averages for ME, MA, NJ, and RI are for 7 years (1979-85). State averages for MD, NH, and VA are for 4 years (1982-85).

Source: USDC, 1986f.

Table 34. Average Fish Otter Trawl Landings (lbs) and Statistics by State, 1979 - 1985 Only Trips Landing 500 or More Pounds of Summer Flounder

State	Average Number Vessels	Average Number Trips	Average Days Fished	Average Days Absent	Average Total Pounds	Average Total Value
ME	6	24	20	46	182,421	152,689
NH	-	-	-	-	-	-
MA	130	474	1,183	1,978	4,324,928	4,310,346
RI	135	1,277	1,415	3,291	11,650,605	9,192,967
NJ	124	1,002	745	2,134	6,608,304	4,459,287
MD	59	330	157	429	1,498,981	611,846
VA	135	923	1,664	3,542	8,463,212	5,041,851
Total					32,728,451	

State	Average Summer Flounder Pounds Small	Pounds Unclass	Total	Value Dollars
ME	1,769	-	14,267	14,880
NH	-	-	-	-
MA	70,440	51,709	1,063,958	1,460,162
RI	349,879	28,078	3,188,305	4,018,490
NJ	1,326,652	202,893	4,781,589	3,724,288
MD	190,926	34	586,403	436,306
VA	2,092,177	109,325	5,919,435	4,045,332
Total			15,553,957	

Average annual number of vessels landing in these states during 1982-85: 509.

Notes: All values are 4 year (1982-85) averages of 1985 adjusted dollars (CPI). State averages for ME, MA, NJ, and RI are for 7 years (1979-85). State averages for MD, NH, and VA are for 4 years (1982-85).

Source: USDC, 1986f.

Table 35. Average Fish Otter Trawl Landings (lbs) and Statistics by State, 1979 - 1985 Only Trips Landing 25% or More of Summer Flounder

State	Average Number Vessels	Average Number Trips	Average Days Fished	Average Days Absent	Average Total Pounds	Average Total Value
ME	-	*	*	-	910	-
NH	-	-	-	-	-	-
MA	89	355	615	1,143	1,223,111	1,609,164
RI	121	599	849	1,844	4,148,179	4,386,188
NJ	121	994	716	2,054	5,570,944	4,045,458
MD	15	254	140	366	853,549	518,770
VA	133	875	1597	3,364	7,428,809	4,635,942
Total					19,224,592	

State	Average Summer Flounder Pounds Small	Unclass	Total	Value Dollars
ME	434	-	434	-
NH	-	-	-	-
MA	51,335	33,559	880,828	1,267,171
RI	277,159	13,795	2,603,441	3,222,824
NJ	1,320,099	190,556	4,729,313	3,653,270
MD	178,660	134	552,399	406,834
VA	2,070,401	107,020	5,845,836	3,982,615
Total			14,611,817	

* = less than 0.5.
Average annual number of vessels landing in these states during 1982-85: 428

Notes: All values are 4 year (1982-85) averages of 1985 adjusted dollars (CPI). State averages for ME, MA, NJ, and RI are for 7 years (1979-85). State averages for MD, NH, and VA are for 4 years (1982-85).

Source: USDC, 1986f.

Table 36. Average Fish Otter Trawl Landings (lbs) and Statistics by State, 1979 - 1985
Only Trips Landing 60% or More of Summer Flounder

State	Average Number Vessels	Average Number Trips	Average Days Fished	Average Days Absent	Average Total Pounds	Average Total Value
ME	-	-	-	-	-	-
NH	-	-	-	-	-	-
MA	81	269	462	869	815,611	647,804
RI	65	253	508	1,009	2,174,680	1,398,897
NJ	114	889	645	1,840	4,936,443	2,081,851
MD	14	86	47	126	272,473	176,502
VA	128	433	809	1,691	3,646,989	2,334,278
Total					11,846,196	

	Average Summer Flounder			
		Pounds		Value
State	Small	Unclass	Total	Dollars
ME	-	-	-	-
NH	-	-	-	-
MA	42,181	30,210	712,989	590,595
RI	200,229	1,421	1,807,743	1,249,452
NJ	1,270,421	177,674	4,450,403	1,944,354
MD	75,906	57	214,316	150,541
VA	1,100,243	54,956	3,072,206	2,080,265
Total			10,257,657	

Average annual number of vessels landing in these states during 1982-85: 354

Notes: All values are 4 year (1982-85) averages of 1985 adjusted dollars (CPI). State averages for ME, MA, NJ, and RI are for 7 years (1979-85). State averages for MD, NH, and VA are for 4 years (1982-85).

Source: USDC, 1986f.

Table 37. Species Composition of Fish Otter Trawl Trips Landing Greater Than 100 Lbs of Summer Flounder, 1985

State	ME	MA	RI	NJ	MD	VA	Total
Vessels	4	229	187	141	18	143	614
Trips	34	1,285	5,120	1,983	436	1,064	9,922
Days fished	14	2,867	3,897	1,109	227	2,090	10,205
Days absent	42	4,730	10,497	3,581	456	4,272	23,578
Total pounds	70,731	7,425,928	30,039,616	9,851,282	1,434,769	6,460,039	55,282,365
Total value	41,369	6,057,901	17,251,069	6,168,677	705,243	4,954,312	35,178,571
Pounds of:							
Winter flounder	8,090	835,614	2,229,697	284,211	2,031	23,606	3,383,249
Yellowtail	460	1,291,220	1,410,943	65,955	-	2,339	2,770,917
Witch flounder	12,202	103,764	278,907	47,477	4,783	4,214	451,347
Black sea bass	-	38,375	414,664	213,358	34,387	483,096	1,183,880
Scup	-	207,723	3,792,948	715,277	36,898	152,922	4,905,768
Silver hake	-	31,074	4,047,649	1,161,650	7,906	41,725	5,290,004
Weakfish	-	2,123	51,433	216,193	35,353	161,337	466,439
Butterfish	-	68,120	3,706,615	193,660	13,685	34,730	4,016,810
Loligo	-	333,904	3,127,441	673,127	114,065	314,683	4,563,220
Other species	46,942	2,375,034	3,851,727	736,359	649,001	626,769	8,285,832
Summer flounder:							
Small lbs	820	81,630	1,403,216	1,808,583	180,840	1,771,607	5,246,696
Unclassified lbs	-	192,226	151,695	468,841	135	32,675	845,572
Total lbs	3,037	2,118,585	7,113,243	5,519,739	536,660	4,613,465	19,904,729
Total value	596	2,386,320	7,375,035	4,863,287	511,243	4,087,037	19,223,518
% Summer flounder							
Weight	4	29	24	56	37	71	36
Value	1	39	43	79	72	82	55

Note: Total vessels are not additive due to landings in more than one State by some vessels.

Source: USDC, 1986f.

Table 38. Species Composition of Fish Otter Trawl Trips Landing Greater Than 500 Lbs of Summer Flounder, 1985

State	MA	RI	NJ	MD	VA	Total
Vessels	168	168	137	18	138	528
Trips	765	3,381	1,614	408	951	7,119
Days fished	1,924	2,954	1,007	221	1,991	8,096
Days absent	3,064	7,571	3,083	431	3,995	18,144
Total pounds	4,100,723	20,510,191	7,875,024	1,414,374	6,025,617	39,925,929
Total value	3,627,714	12,898,785	5,581,756	694,693	4,708,938	27,511,886
Pounds of:						
Winter flounder	306,362	971,941	263,109	2,031	23,033	1,566,476
Yellowtail	493,203	884,603	58,506	-	2,152	1,438,464
Witch flounder	55,034	220,767	46,123	4,783	4,207	330,914
Black sea bass	12,349	298,651	130,412	33,910	370,957	846,279
Scup	156,220	2,474,754	277,690	36,697	106,481	3,051,842
Silver hake	3,640	2,633,470	526,823	7,786	41,192	3,212,911
Weakfish	1,983	28,528	170,279	34,675	111,226	346,691
Butterfish	6,579	2,480,371	103,386	13,457	28,041	2,631,834
Loligo	5,702	1,682,459	451,064	113,029	291,235	2,543,489
Other species	1,057,301	2,086,952	398,345	637,227	462,214	4,642,039
Summer flounder:						
Small lbs	72947	1330548	1790552	178741	1761731	5,134,519
Unclassified lbs	177,770	144,105	460,136	135	32,504	814,650
Total lbs	2,008,902	6,777,366	5,455,564	530,779	4,585,491	19,358,102
Total value	2,281,310	6,987,688	4,799,416	505,048	4,059,966	18,633,428
% Summer flounder						
Weight	49	33	69	38	76	48
Value	63	54	86	73	86	68

Note: Total vessels are not additive due to landings in more than one State by some vessels.

Source: USDC, 1986f.

Table 39. Species Composition of Fish Otter Trawl Trips Landing Greater Than 25% Summer Flounder by Weight, 1985

State	MA	RI	NJ	MD	VA	Total
Vessels	148	161	134	18	139	503
Trips	802	1,575	1,559	275	968	5,179
Days fished	1,568	2,073	969	189	1,963	6,762
Days absent	2,660	4,742	2,951	365	3,972	14,690
Total pounds	2,538,085	8,776,201	6,519,497	831,391	5,695,732	24,360,906
Total value	2,671,136	7,418,006	5,199,174	604,498	4,556,409	20,449,223
Pounds of:						
Winter flounder	168,861	331,094	170,388	1,927	23,578	695,848
Yellowtail	173,389	245,823	23,037	-	2,152	444,401
Witch flounder	8,041	94,295	34,835	4,783	4,176	146,130
Black sea bass	9,891	81,283	92,089	32,985	234,708	450,956
Scup	35,187	283,816	88,220	32,185	56,468	495,876
Silver hake	665	372,555	39,339	7,424	39,506	459,489
Weakfish	1,763	14,103	117,039	6,303	91,014	230,222
Butterfish	565	533,733	52,860	10,260	25,200	622,618
Loligo	3,081	387,251	299,558	105,343	264,216	1,059,449
Other species	200,178	800,557	197,334	136,972	387,544	1,722,585
Summer flounder:						
Small lbs	184,320	78,656	435,148	135	1,755,675	2,453,934
Unclassified lbs	162,100	75,596	435,148	135	32,533	705,512
Total lbs	1,941,424	5,672,448	5,410,512	493,209	4,567,885	18,085,478
Total value	2,228,635	5,829,336	4,751,966	468,661	4,044,599	17,323,197
% Summer flounder						
Weight	76	65	83	59	80	74
Value	83	79	91	78	89	85

Note: Total vessels are not additive due to landings in more than one State by some vessels.

Source: USDC, 1986f.

Table 40. Species Composition of Fish Otter Trawl Trips Landing Greater Than 60% Summer Flounder by Weight, 1985

State	MA	RI	NJ	MD	VA	Total
Vessels	119	129	128	16	135	441
Trips	637	561	1,390	120	853	3,561
Days fished	1,243	1,362	880	105	1,810	5,400
Days absent	2,116	2,564	2,636	197	3,594	11,107
Total pounds	1,883,220	4,905,569	5,775,146	419,510	5,177,397	18,160,842
Total value	2,041,351	4,694,506	4,715,176	338,958	4,228,540	16,018,531
Pounds of:						
Winter flounder	73,246	82,034	99,665	-	17,397	272,342
Yellowtail	29,092	47,539	10,484	-	537	87,652
Witch flounder	2,964	55,728	30,410	2,730	3,111	94,943
Black sea bass	5,750	38,391	56,825	15,498	168,201	284,665
Scup	26,762	50,238	34,371	5,079	32,117	148,567
Silver hake	50	31,939	11,928	844	29,623	74,384
Weakfish	1,678	4,506	81,960	1,564	76,949	166,657
Butterfish	445	53,308	29,142	2,953	16,775	102,623
Loligo	1,811	76,657	194,426	45,472	197,542	515,908
Other species	93,657	332,571	145,877	35,650	313,480	921,235
Summer flounder:						
Small lbs	50,472	728,306	1,706,008	105,377	1,655,702	4,245,865
Unclassified lbs	144,730	5,633	405,585	-	32,026	587,974
Total lbs	1,657,604	4,149,822	5,088,811	309,720	4,323,690	15,529,647
Total value	1,901,064	4,229,401	4,452,171	284,110	3,831,237	14,697,983
% Summer flounder						
Weight	88	85	88	74	84	86
Value	93	90	94	84	91	92

Note: Total vessels are not additive due to landings in more than one State by some vessels.

Source: USDC, 1986f.

Table 41. North Carolina Winter Fishery

Percentage of North Carolina summer flounder landings taken in the winter trawl fishery:

1982-83 season	73%
1983-84 season	79%
1984-85 season	81%
Average	78%

Landings of summer flounder as percentage of individual winter trawl fishery:

	Nearshore Directed Otter Trawl	Offshore Mixed Otter Trawl	Offshore Flynet
1982-83 season	69%	17%	14%
1983-84 season	79%	19%	2%
1984-85 season	72%	27%	1%
Average	74%	21%	6%

The average pounds, number, and percentage per trip of summer flounder in the nearshore directed otter trawl fishery:

	Pounds	Number	Percentage
1982-83 season	12,310	10,154	94
1983-84 season	21,355	18,229	93
1984-85 season	18,390	13,938	89
Average	17,352	14,107	92

The average pounds, number, and percentage per trip of summer flounder in the offshore mixed otter trawl fishery:

	Pounds	Number	Percentage
1982-83 season	3,036	3,099	10
1983-84 season	6,309	6,924	29
1984-85 season	9,776	9,116	38
Average	6,374	6,380	26

Note: EEZ landings occur in both the nearshore and offshore fisheries.

Source: North Carolina, 1986.

Table 42. Average Summer Flounder Recreational Catch by State and Mode of Fishing, 1979 - 1985

State (% Total Catch)	Mode	% Catch By Mode	Number of Fish Type A	Number of Fish Type A + B1	Number of Fish Type A + B1 + B2	Weight (Pounds) Type A	Weight (Pounds) Mean	Weight (Pounds) Type A + B1	Weight (Pounds) Type A + B1 + B2
ME	MM	100%	2759	2759	4388	5794	1.32	3643	5794
(*)	Total		2759	2759	4388	5794	1.32	3643	5794
NH	BB	71%	80	80	80	35	.44	35	35
(*)	MM	29%	-	33	33	-	-	-	-
	Total		80	113	113	35	.31	35	35
MA	BB	3%	6459	7220	17645	10693	1.66	11402	26432
(2%)	MM	6%	8950	19649	30522	10850	1.21	24971	38653
	PC	4%	995	22459	22459	3326	3.34	66796	66796
	PR	87%	250313	436678	460771	409495	1.64	723227	762328
	Total		266717	486005	531397	434364	1.63	791487	865411
RI	BB	2%	3831	3831	3831	4881	1.27	4881	4881
(1%)	MM	6%	3730	6515	10843	3314	.89	6055	9910
	PC	2%	120	2903	2903	158	1.32	365	365
	PR	91%	60087	153263	176321	110129	1.83	268974	311095
	Total		67767	166513	193998	118481	1.75	291124	339497
CT	BB	2%	2357	5489	7389	2041	.87	4753	6398
(*)	MM	13%	28127	29201	46839	16264	.58	16878	27370
	PC	9%	21163	31613	32269	20996	.99	33899	34994
	PR	76%	135310	192193	272663	186852	1.38	267071	381499
	Total		186957	258496	359161	226153	1.21	312690	434460
NY	BB	3%	65512	94710	166026	93828	1.43	135283	239268
(18%)	MM	1%	24728	33792	66547	32748	1.32	44665	87573
	PC	19%	465237	600312	897026	863045	1.86	1142329	1654944
	PR	77%	1560616	2099628	3728551	2769134	1.77	3738794	6600293
	Total		2116093	2828441	4858150	3758755	1.78	5024078	8629392
NJ	BB	1%	45765	59771	90126	48995	1.07	64228	96873
(35%)	MM	5%	165655	354211	491328	176246	1.06	344142	471281
	PC	9%	410383	808147	905219	532201	1.30	1053270	1178783
	PR	85%	4640407	6809240	8117449	5043931	1.09	7419269	8821530
	Total		5262210	8031369	9604123	5801373	1.10	8854258	10588156
DE	BB	4%	9601	14748	23471	12575	1.31	19303	31087
(2%)	MM	3%	8580	13644	17096	11287	1.32	19857	24526
	PC	29%	137864	167437	169930	180594	1.31	224389	227602
	PR	64%	306638	333454	377838	530660	1.73	579371	656156
	Total		462685	529284	588333	735117	1.59	840930	934747
MD	BB	4%	23536	31607	52023	33248	1.41	44149	70919
(5%)	MM	23%	103648	118296	290889	137521	1.33	157045	386162
	PC	3%	20977	27936	32348	26451	1.26	27677	32904
	PR	70%	283068	354324	866107	318112	1.12	399150	985223
	Total		431229	532165	1241368	515333	1.20	635955	1483476
VA	BB	24%	1412785	1513877	1995606	783474	.55	830803	1097563
(30%)	MM	7%	386783	490539	600880	219792	.57	274575	341394
	PC	18%	124948	783840	1484839	150883	1.21	970894	1852950
	PR	50%	2112631	2531407	4114846	2573232	1.22	3076500	4990637
	Total		4037145	5319664	8196169	3727382	.92	4911496	7567291
NC	BB	28%	270990	372127	478886	224210	.83	308211	400826
(6%)	MM	10%	84921	124292	177046	71958	.85	105928	149227
	PC	14%	153284	157143	245445	79554	.52	81993	129047
	PR	47%	557628	654429	808272	538046	.96	634327	781004
	Total		1066825	1307991	1709649	913768	.86	1120334	1464366
Total			13900467	19462800	27286849	16236586	1.17	22733727	31872573

Notes: All percentages are of total catch (Types A + B1 + B2). * = denotes less than 0.5%.
Source: USDC, 1986e.

Table 43. Average Summer Flounder Recreational Catch by State and Water Area of Fishing, 1979 - 1985

			Number of Fish			Weight (Pounds)			
	Area	% Catch By Area	Type A	Type A+B1	Type A+B1+B2	Type A	Mean	Type A+B1	Type A+B1+B2
ME	INT	98%	2669	2669	4298	5675	1.32	3524	5675
	TS	2%	90	90	90	119	1.32	119	119
	Total		2759	2759	4388	5794	1.32	3643	5794
NH	INT	71%	80	80	80	35	.44	35	35
	UNK	29%	-	33	33	-	-	-	-
	Total		80	113	113	35	.31	35	35
MA	INT	36%	138759	161112	188839	220345	1.66	255463	295003
	TS	52%	117215	261123	276356	194063	1.90	431118	454529
	EEZ	10%	5021	52364	53774	9539	1.82	118439	121049
	UNK	2%	5722	11407	12428	10417	1.63	21376	23628
	Total		266717	486005	531397	434364	1.63	791487	865411
RI	INT	4%	33087	48011	64933	55449	1.84	81713	109553
	TS	46%	32270	78649	88811	59536	1.42	145484	163190
	EEZ	19%	2315	37130	37432	3285	2.21	52866	53296
	UNK	1%	96	2722	2722	212	1.75	212	212
	Total		67767	166513	193998	118481	1.75	291124	339497
CN	INT	86%	177790	238586	308437	208375	1.55	284804	364585
	TS	11%	4413	11801	39337	6822	2.30	19109	59436
	EEZ	3%	4754	8109	11386	10956	2.30	18688	26240
	Total		186957	258496	359161	226153	1.21	312690	434460
NY	INT	79%	1692234	2187570	3822848	2957380	2.24	3827436	6701382
	TS	12%	250267	414101	580314	560034	1.51	916482	1257856
	EEZ	1%	37681	56594	66816	56999	1.36	85605	101035
	UNK	8%	135911	170177	388172	184342	1.78	231548	521805
	Total		2116093	2828441	4858150	3758755	1.78	5024078	8629392
NJ	INT	42%	2531326	3475897	3989623	2838474	1.06	3896000	4473822
	TS	53%	2510011	4019730	5040209	2666666	1.42	4269609	5331571
	EEZ	5%	179929	452129	473118	255014	1.01	632093	662488
	UNK	1%	40944	83613	101172	41219	1.10	83207	100586
	Total		5262210	8031369	9604123	5801373	1.10	8854258	10588156
DE	INT	37%	144364	187603	215493	266578	1.20	341407	390481
	TS	8%	35277	38786	46978	42297	1.48	46573	56325
	EEZ	47%	246208	258082	278867	365594	1.65	380856	414807
	UNK	8%	36834	44812	46997	60647	1.59	74084	77758
	Total		462685	529284	588333	735117	1.59	840930	934747
MD	INT	73%	296895	370227	901160	369794	1.02	459808	1109361
	TS	7%	43024	57147	92501	44034	1.84	52699	93988
	EEZ	1%	8961	9456	16075	16521	1.03	17439	29763
	UNK	19%	82349	95333	231631	84983	1.20	98075	242096
	Total		431229	532165	1241368	515333	1.20	635955	1483476
VA	INT	45%	1773477	2407456	3701182	1848244	.77	2493472	3963093
	TS	45%	1874366	2428302	3703756	1442798	1.09	2140461	3466176
	EEZ	3%	128244	159226	250454	139641	1.14	170860	270339
	UNK	67%	261060	324679	540779	296698	.92	347979	582936
	Total		4037145	5319664	8196169	3727382	.92	4911496	7567291
NC	INT	43%	513184	597361	734410	479467	.78	559319	680145
	TS	52%	513435	652282	882980	402680	1.20	517062	699857
	EEZ	1%	2016	11235	11818	2416	.76	13805	14526
	UNK	5%	38188	47113	80441	29205	.86	40273	65576
	Total		1066825	1307991	1709649	913768	.86	1120334	1464366
Total			13900467	19462800	27286849	16236586	1.17	22733727	31872573

Note: All percentages are of total catch (Types A + B1 + B2).
Source: USDC, 1986e.

Table 44. Summer Flounder Directed Recreational Fishing Trips, 1979 - 1985
[thousands of participants and thousands of trips]

		ME	NH	MA	RI	CT	ME - CT Total	NC
1979	Total participants	196	231	799	445	400	-	1,179
	Total trips	506	568	2,836	1,683	1,663	7,256	4,200
	% trips fluking	*	*	*	*	*	3	11
	Fluke trips	*	*	*	*	*	239	451
	% total fluke trips	*	*	*	*	*	7	13
1980	Total participants	258	182	258	341	364	-	1,298
	Total trips	854	453	3,560	1,216	1,684	7,767	4,548
	% trips fluking	*	*	*	*	*	2	3
	Fluke trips	*	*	*	*	*	148	145
	% total fluke trips	*	*	*	*	*	4	4
1981	Total participants	195	93	963	244	194	-	1,017
	Total trips	562	259	3,886	870	979	6,556	2,601
	% trips fluking	*	*	*	*	*	2	3
	Fluke trips	*	*	*	*	*	110	69
	% total fluke trips	*	*	*	*	*	3	2
1982	Total participants	151	100	870	306	266	-	914
	Total trips	567	302	3,921	1,295	1,586	7,671	4,009
	% trips fluking	*	*	*	*	*	3	8
	Fluke trips	*	*	*	*	*	220	309
	% total fluke trips	*	*	*	*	*	4	6
1983	Total participants	205	141	1,564	430	275	-	1,833
	Total trips	485	364	5,788	1,351	1,398	9,386	6,358
	% trips fluking	*	*	*	*	*	3	6
	Fluke trips	*	*	*	*	*	270	399
	% total fluke trips	*	*	*	*	*	7	10
1984	Total participants	212	154	970	418	290	-	1,474
	Total trips	469	346	3,098	1,221	1,505	6,639	4,821
	% trips fluking	*	*	*	*	*	3	8
	Fluke trips	*	*	*	*	*	186	409
	% total fluke trips	*	*	*	*	*	4	9
1985	Total participants	277	41	1,580	550	362	-	1,599
	Total trips	758	88	4,771	1,565	1,519	8,701	5,194
	% trips fluking	*	*	*	*	*	3	11
	Fluke trips	*	*	*	*	*	218	571
	% total fluke trips	*	*	*	*	*	8	21
Seven Year Average								
Total participants		213	135	1,001	391	307	-	1,331
Total trips		600	340	3,980	1,314	1,476	7,711	4,533
Total trips/Participant		2.8	2.5	4.0	3.4	4.8	-	3.4
% trips fluking		*	*	*	*	*	3	7
Fluke trips		*	*	*	*	*	198	324
% total fluke trips		*	*	*	*	*	5	8

Table 44. (continued)

		NY	NJ	DE	MD	VA	NY - VA Total	Coastwide Total
1979	Total participants	1,515	946	130	955	695	-	-
	Total trips	8,138	4,313	534	3,706	1,963	18,654	30,110
	% trips fluking	*	*	*	*	*	15	12
	Fluke trips	*	*	*	*	*	2,835	3,525
	% total fluke trips	*	*	*	*	*	80	100
1980	Total participants	860	2,988	91	910	2,091	-	-
	Total trips	5,511	9,372	463	3,420	6,148	24,914	37,229
	% trips fluking	*	*	*	*	*	13	9
	Fluke trips	*	*	*	*	*	3,189	3,482
	% total fluke trips	*	*	*	*	*	92	100
1981	Total participants	1,015	752	114	903	786	-	-
	Total trips	4,468	4,024	708	2,586	2,985	14,771	23,928
	% trips fluking	*	*	*	*	*	23	15
	Fluke trips	*	*	*	*	*	3,384	3,563
	% total fluke trips	*	*	*	*	*	95	100
1982	Total participants	605	760	212	1,273	895	-	-
	Total trips	4,063	5,443	807	3,996	2,720	17,029	28,709
	% trips fluking	*	*	*	*	*	26	17
	Fluke trips	*	*	*	*	*	4,467	4,996
	% total fluke trips	*	*	*	*	*	89	100
1983	Total participants	730	1,204	247	1,234	1,808	-	-
	Total trips	6,735	6,105	1,009	4,114	5,049	23,012	38,756
	% trips fluking	*	*	*	*	*	15	10
	Fluke trips	*	*	*	*	*	3,346	4,015
	% total fluke trips	*	*	*	*	*	83	100
1984	Total participants	766	1,480	256	864	1,145	-	-
	Total trips	6,220	6,263	1,298	3,329	3,979	21,089	32,549
	% trips fluking	*	*	*	*	*	20	14
	Fluke trips	*	*	*	*	*	4,114	4,710
	% total fluke trips	*	*	*	*	*	87	100
1985	Total participants	704	1,799	128	597	909	-	-
	Total trips	5,128	7,409	574	1,793	2,912	17,816	31,711
	% trips fluking	*	*	*	*	*	10	8
	Fluke trips	*	*	*	*	*	1,869	2,659
	% total fluke trips	*	*	*	*	*	70	100
Seven Year Average								
Total participants		885	1,418	168	962	1,190	-	-
Total trips		5,752	6,133	770	3,278	3,679	19,612	31,856
Total trips/Participant		6.5	4.3	4.6	3.4	3.1	-	-
% trips fluking		*	*	*	*	*	17	12
Fluke trips		*	*	*	*	*	3,409	3,931
% total fluke trips		*	*	*	*	*	87	100

Notes: * summer flounder directed trips were only determined for North Carolina.
- total number of participants not determinable due to inter-state travel of some participants.

Source: USDC, 1986b.

Table 45. Average Summer Flounder Recreational Catch by Mode and Area, 1979 - 1985

Mode/Area		Number of Fish (000) Type A	Type A + B1	Type A + B1 + B2	Weight (Lbs x 000) Type A	Mean	Type A + B1	Type A + B1 + B2
BB	Int	295	426	550	219	.74	301	389
	TS	1,514	1,629	2,181	953	.63	1,066	1,645
	Unk	32	49	104	42	1.31	57	127
	Total	1,841	2,103	2,835	1,214	.66	1,458	2,129
	%	13	11	10	7		6	7
MM	Int	391	496	721	352	.90	446	645
	TS	353	564	795	261	.74	416	589
	Unk	74	133	220	73	.99	130	222
	Total	818	1,193	1,737	686	.84	988	1,436
	%	6	6	6	4		4	5
PC	Int	625	954	1,386	861	1.38	1,329	1,917
	TS	463	1,235	1,923	675	1.46	1,952	3,066
	EEZ	195	317	332	271	1.39	458	484
	Unk	52	97	150	51	.98	84	122
	Total	1,335	2,602	3,793	1,857	1.39	3,584	5,144
	%	10	13	14	11		16	16
PR	Int	5,993	7,802	11,273	7,818	1.30	10,178	14,706
	TS	3,050	4,534	5,851	3,530	1.16	5,294	6,854
	EEZ	420	728	867	589	1.40	986	1,164
	Unk	443	501	931	543	1.23	612	1,143
	Total	9,907	13,565	18,923	12,480	1.26	17,088	23,838
	%	71	70	69	77		75	75
Int	BB	295	426	550	219	.74	301	389
	MM	391	496	721	352	.90	446	645
	PC	625	954	1,386	861	1.38	1,329	1,917
	PR	5,993	7,802	11,273	7,818	1.30	10,178	14,706
	Total	7,304	9,677	13,931	9,250	1.27	12,255	17,643
	%	53	50	51	57		54	55
TS	BB	1,514	1,629	2,181	953	.63	1,066	1,645
	MM	353	564	795	261	.74	416	589
	PC	463	1,235	1,923	675	1.46	1,952	3,066
	PR	3,050	4,534	5,851	3,530	1.16	5,294	6,854
	Total	5,380	7,962	10,751	5,419	1.01	8,250	11,418
	%	39	41	39	33		36	35
EEZ	PC	195	317	332	271	1.39	458	484
	PR	420	728	867	589	1.40	986	1,164
	Total	615	1,044	1,200	860	1.40	1,461	1,673
	%	4	5	4	5		6	5
Unk	BB	32	49	104	42	1.31	57	127
	MM	74	133	220	73	.99	130	222
	PC	52	97	150	51	.98	84	122
	PR	443	501	931	543	1.23	612	1,143
	Total	601	780	1,404	708	1.18	910	1,653
	%	4	4	5	4		4	5
Total		13,900	19,463	27,287	16,237	1.17	22,734	31,873

Source: USDC, 1986e.

Table 46. EEZ Average Summer Flounder Recreational Catch, 1979 - 1985

			Number of Fish			Weight (Pounds)			
State	Mode	% Catch A + B1 + B2	Type A	Type A + B1	Type A + B1 + B2	Type A	Mean	Type A + B1	Type A + B1 + B2
MA	PC	40%	241	21249	21249	690	2.86	60837	60837
	PR	60%	4780	31115	32525	8849	1.85	57602	60212
	Total	5%	5021	52364	53774	9539	1.90	118439	121049
RI	PC	1%	120	277	277	158	1.32	365	365
	PR	99%	2195	36853	37155	3127	1.42	52501	52931
	Total	3%	2315	37130	37432	3285	1.42	52866	53296
CT	PR	100%	4754	8109	11386	10956	2.30	18688	26240
	Total	1%	4754	8109	11386	10956	2.30	18688	26240
NY	PC	26%	11030	16370	17356	16813	1.52	24953	26456
	PR	74%	26651	40224	49460	40186	1.51	60652	74579
	Total	6%	37681	56594	66816	56999	1.51	85605	101035
NJ	PC	33%	69001	146558	156601	111607	1.62	237053	253297
	PR	67%	110928	305571	316517	143407	1.29	395040	409191
	Total	39%	179929	452129	473118	255014	1.42	632093	662488
DE	PC	44%	109971	120794	122887	137168	1.25	150668	153278
	PR	56%	136237	137288	155980	228426	1.68	230188	261529
	Total	23%	246208	258082	278867	365594	1.48	380856	414807
MD	PC	24%	2245	2361	3820	3113	1.39	3274	5297
	PR	76%	6716	7095	12255	13408	2.00	14165	24466
	Total	1%	8961	9456	16075	16521	1.84	17439	29763
VA	PC	4%	2230	8954	10189	1537	0.69	6171	7023
	PR	96%	126014	150272	240265	138104	1.10	164689	263316
	Total	21%	128244	159226	250454	139641	1.09	170860	270339
NC	PC	1%	130	130	130	86	0.66	86	86
	PR	99%	1886	11105	11688	2330	1.24	13719	14440
	Total	1%	2016	11235	11818	2416	1.20	13805	14526
Total	PC	28%	194968	316693	332509	271172	1.39	483407	506639
	PR	72%	420161	727632	867231	588793	1.40	1007244	1186904
	Total		615129	1044325	1199740	859965	1.40	1459991	1677265

Note: Weights are summed by state, not determined by the lbs/fish.
PC represents party/charter boats.
PR represents private/rental boats.

Source: USDC, 1986e.

Table 47. Summer Flounder Recreational Landings by Year, Coastwide and EEZ, 1979 - 1985

Year	Area	Number of Fish (000)	Lbs per Fish	Total Lbs (000)
1979	Coastwide	20,828	1.03	22,477
	EEZ	474	1.51	716
	% EEZ	2		3
1980	Coastwide	22,213	1.16	25,849
	EEZ	363	1.14	414
	% EEZ	2		2
1981	Coastwide	9,333	1.22	11,344
	EEZ	445	2.09	930
	% EEZ	5		8
1982	Coastwide	15,989	1.18	18,931
	EEZ	1,120	1.14	1,271
	% EEZ	7		7
1983	Coastwide	26,540	1.35	35,767
	EEZ	1,339	1.17	1,568
	% EEZ	5		4
1984	Coastwide	26,227	1.11	28,991
	EEZ	1,188	1.68	1,991
	% EEZ	5		7
1985	Coastwide	15,110	1.13	17,117
	EEZ	2,381	1.40	3,339
	% EEZ	16		20

Note: All landings are types A + B1 fish.

Source: USDC, 1986e.

Table 48. Summer Flounder Recreational Total Lengths from the MRFSS, 1979-1985

		% Landings	% ≤ 11"	% 11"	% 12"	% 13"	% >= 14"	Total Measured
MA	Total	3	19	9	8	14	51	327
	EEZ	5	-	-	5	41	55	22
RI	Total	1	12	6	5	10	67	250
	EEZ	4	-	10	25	20	45	20
CT	Total	1	22	15	14	13	36	727
	EEZ	1	15	4	11	7	63	27
NY	Total	15	4	4	6	13	74	3,849
	EEZ	5	-	3	10	10	78	40
NJ	Total	41	8	11	18	21	43	6,958
	EEZ	43	6	5	17	20	53	309
DE	Total	3	5	6	9	19	61	2,369
	EEZ	25	1	2	7	21	68	782
MD	Total	3	7	11	20	19	43	3,310
	EEZ	1	1	6	13	26	55	145
VA	Total	27	23	14	15	14	34	3,571
	EEZ	15	17	23	17	14	29	312
NC	Total	7	17	25	17	16	25	1,790
	EEZ	1	10	20	40	20	10	10
Adjusted	Total	100	12	12	15	17	45	23,151
	EEZ	100	5	7	14	20	54	1,667

Note: Adjusted total is the sum of the percentage of size for each state multiplied by the percentage of landings (types A & B1) for that state.

Source: USDC, 1986b.

Table 49. Summer Flounder Foreign Catch, 1978 - 1985

		Weight (Lbs x 000)					%	
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total	Summer Flounder	Adj. Total
1978	Observed Summer Flounder	80	14	-	51	145		530
	Observed catch, all species	7,603	3,902	11,037	6,571	29,112	0.5	
	Total catch, all species	41,365	15,034	24,728	25,149	106,000		
1979	Observed Summer Flounder	49	-	-	29	78		221
	Observed catch, all species	4,660	4,558	12,361	8,895	30,473	0.3	
	Total catch, all species	38,464	5,995	18,391	22,085	84,935		
1980	Observed Summer Flounder	103	-	-	62	165		496
	Observed catch, all species	5,835	3,606	11,910	10,540	31,891	0.5	
	Total catch, all species	43,879	1,967	13,855	35,618	95,319		
1981	Observed Summer Flounder	44	-	-	83	128		402
	Observed catch, all species	12,100	-	8,793	12,205	33,098	0.4	
	Total catch, all species	61,372	94	10,545	31,310	103,000		
1982	Observed Summer Flounder	59	-	-	17	76		323
	Observed catch, all species	8,117	267	4,043	6,928	19,355	0.4	
	Total catch, all species	36,147	1,633	15,248	29,703	82,731		
1983	Observed Summer Flounder	135	-	-	93	229		290
	Observed catch, all species	12,399	6,808	566	11,124	30,897	0.7	
	Total catch, all species	23,580	1,568	31	13,960	39,138		
1984	Observed Summer Flounder	218	-	-	174	392		878
	Observed catch, all species	14,455	-	528	7,702	22,684	1.7	
	Total catch, all species	33,523	8,507	515	8,178	50,723		
1985	Observed Summer Flounder	189	-	-	9	198		197
	Observed catch, all species	42,829	30,533	2,427	7,795	83,584	0.2	
	Total catch, all species	43,783	29,697	2,060	6,569	82,109		

Notes: All foreign fisheries data is for the Atlantic EEZ only.
Observed catch is that recorded by NMFS foreign fisheries observers.
Total catch is that reported by the foreign fishing vessels.
\- = zero.

Source: USDC, 1986e.

Table 50 Northwest Atlantic EEZ Monthly Foreign Fishery Catch (000 lbs), 1985

	Summer Flounder	Atlantic Mackerel	Butter-fish	*Illex* Squid	*Loligo* Squid	Other Finfish	Hake	River Herring	Total
Jan	96	1,628	112	146	2,668	315	195	2	5,065
Feb	52	6,650	438	88	3,932	916	590	1	12,615
March	40	19,478	481	26	3,515	484	2,029	81	26,103
April	-	17,755	-	0	-	30	1	43	17,830
May	-	11,829	3	-	0	1	33	1	11,867
June	-	0	-	0	-	0	-	0	-
July	-	0	-	0	-	0	-	0	-
August	-	0	2	1,191	24	-	0	-	1,216
Sept	-	0	53	736	27	22	5	-	844
Oct	-	0	496	23	1,462	110	24	-	2,115
Nov	-	0	172	13	1,798	236	41	-	2,259
Dec	9	826	16	-	1,030	263	48	10	2,194
Total	198	58,166	1,772	2,223	14,457	2,379	2,965	137	82,109

Note: Data are summed for all total foreign catch combined.
Summer flounder are included in the other finfish category.

Source: USDC, 1986e.

Table 51. Summer Flounder Commercial Ex-vessel Value by State (thousands of $), 1979 - 1985

	1979		1980		1981		1982	
	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real
ME	2	3	2	3	2	2	9	10
NH	-	0	-	0	-	0	-	-
MA	887	1315	329	430	520	616	1122	1254
RI	2053	3043	1164	1520	2493	2953	3380	3777
CT	25	37	42	55	77	91	55	61
NY	1161	1721	1193	1557	1832	2170	1655	1850
NJ	3931	5826	2724	3556	2764	3274	3232	3612
DE	2	3	-	0	4	5	6	7
MD	813	1205	620	809	263	312	244	273
VA	4326	6411	3856	5034	1983	2349	2773	3099
NC	8838	13098	7888	10298	6198	7342	5672	6339
TOTAL	22039	32663	17820	23264	16137	19115	18148	20282

	1983		1984		1985	
	Nominal	Real	Nominal	Real	Nominal	Real
ME	52	56	-	0	1	1
NH	-	0	-	0	-	-
MA	1845	1992	1515	1569	2506	2506
RI	4152	4483	4667	4834	7853	7853
CT	129	139	131	136	-	-
NY	1333	1439	2405	2491	2953	2953
NJ	3294	3557	3924	4064	4961	4961
DE	4	4	7	7	-	-
MD	559	604	557	577	514	514
VA	4609	4977	5577	5776	4383	4383
NC	5684	6137	9038	9360	9545	9545
TOTAL	21662	23390	27823	28816	32716	32716

Note: 1985 data do not include Massachusetts state supplemental landings, Connecticut, or Chesapeake Bay landings.
Real values are inflated to 1985 dollars using CPI.

Source: USDC, 1986e.

Table 52. State Commercial Summer Flounder Landings and Relative Importance (thousands of lbs, thousands of $), 1985

	Summer Flounder		Total Landings		Summer Flounder % of Total Landings	
State	Quantity	Value	Quantity	Value	Quantity	Value
ME	3	1	175,460	100,919	.0	.0
NH	-	0	7,606	5,263	.0	.0
MA	2,224	2,506	296,222	231,522	.8	1.1
RI	7,533	7,854	103,770	69,848	7.3	11.2
CN	183	183	6,734	11,864	2.7	1.5
NY	2,517	2,953	39,233	38,005	6.4	7.8
NJ	5,634	4,961	107,785	60,844	5.2	8.2
DE	10	9	4,793	2,289	.2	.4
MD	577	565	91,931	47,418	.6	1.2
VA	5,036	4,384	722,658	76,535	.7	5.7
NC	10,965	9,545	214,871	64,589	5.1	14.8
TOTAL	34,683	32,959	1,771,063	709,096	2.0	4.6

Note: Numbers may not total due to rounding.

Sources: Summer flounder landings from USDC, 1986e. Total landings from USDC, 1986a.

Table 53. Summer Flounder Landings (lbs), Value ($), and Price ($/lb) by Market Category

Size	Year	Landings	Value	Price	Adjusted 1985 Value	Adjusted 1985 Price
Jumbo	79	1,905,863	1,439,140	.76	2,132,893	1.12
	80	1,388,958	1,242,609	.89	1,622,239	1.17
	81	1,898,432	1,938,816	1.02	2,293,269	1.21
	82	1,978,146	2,262,969	1.14	2,522,064	1.27
	83	2,243,599	2,519,828	1.12	2,720,806	1.21
	84	3,014,270	3,570,007	1.18	3,697,384	1.23
	85	2,786,105	3,541,142	1.27	3,541,142	1.27
Large	79	7,337,288	4,620,607	.63	6,848,020	.93
	80	5,684,826	3,740,340	.66	4,883,053	.86
	81	3,818,083	3,273,370	.86	3,871,805	1.01
	82	4,650,410	4,028,799	.87	4,490,069	.97
	83	7,978,172	6,368,855	.80	6,876,827	.86
	84	8,785,015	7,420,366	.84	7,685,124	.87
	85	6,538,124	7,477,032	1.14	7,477,032	1.14
Medium	79	4,661,196	2,307,775	.50	3,420,263	.73
	80	5,319,026	2,552,771	.48	3,332,669	.63
	81	3,941,805	2,621,504	.67	3,100,766	.79
	82	5,494,965	4,034,903	.73	4,496,872	.82
	83	8,214,015	5,186,952	.63	5,600,657	.68
	84	9,145,389	5,786,958	.63	5,993,436	.66
	85	8,454,800	7,901,204	.93	7,901,204	.93
Small	79	2,606,706	711,515	.27	1,054,508	.40
	80	4,026,329	1,056,154	.26	1,378,820	.34
	81	3,928,282	1,439,284	.37	1,702,413	.43
	82	5,914,850	2,581,759	.44	2,877,353	.49
	83	6,390,426	2,366,360	.37	2,555,098	.40
	84	9,377,263	3,252,676	.35	3,368,731	.36
	85	7,274,221	4,460,395	.61	4,460,395	.61
Unclassified	79	25,385,908	12,959,788	.51	19,207,193	.76
	80	18,036,551	9,228,365	.51	12,047,728	.67
	81	9,786,546	6,864,224	.70	8,119,137	.83
	82	7,014,409	5,239,667	.75	5,839,574	.83
	83	7,476,984	5,219,622	.70	5,635,932	.75
	84	10,019,252	7,792,715	.78	8,070,758	.81
	85	9,399,035	9,336,270	.99	9,336,270	.99
Total	79	41,896,961	22,038,825	.53	32,662,877	.78
	80	34,455,690	17,820,239	.52	23,264,509	.68
	81	23,373,148	16,137,198	.69	19,087,390	.82
	82	25,052,780	18,148,097	.72	20,225,932	.81
	83	32,303,196	21,661,617	.67	23,389,320	.72
	84	40,341,189	27,822,722	.69	28,815,433	.71
	85	34,452,285	32,716,043	.95	32,716,043	.95

Source: USDC, 1986e.

Table 54. Average Monthly Summer Flounder Landings (lbs), Real Exvessel Value (1985 $), and Real Price (1985 $/lb), 1979 - 1985

Month	Landings	Real Value	EEZ Landings	% EEZ Landings	Real Price
Jan	5,052,520	$3,658,044	4,563,291	90	$.72
Feb	3,388,378	2,946,379	3,254,914	96	.87
Mar	3,109,728	2,890,157	2,902,861	93	.93
Apr	2,018,485	1,853,090	1,857,743	92	.92
May	1,492,531	1,433,481	833,889	56	.96
Jun	991,771	1,025,442	398,079	40	1.03
Jul	995,425	1,130,720	270,532	27	1.14
Aug	1,471,923	1,455,816	548,806	37	.99
Sep	2,141,472	1,723,439	1,076,610	50	.80
Oct	2,959,736	2,101,888	1,749,168	59	.71
Nov	4,055,634	2,406,112	2,243,172	55	.59
Dec	5,049,258	2,864,793	3,296,903	65	.57

Note: All values are adjusted 1985 dollars (CPI).

Source: USDC, 1986e.

Table 55. Number of Vessels Landing Summer Flounder, 1979 - 1985

	(1) All Vessels	(2) Fish Otter Trawls	(3) Difference	(4) Other Gear in EEZ	(5) Crossover
1979*	580	476	104	8	unk
1980*	567	456	111	10	unk
1981*	571	509	62	75	13
1982**	716	641	75	100	25
1983**	784	702	82	126	44
1984**	727	660	67	126	59
1985**	731	653	78	117	39

Notes:

(1) = the total number of individual vessels identified in the NMFS weighout system.

(2) = the total number of individual vessels using a fish otter trawl (as opposed to scallop, lobster, shrimp, or other otter trawl) as identified in the NMFS weighout system.

(3) = difference between the number of all vessels (1) and the number of fish otter trawls (2).

(4) = the number of individual vessels landing summer flounder from the EEZ with gear other than fish otter trawls identified in the NMFS weighout system.

(5) = the minimum number of vessels which must be landing summer flounder by both fish otter trawls and other gear based on the number of vessels known to use other gear in the EEZ and the number of individual vessels known to land summer flounder but to not be fish otter trawlers.

* = only vessels landing in ME, MA, RI, and NJ.
** = only vessels landing in ME, NH, MA, RI, NJ, MD, and VA.
unk = unknown.

Source: USDC, 1986f.

Table 56. Recreational Expenditures by Area

		North Atlantic	Mid Atlantic	South Atlantic	Overall
	(1)				
1979	Average expenditures	$15.71	$20.45	$20.16	$18.77
	Average miles	30.4	44.3	30.0	34.9
1980	Average expenditures	$14.49	$21.80	$27.94	$21.41
	Average miles	27.8	40.9	33.8	34.2

	(2)	Atlantic Coast
1981	Overall average expenditures	$43.65
	Average miles	30.5
	Shore mode, natural bait	$28.71
	Boat mode, still fishing	$42.92

	(3) Summer Flounder Only	Atlantic Coast
1979	Average expenditures	$17.16
	Average miles	28.0
1980	Average expenditures	$25.22
	Average miles	35.4
1979-80	Average expenditures	$21.19
	Average miles	31.7

Notes: All mileage is one way. All expenditures are adjusted to 1985 dollars. All overall expenditures and miles are unweighted averages.

Sources: (1) = USDC, 1986b. (2) = KCA, 1983. (3) = USDC, 1986e.

Table 57. Expenditures by Summer Flounder Recreational Fishermen

Coastwide

(1)	Average Number Summer Flounder Trips	Average Expenditures	Total Expenditures (000)
ME - CT	198,000	$15.10	$2,990
NY - VA	3,409,000	$21.13	$72,032
NC	324,000	$24.05	$7,792
Total			$82,814

(2) Mode	% Catch	Average Number Summer Flounder Trips	Average Expenditures	Total Expenditures (000)
Shore	17	3,931,000	$28.71	$19,186
Boat	83	3,931,000	$42.92	$140,036
Total				$159,222

(3)	Average Number Summer Flounder Trips	Average Expenditures	Total Expenditures (000)
Atlantic coast	3,931,000	$21.19	$83,298

EEZ

(2) Mode	Average Number Summer Flounder Trips	Average Expenditures	Total Expenditures (000)
Boat	348,000	$42.92	$14,936

Notes: All expenditures are derived from Table 56.

Sources: (1) = USDC, 1986b, (2) = KCA, 1983, (3) = USDC, 1986e.

Table 58. Average Success Rate for Summer Flounder Anglers, 1979 - 1985

Rate of unsuccessful trips all anglers, all species			
North Atlantic	42%		
Mid-Atlantic	36%		
South Atlantic	38%		
Average catch per trip, all anglers, all species			
North Atlantic	5.3	fish	
Mid-Atlantic	5.6	fish	
South Atlantic	4.3	fish	
Average catch per trip, all party, charter, and private boats			
North Atlantic	6.8	fish	
Mid-Atlantic	6.7	fish	
South Atlantic	5.1	fish	
Coastwide Summer Flounder Anglers			
Those anglers targeting on or catching summer flounder			
Average catch per trip	6.2	total fish	
Average landings per trip	2.9	other fish	1.9 summer flounder
Targeting on summer flounder	84%		
Average catch per trip	3.6	total fish	
Average landings per trip	1.1	other fish	1.6 summer flounder
Unsuccessful for catching any fish	54%		
Unsuccessful for landing any fish	66%		
Unsuccessful for summer flounder	74%		
Average summer flounder landings of successful anglers	6.0	summer flounder	
Non-target anglers who caught summer flounder	16%		
Average catch per trip	20.8	total fish	
Average landings per trip	13.0	other fish	4.3 summer flounder
Caught only summer flounder	33%		
Average summer flounder landings	3.8	summer flounder	
Landed only summer flounder	43%		
Average summer flounder landings	4.2	summer flounder	
EEZ Summer flounder anglers			
Those anglers targeting on or catching summer flounder			
Average catch per trip	9.9	total fish	
Average landings per trip	4.9	other fish	3.5 summer flounder
Targeting on summer flounder	64%		
Average catch per trip	6.1	total fish	
Average landings per trip	2.3	fish	1.8 summer flounder
Unsuccessful for catching any fish	44%		
Unsuccessful for landing any fish	52%		
Unsuccessful for summer flounder	64%		
Average summer flounder landings of successful anglers	5.7	summer flounder	
Non-target anglers who caught summer flounder	36%		
Average catch per trip	10.5	total fish	
Average landings per trip	6.0	other fish	4.2 summer flounder
Caught only summer flounder	29%		
Average summer flounder landings	3.4	summer flounder	
Landed only summer flounder	37%		
Average summer flounder landings	3.7	summer flounder	

Sources: USDC, 1986b and USDC, 1986e.

Table 59. Fulton Market Share of Total Summer Flounder Landings (lbs x 000) 1984 and 1985

	1984			1985*		
	State Landings	Fulton Market	% Fulton	State Landings	Fulton Market	% Fulton
ME	2.4	.0	-	2.5	.0	-
NH	.2	.0	-	.3	.0	-
MA	1,488.1	47.9	3.22	2,224.4	147.2	6.62
RI	4,479.3	535.7	11.96	7,532.8	712.6	9.46
CN	130.8	112.1	85.70	N/A	124.6	N/A
NY	2,294.7	697.1	30.38	2,517.4	1,004.3	39.89
NJ	6,364.4	174.7	2.74	5,634.2	147.5	2.62
DE	8.7	.0	-	.0	.0	-
MD	812.7	7.5	.92	539.8	.0	-
VA	9,673.4	126.9	1.31	5,036.3	29.8	.59
NC	15,086.5	692.6	4.59	10,964.6	771.0	7.03
Total	40,341.2	2,394.5	5.94	34,452.3	2,937.0	8.52
Total ME-DE	14,768.6	1,567.5	10.61	17,911.6	2,136.2	11.93

* = Landings data are not reported (N/A) for Connecticut, and some of Massachusetts and Maryland. Therefore, 1985 percentages are overestimated.

Sources: USDC, 1986e and USDC, 1986g.

Table 60. Total Flounder and Summer Flounder Commercial Landings Overall US 1960-1985 (thousands of pounds)

	Total Flounders	Summer Flounder	% Summer Flounder
1960	127,048	21,087	17
1961	133,111	19,403	15
1962	155,329	15,463	10
1963	176,798	13,617	8
1964	176,351	12,237	7
1965	180,121	10,115	6
1966	174,520	14,109	8
1967	158,664	12,930	8
1968	158,499	9,053	6
1969	162,275	6,695	4
1970	168,545	8,861	5
1971	155,946	9,352	6
1972	169,239	10,117	6
1973	168,410	17,207	10
1974	162,450	25,885	16
1975	161,635	28,273	18
1976	169,389	35,193	21
1977	170,560	30,732	18
1978	180,720	30,997	17
1979	209,288	41,897	20
1980	216,920	34,456	16
1981	201,053	23,373	12
1982	228,341	25,053	11
1983	253,528	32,303	13
1984	219,995	40,341	18
1985	195,718	34,673	18

Note: Data are only for North Carolina and north. Prior to 1979 in North Carolina summer flounder were not separated from total flounders.

Sources: USDC 1984 and USDC, 1986a.

Table 61. Quantity (lbs x 000) and Value ($ x 000) of Flatfish and Turbot Imports to the US

	Flounders and Other Flatfish Whole fresh & frozen		Flounders and Other Flatfish Fillets fresh & frozen		Turbot Fillets fresh & frozen	
	Quantity	Value	Quantity	Value	Quantity	Value
1979	7,318	9,197	46,157	61,895	34,978	30,469
1980	5,043	6,062	36,511	47,126	35,044	31,824
1981	6,590	7,914	54,297	74,832	29,549	30,526
1982	7,304	8,044	43,937	62,883	27,036	33,343
1983	8,615	8,567	35,690	53,590	14,666	17,423
1984	16,105	11,627	45,761	68,240	16,677	18,526
1985	22,367	15,766	57,964	89,675	21,339	26,257

1984 Major importing countries

	Flounder and other flatfish								Turbot	
	Whole				Fillets				Fillets	
	Fresh		Frozen		Fresh		Frozen			
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Argentina	1	3	385	99	4	5	1,038	830	110	51
Canada	12,038	4,728	468	514	3,005	5,005	25,085	41,184	10,179	12,326
Iceland	-	0	515	450	156	137	757	953	2,937	2,845
Netherlands	858	2,610	587	1,297	95	255	4,982	7,564	88	121

1986 Major importing countries (through May)

	Flounder and other flatfish								Turbot	
	Whole				Fillets				Fillets	
	Fresh		Frozen		Fresh		Frozen			
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Argentina	97	119	41	63	149	269	2,939	5,246	-	-
Canada	3,067	2,140	128	115	956	2,087	5,105	9,503	613	745
Iceland	-	0	-	0	4	9	354	500	710	852
Netherlands	397	1,628	587	1,927	425	1,081	3,622	5,902	-	-
Japan									935	1,157
Spain			1,400	?						

Source: USDC, 1985a and USDC, 1986e.

Table 62. Seven Year Average Fish Otter Trawl Summer Flounder Commercial Landings (thousands of lbs) by State and Water Area of Catch, 1979 - 1985

	ME	NH	MA	RI	CT	NY	NJ	MD	VA	NC	Total
511	*	-	-	-	-	-	-	-	-	#	*
512	2	-	-	-	-	-	1	-	-	#	3
513	11	*	1	-	-	-	-	-	-	#	12
514	-	-	68	*	-	-	-	-	-	#	68
515	3	-	1	*	-	-	-	-	-	#	4
521	-	-	25	6	-	-	1	1	-	#	32
522	-	-	21	6	-	-	-	-	-	#	27
523	*	-	4	4	-	-	-	-	-	#	8
524	*	-	32	32	-	*	-	-	-	#	65
525	-	-	61	470	-	12	-	-	-	#	543
526	-	-	340	891	-	23	*	-	9	#	1,262
537	-	-	160	1,641	-	71	2	-	5	#	1,879
538	-	-	557	200	-	28	-	-	1	#	786
539	-	-	*	263	39	*	-	-	-	#	303
611	-	-	*	32	44	437	*	-	-	#	513
612	-	-	1	*	-	303	314	1	11	#	629
613	-	-	15	95	-	626	423	*	5	#	1,165
614	-	-	-	-	-	-	552	1	2	#	555
615	-	-	-	*	-	*	176	10	7	#	194
616	-	-	9	153	-	219	512	2	23	#	918
621	-	-	-	1	-	-	1,563	535	450	#	2,550
622	-	-	6	*	-	-	1,526	118	191	#	1,841
623	-	-	-	*	-	-	-	-	-	#	*
624	-	-	-	*	-	-	-	-	-	#	*
625	-	-	-	*	-	-	17	10	1,245	#	1,272
626	-	-	*	*	-	-	5	166	1,803	#	1,975
627	-	-	-	*	-	-	*	4	-	#	4
631	-	-	-	-	-	-	-	-	1,765	#	1,765
632	-	-	-	-	-	-	-	-	902	#	902
633	-	-	-	-	-	-	-	-	*	#	*
635	-	-	-	-	-	-	-	-	80	#	80
636	-	-	-	-	-	-	-	-	11	#	11
637	-	-	-	-	-	-	-	-	-	#	-
639	-	-	-	*	-	-	-	-	-	#	*
NC Ocean-		-	-	-	-	-	-	-	-	10,240	10,240
Total	16	*	1,301	3,797	83	1,720	5,091	848	6,510	10,240	29,606

* = less than 500 lbs.
\- = zero.
\# North Carolina landings data not reported by water area.

Source: USDC, 1986e.

Table 63. Seven Year Average Summer Flounder Fish Otter Trawl Landings (lbs), Value (1985 $), and Price (1985 $/lb) by Market Category, 1979 - 1985

		Landings	Value	Price
Northern area	Jumbo	1,389,786	1,732,418	1.25
	Large	1,877,100	2,050,293	1.09
	Medium	1,288,286	1,103,477	.86
	Small	554,457	327,667	.59
	Unclassified	1,560,457	1,680,870	1.08
	Total	6,670,086	6,894,725	1.03
Middle area	Jumbo	357,300	441,830	1.24
	Large	1,544,757	1,548,073	1.00
	Medium	1,874,257	1,515,958	.81
	Small	1,699,329	789,616	.46
	Unclassified	1,211,743	1,068,299	.88
	Total	6,687,386	5,363,776	.80
Combined Northern & Middle areas	Jumbo	1,747,086	2,174,248	1.24
	Large	3,421,857	3,598,366	1.05
	Medium	3,162,543	2,619,435	.83
	Small	2,253,786	1,117,283	.50
	Unclassified	2,772,200	2,749,169	.99
	Total	13,357,472	12,258,501	.92
Southern area	Jumbo	380,335	429,024	1.13
	Large	2,548,897	2,070,838	.81
	Medium	2,973,931	1,977,829	.67
	Small	3,050,688	1,224,137	.40
	Unclassified	7,294,696	5,144,921	.71
	Total	16,248,547	10,846,749	.67

Source: USDC, 1986e.

Table 64. Summer Flounder Mesh Selectivity Studies

			ICES Guage Mesh Size Retention					Selection	Total	< 14"		> = 14"		Fluke	
Size	Study	Month	Ave	Dry	Wet	L50	SD	Factor	Fluke	Number	%	Number	%	lbs	Bycatch
1.5"	NC (a)	Dec	-	-	-	-	-	-	188	85	45.2	103	54.8	272	515 lbs
	NC (b)	Dec	-	-	-	-	-	-	192	90	46.9	102	53.1	282	345 lbs
	NC (c)	Jan	-	-	-	-	-	-	93	64	68.8	29	31.2	111	1,833 lbs
	NC (d)	Jan	-	-	-	-	-	-	211	180	85.3	31	14.7	127	326 lbs
	NC (e)	Dec-Feb	-	-	-	-	-	-	174	82	47.1	92	52.9	254	4,979 lbs
	NC (f)	Jan-Feb	-	-	-	-	-	-	154	82	53.2	72	46.8	226	2,407 lbs
	NC (g)	Dec,Feb	-	-	-	-	-	-	182	85	46.7	97	53.3	269	891 lbs
	NC (h)	Nov-Dec	-	-	-	-	-	-	367	251	68.4	116	31.6	-	-
2.25"	LI S (a)	May	2.3	-	-	-	-	-	1,983	1,092	55.1	891	44.9	2,110	10,989 lbs
2.5"	LI M (a)	May	2.6	-	-	-	-	-	170	29	17.1	141	82.9	262	6,042 lbs
	LI M (b)	May	2.5	-	-	-	-	-	1,492	482	32.3	1,010	67.7	1,992	25,301 lbs
	LI S (b)	May	2.5	-	-	-	-	-	2,950	1,485	50.3	1,465	49.7	3,231	13,283 lbs
3.0"	NJ N	Sept	-	2.5	2.6	-	-	-	274	185	67.5	89	32.5	-	-
	NJ C	Sept	-	3.2	3.3	-	-	-	490	370	75.5	120	24.5	-	-
	NJ S	Sept	-	2.7	2.8	-	-	-	186	99	53.2	87	46.8	-	-
	NJ All	Sept	-	-	-	-	-	-	950	654	68.8	296	31.2	-	9,945 fish
	NC (a)	Dec	2.9	2.8	-	-	-	-	304	97	31.9	207	68.1	529	1,065 lbs
3.5"	NC (b)	Dec	3.8	3.8	-	-	-	-	292	164	56.2	128	43.8	337	349 lbs
4.0"	NC (c)	Jan	4.5	4.7	-	11.0	0.51	-	192	104	54.2	88	45.8	297	2,783 lbs
4.5"	NC (d)	Jan	5.0	5.2	-	12.8	0.35	-	107	52	48.6	55	51.4	138	303 lbs
	NC (h)	Nov-Dec	4.4	-	-	-	-	-	306	157	51.3	149	48.7	-	-
5.0"	NJ N	Sept	-	4.4	4.4	-	-	-	157	97	61.8	60	38.2	-	-
	NJ C	Sept	-	4.6	4.7	-	-	-	325	195	60.0	130	40.0	-	-
	NJ S	Sept	-	4.4	4.4	-	-	-	153	92	60.1	61	39.9	-	-
	NJ All	Sept	-	-	-	-	-	-	635	384	60.5	251	39.5	-	1,716 fish
	NC (e)	Dec-Feb	5.2	5.2	-	12.6	3.41	-	133	36	27.1	97	72.9	199	630 lbs
5.5"	NJ N	Sept	-	5.0	4.8	-	-	-	107	36	33.6	71	66.4	-	-
	NJ C	Sept	-	5.2	5.7	-	-	-	223	110	49.3	113	50.7	-	-
	NJ S	Sept	-	5.2	5.0	-	-	-	129	57	44.2	72	55.8	-	-
	NJ All	Sept	-	-	-	-	-	-	459	203	44.2	256	55.8	-	2,265 fish
	LI M (a)	May	5.8	-	-	14.7	0.24	2.52	136	6	4.4	130	95.6	223	2,741 lbs
	LI M (b)	May	5.7	-	-	14.9	0.10	2.62	671	53	7.9	618	92.1	1,125	6,045 lbs
	LI S (a)	May	5.6	-	-	12.8	0.08	2.29	1,872	760	40.6	1,112	59.4	2,255	8,823 lbs
	LI S (b)	May	5.6	-	-	13.6	0.08	2.45	1,542	460	29.8	1,082	70.2	1,974	7,011 lbs
	NC (f)	Jan-Feb	5.7	5.9	-	14.3	2.52	-	89	9	10.1	80	89.9	178	658 lbs
6.0"	NC (g)	Dec,Feb	6.3	6.2	-	16.9	2.40	-	96	15	15.6	81	84.4	235	400 lbs

Note: All letter footnotes after the studies are used to match control and experimental sets.

Sources: Anderson, *et al.*, 1983; Gillikin, *et al.*, 1981; Gillikin, 1982; and New Jersey, 1985.

Table 65. Summer Flounder Retention Level by Mesh Size

Retention Percent	Mesh Size 4.5″	5.0″	5.5″	Mesh Selection Factors*	Adjusted R^2	Durban-Watson
10%	8.4	9.3	10.2	1.86	0.27	1.95
25%	9.8	10.9	12.0	2.18	0.45	2.49
50%	11.1	12.3	13.5	2.46	0.88	2.22
75%	11.6	12.9	14.2	2.58	0.81	2.49
90%	11.8	13.2	14.5	2.63	0.81	2.13

Note: The mesh selection factor is the calculated ratio between the retention percent and the mesh size (i.e., 2.46 is 13.5″ divided by 5.5″). Overall mesh selection factors were developed by pooling all appropriate data from the previous studies and was derived as the best estimate of the slope, through linear regression techniques.

* All R^2 values were significant.

Source: Pooling of all data from Anderson *et al.*, 1983; Gillikin *et al.*, 1981; Gillikin, 1982; and New Jersey, 1985.

Table 66. Percentage of Number of Fish and Pounds and Weight per Average Fish Based on Various Mesh Studies

The unweighted average percent number and weight of fish are shown for each study.

The number of fish used for each study is based on the experimental tows and their respective controls.

The weight of fish for each study is based on the total number of fish actually caught and their expected weight (Wilk *et al.*, 1978).

Northern Area Mesh Studies, 5.5" Alternatives (Anderson et al., 1983)

Only the Shinnecock portion of the study is used for this analysis; the Montauk portion was incomplete.

The number of fish is the actual number recorded from the respective control and experimental tows.

	Control			5.6" Experimental		
	% fish	% lbs	lb/fish	% fish	% lbs	lb/fish
< 11"	.8	0.6	.41	.3	.1	.34
11" - 12"	2.4	2.6	.55	.2	.1	.56
11" - 13"	15.6	18.5	.70	4.3	2.4	.74
11" - 14"	41.7	37.2	.82	24.8	16.3	.88
13" - 14"	26.1	18.7	.90	20.5	13.9	.91
14" - 16"	39.4	39.9	1.22	48.4	44.6	1.23
16" - 18"	14.7	15.4	1.74	22.4	29.5	1.76
> 18"	3.4	6.9	2.99	4.1	9.5	3.08
Total	4,933	5,837.4	1.18	3,414	4,558.0	1.34

Middle Area Mesh Study, 5.5" Alternatives (New Jersey, 1985)

All three control sets of tows are averaged for the control portion.

The only set of tows used for this analysis are from the central area (Table 64, NJC).

	Control			5.7" Experimental		
	% fish	% lbs	lb/fish	% fish	% lbs	lb/fish
< 11"	11.2	3.5	.33	3.8	.8	.29
11" - 12"	3.3	1.9	.62	1.1	.5	.57
11" - 13"	21.8	15.8	.77	10.4	6.2	.79
11" - 14"	47.9	39.8	.88	36.6	26.3	.94
13" - 14"	26.1	24.0	.97	26.2	20.1	1.00
14" - 16"	30.9	37.6	1.29	40.9	41.1	1.32
16" - 18"	8.3	14.9	1.90	13.4	19.7	1.93
> 18"	1.7	4.2	2.62	5.3	12.1	3.00
Total	490	518.5	1.06	223	292.6	1.31

Table 66 (continued)

Northern Area Mesh Studies, 4.5" and 5.0" Alternatives (Anderson *et al.*, 1983, New Jersey, 1985)

The control is an unweighted average of the percentages and weights per fish from the Anderson and New Jersey controls.
The number of fish for the experimental and control tows are from the applicable New Jersey tows.

	Control for 4.5"			4.5" Experimental			Control for 5.0"			5.0" Experimental		
	% fish	% lbs	lb/fish	% fish	% lbs	lb/fish	% fish	% lbs	lb/fish	% fish	% lbs	lb/fish
< 11"	6.0	2.0	.39	1.8	.5	.30	6.0	2.0	.39	0	0	0
11" - 12"	2.8	2.2	.62	1.5	.7	.59	2.8	2.2	.62	1.7	.8	.63
11" - 13"	18.7	17.1	.77	16.5	10.6	.78	18.7	17.1	.77	11.0	6.1	.77
11" - 14"	44.8	38.5	.87	47.6	35.5	.91	44.8	38.5	.87	30.8	20.4	.91
13" - 14"	26.2	21.4	.98	31.0	24.9	.98	26.2	21.4	.98	19.8	14.3	1.00
14" - 16"	35.2	38.8	1.25	37.6	39.9	1.29	35.2	38.8	1.25	47.5	45.4	1.31
16" - 18"	11.5	15.1	1.82	8.7	13.6	1.91	11.5	15.1	1.82	16.3	22.5	1.90
> 18"	2.6	5.6	2.80	4.3	10.5	3.00	2.6	5.6	2.80	5.4	11.7	2.95
Total	950	1,080.0	1.14	630	766.6	1.22	463	522.9	1.14	235	323.4	1.38

Southern Area Mesh Studies, All Alternatives (Gillikin *et al.*, 1981, Gillikin, 1982)

The control study is an unweighted average of all controls (Table 64, NC (a)-(h)). The number of fish used with these percentages varies from comparison to comparison depending on which controls were applicable.

The 4.5" study is the unweighted average of the two North Carolina 4.5" and 4.4" studies (Table 64, NC (c)&(h)). The number of fish from the control NC (h) was used since NC (c) was considered anomalous in terms of number of fish (twice as many in the experimental as in the control tows).

The 5.0" mesh study is an average of two studies (Table 64, NC (d)&(e)). The total number of fish for both the experimental and control is the total from both studies.

The 5.5" mesh study is an average of two studies (Table 64, NC (e)&(f)). The total number of fish for both the experimental and control is the total from both studies.

	Control			4.5" Experimental			5.0" Experimental			5.5" Experimental		
	% fish	% lbs	lb/fish	% fish	% lbs	lb/fish	% fish	% lbs	lb/fish	% fish	% lbs	lb/fish
< 11"	29.2	10.1	.32	2.5	.8	.43	6.1	1.8	.36	4.1	.7	.31
11" - 12"	5.9	3.3	.60	11.2	5.2	.62	1.2	.6	.62	.6	.2	.60
11" - 13"	16.5	11.2	.72	33.8	18.8	.73	10.5	6.3	.77	4.3	2.0	.69
11" - 14"	27.5	20.4	.82	52.6	32.5	.81	32.6	23.1	.92	14.8	8.5	.92
13" - 14"	11.0	9.2	.98	18.8	13.7	.96	22.1	16.8	.99	10.5	6.5	1.02
14" - 16"	21.3	25.0	1.34	23.8	24.1	1.33	38.9	38.8	1.34	39.3	31.5	1.36
16" - 19.7"	18.4	32.8	2.16	16.9	27.9	2.15	19.3	27.3	1.99	35.6	44.7	2.15
> 19.7"	3.6	11.7	4.13	4.2	14.7	4.51	3.1	9.0	5.05	6.2	14.6	4.00
Experimental Total				306	400.0	1.31	240	332.1	1.38	222	376.9	1.70
Control Total				367	422.3	1.15	385	443.1	1.15	328	377.5	1.15

Sources: Anderson, *et al.* 1983; Gillikin, *et al.* 1981; Gillikin, 1982.; and New Jersey, 1985.

Table 67. Summer Flounder Landings, Catch-Landing Ratios, and Mesh Related Mortalities for Various Minimum Fish Sizes

	Minimum Fish Sizes									
	Current Landings				Post-regulation Landings		Ratios (future catch/current landings)			
	14"	13"	12"	11"	14"	13"	14"	13"	12"	11"
5.5" Mesh										
Northern Area	3,630.9	4,722.5	5,650.6	5,802.4	3,810.5	N/A	1.255	.965	.807	.786
Middle Area	294.0	418.4	490.5	500.4	213.3	N/A	.995	.699	.597	.585
Southern Area	262.4	297.1	326.9	339.4	342.2	N/A	1.436	1.269	1.153	1.110
5.0" Mesh										
Northern Area	311.1	423.0	500.9	512.4	257.4	303.7	1.040	.765	.646	.631
Southern Area	308.0	348.7	383.7	398.3	249.4	305.2	1.078	.952	.866	.834
4.5" Mesh										
Northern Area	642.6	873.7	1,034.6	1,058.4	491.4	682.3	1.193	.877	.741	.724
Southern Area	293.5	332.4	365.7	379.6	266.8	321.6	1.363	1.203	1.094	1.054

	Mesh Related Mortality							
	Current				Post-regulation			
	≤ 11"	11"-13"	13"-14"	11"-14"	≤ 11	11"-13"	13"-14"	11"-14"
5.5" Mesh								
Northern Area	39	N/A	N/A	2,057	10	N/A	N/A	847
Middle Area	55	N/A	N/A	235	8	N/A	N/A	82
Southern Area	96	N/A	N/A	90	9	N/A	N/A	33
5.0" Mesh								
Northern Area	28	86	121	207	0	26	47	73
Southern Area	112	64	42	106	15	25	53	78
4.5" Mesh								
Northern Area	57	178	249	427	11	104	195	299
Southern Area	107	61	40	101	8	103	58	161

Notes: The data presented in this table are drawn entirely from the data presented in Table 66.

The current landings data are based on what would be legally landed from the control tows (Table 66) based on existing minimum size restirctions.

The post-regulation landings are similarly based on what would be legally landed from the experimental tows (Table 66) with post-regulation legal minimum sizes.

The ratios are determined by dividing the post-regulation catch (experimental tows, Table 66) by the current landings (above).

The mesh related mortalities are determined by multipling the total number of summer flounder per set of tows (Table 66) by the appropriate number percentages (Table 66).

Table 68. Commercial Landings of Summer Flounder and All Other Species, Quantity (Lbs x 000) and Value ($ x 000), as well as Number of Vessels and Trips Affected for Various Minimum Summer Flounder Regulated Trip Thresholds, 1985

	100	500	700	800	1,000	1,500	2,000	25%	50%	60%
Summer flounder										
Quantity	19,876	19,339	19,090	18,977	18,730	18,058	17,382	18,069	16,451	15,521
Value	19,197	18,615	18,348	18,224	17,959	17,248	16,537	17,308	15,622	14,690
Total catch										
Quantity	54,748	39,872	37,280	36,034	34,289	30,401	27,452	24,342	19,855	18,158
Value	34,915	27,487	26,122	25,578	24,648	22,495	20,892	20,434	17,321	16,014
Other species										
Quantity	34,872	20,533	18,190	17,057	15,559	12,343	10,070	6,273	3,404	2,637
Value	15,718	8,872	7,774	7,354	6,689	5,247	4,355	3,126	1,699	1,324
Number of										
Vessel	610	528	507	493	474	434	413	502	463	439
Trips	9,685	7,119	6,549	6,273	5,938	5,110	4,626	5,183	3,917	3,568
Affected summer flounder										
Quantity	18,907	15,779	14,506	13,959	12,792	10,393	8,130	18,069	16,451	15,521
% lbs	90	75	69	66	61	49	39	86	78	74
Affected other species										
Quantity	33,172	16,753	13,822	12,547	10,626	7,104	4,710	6,273	3,404	2,637
% lbs	95	82	76	74	68	58	47	100	100	100

Notes: Affected summer flounder are determined to be the quantity of summer flounder which would be affected by a mesh regulation after the minimum allowance was reached. This was determined by multiplying the number of trips by the non-regulated allowance and subtracting from the total summer flounder landings in that category.

Percent of affected summer flounder quantity is the affected summer flounder quantity divided by the total summer flounder quantity landed by finfish otter trawlers in 1985 in Maine through Virginia (20,998,000 lbs).

Affected other species are determined to be the quantity of other species where was landed with the affected summer flounder, assuming a constant catch ratio throughout the trip.

Percent of affected other species is the affected other species quantity divided by the total other species quantity for that category.

Source: USDC, 1986f.

Table 69. Cetaceans and Turtles Found in Survey Area

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

Source: University of Rhode Island, 1982.

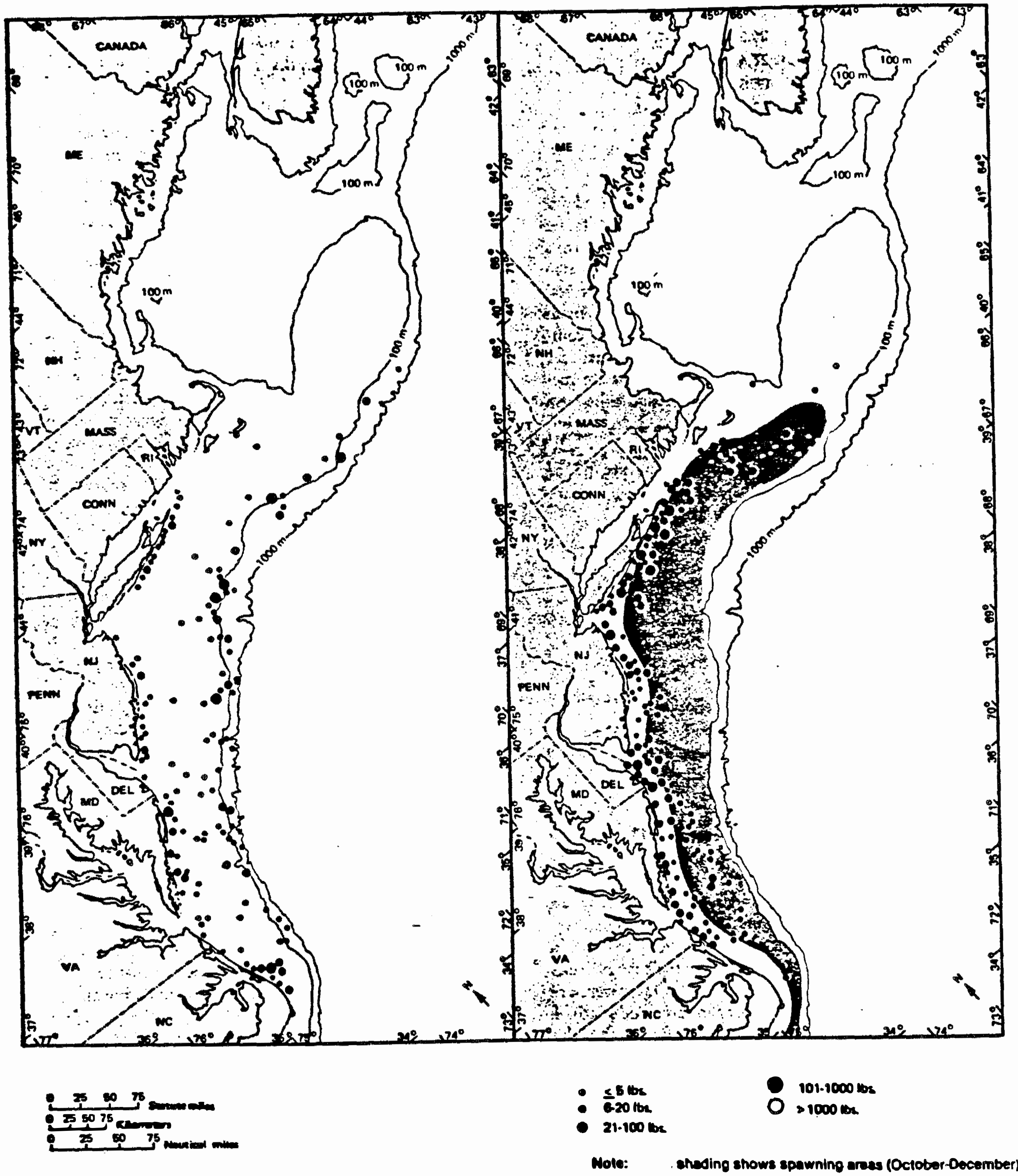


Figure 1. Seasonal Distribution of Summer Flounder Based Upon NEFC Surveys, 1973 and 1974, Spawning Areas Indicated by Shading. Left side is Spring Distribution and Right side is Autumn Distribution.
Source: Grosslein and Azarovitz, 1982.

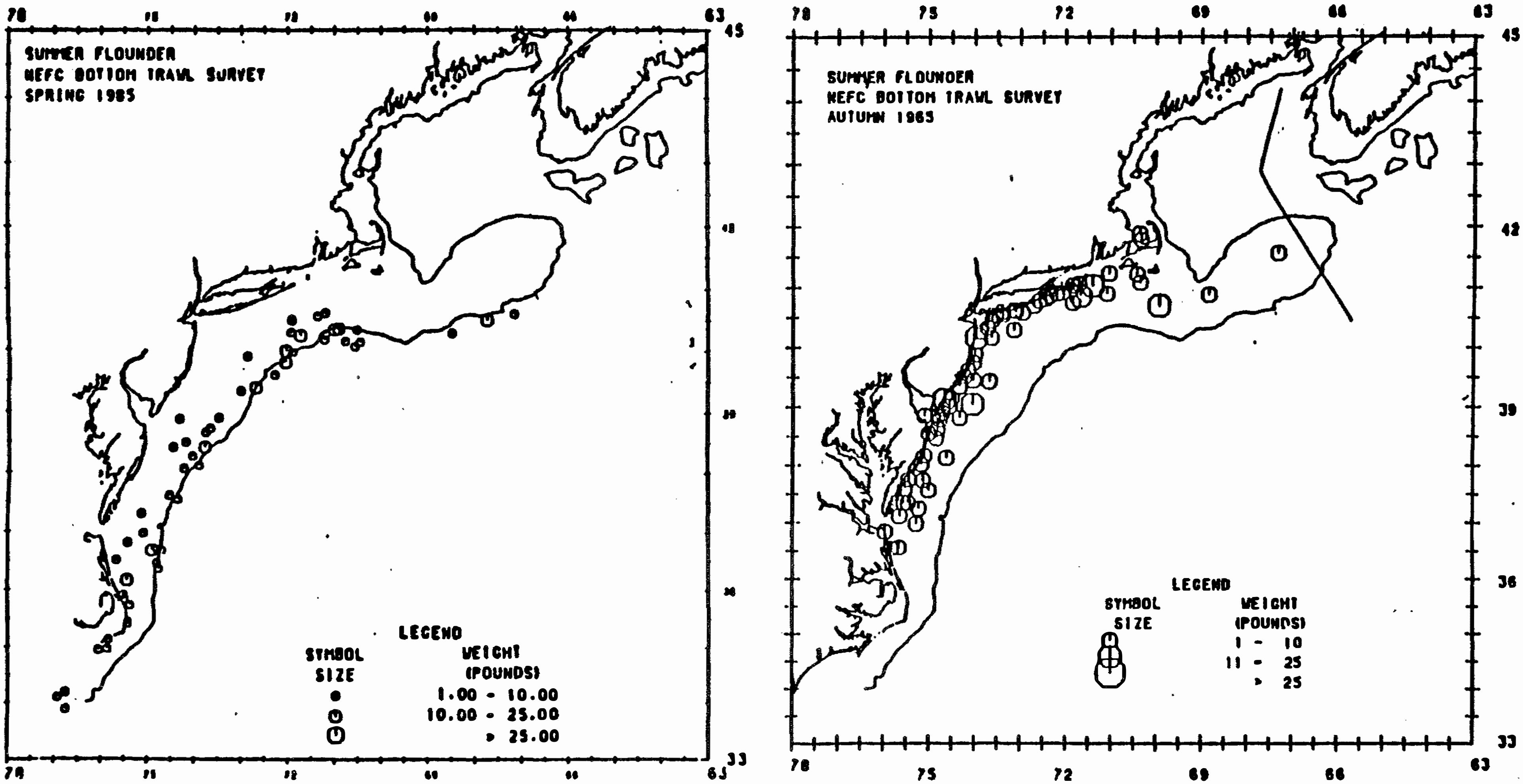


Figure 2. Summer Flounder Catch (lbs) Per Tow in NEFC Bottom Trawl Surveys, 1985.

Source: unpub. prelim. NMFS data.

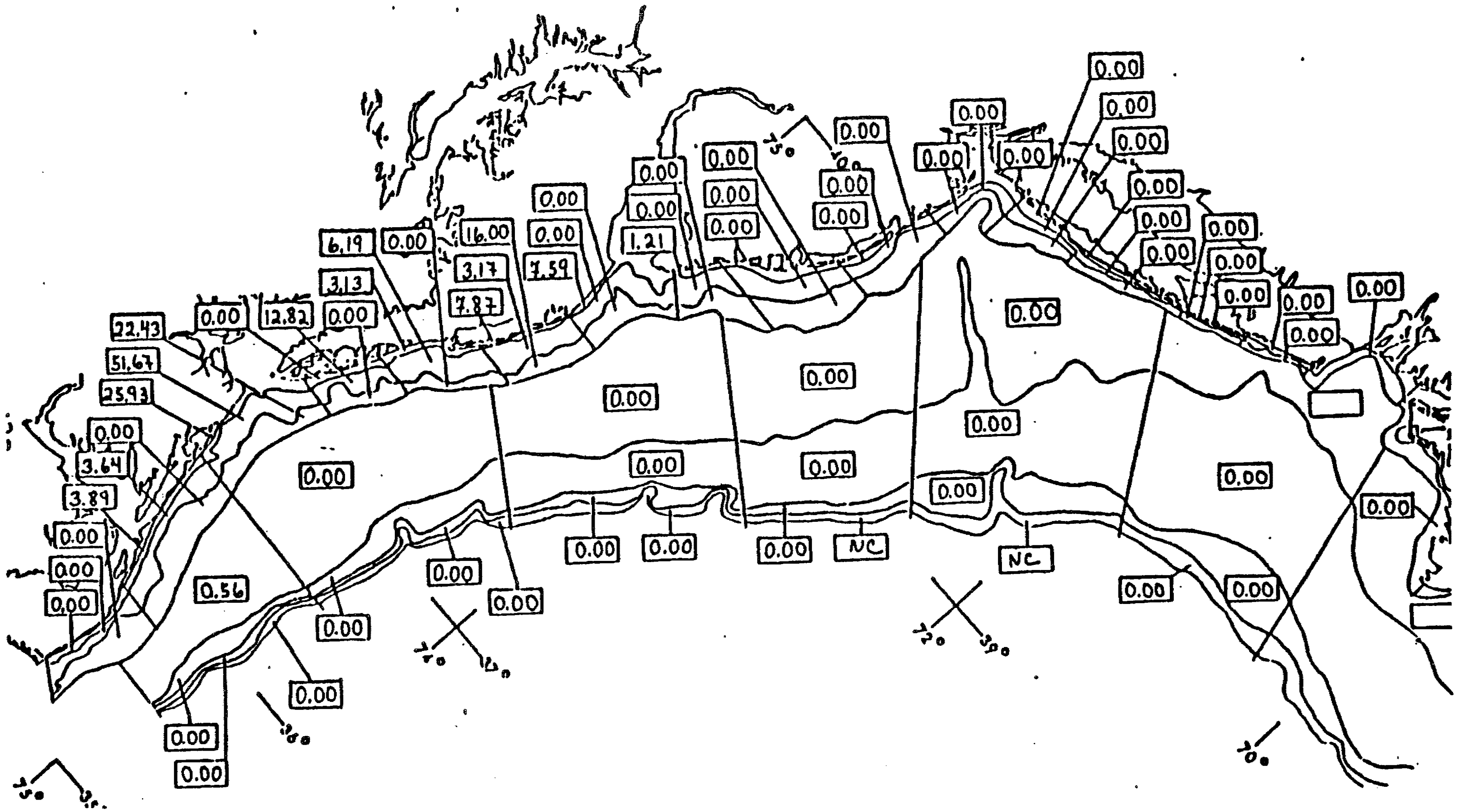


Figure 3. Percentage of Young of the Year Summer Flounder Caught by NEFC Trawl Survey During the Spring, 1968-1979.

Source: Azarovitz et al., 1980.

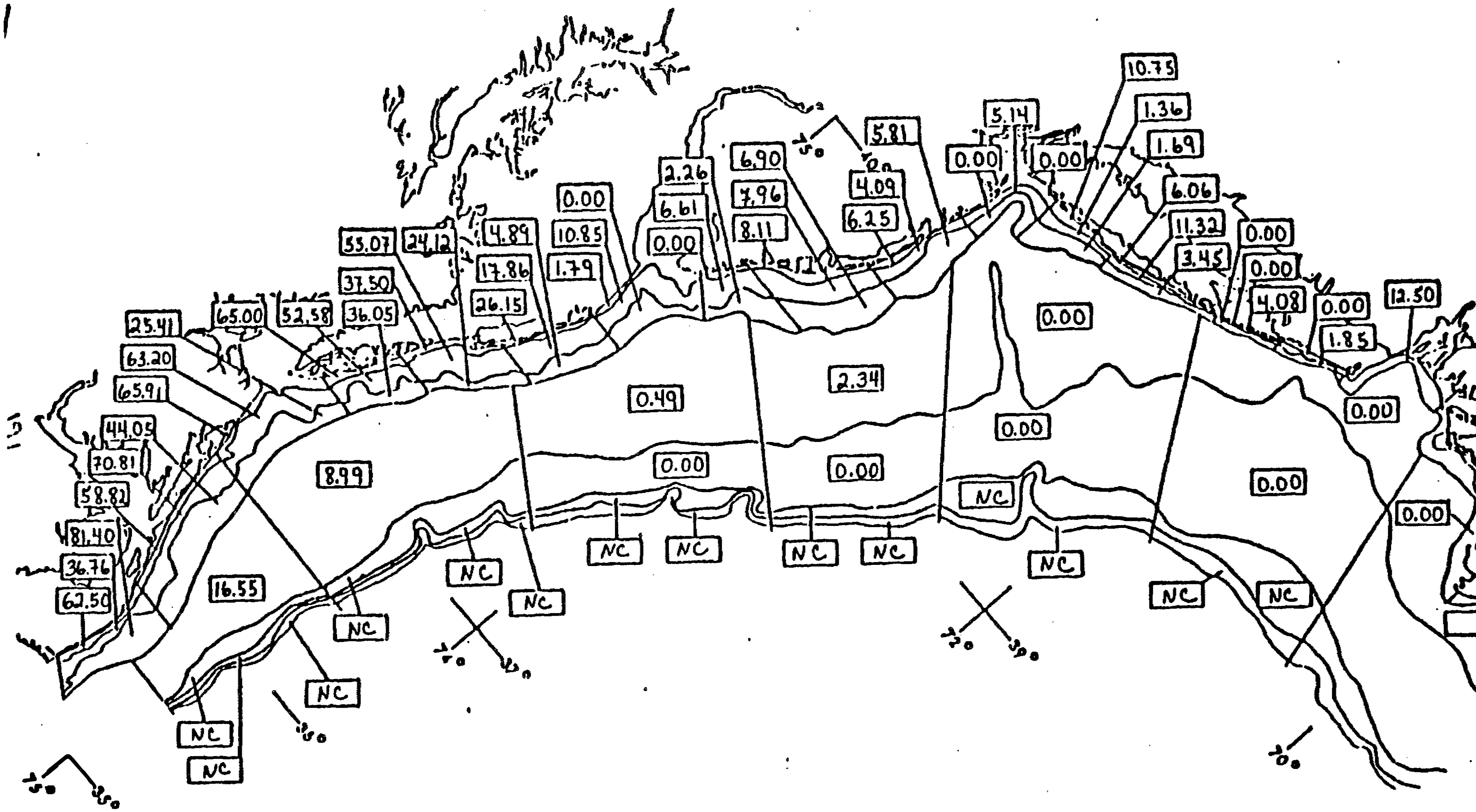


Figure 4. Percentage of Young of the Year Summer Flounder Caught by NEFC Trawl Survey During the Autumn, 1967-1979.

Source: Azarovitz et al., 1980.

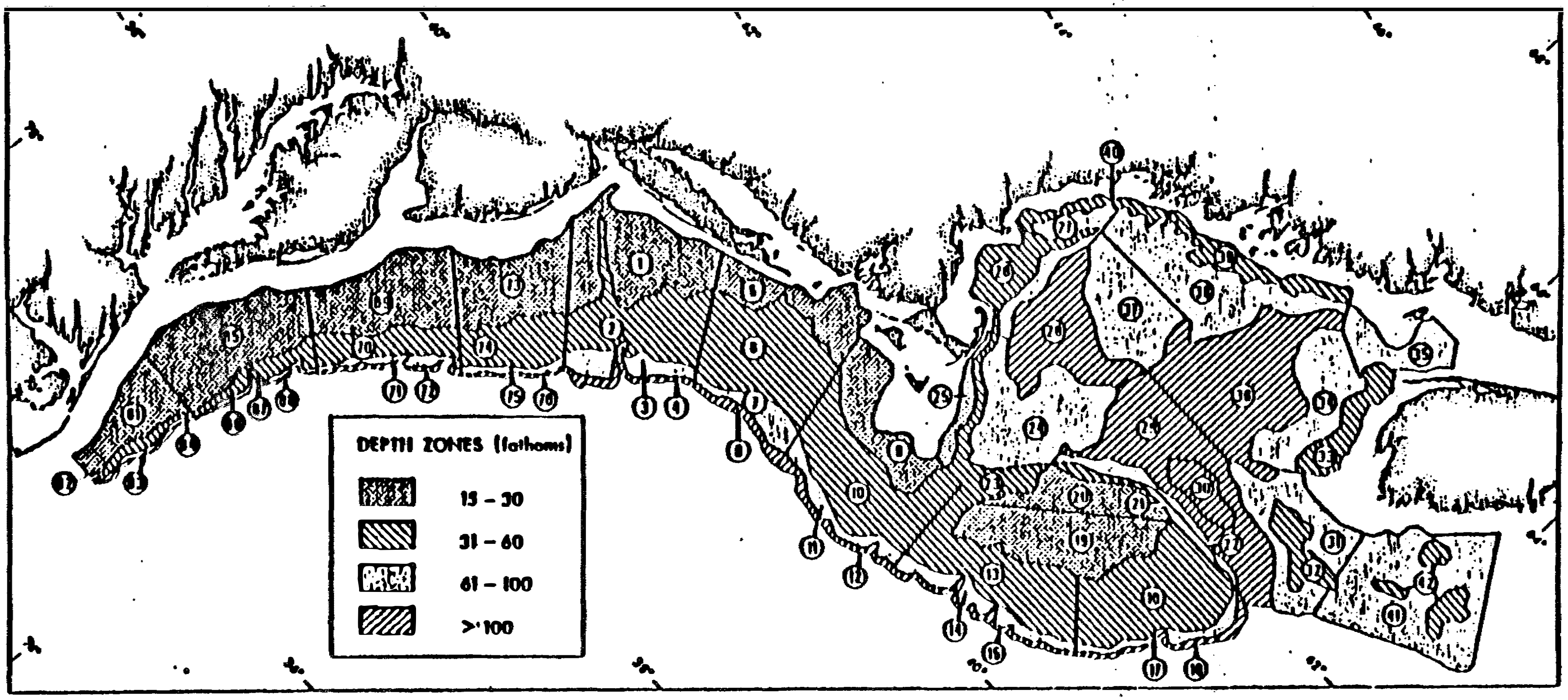


Figure 5. Northwest Atlantic NEFC Trawl Survey Strata.

Source: Clark, 1978.

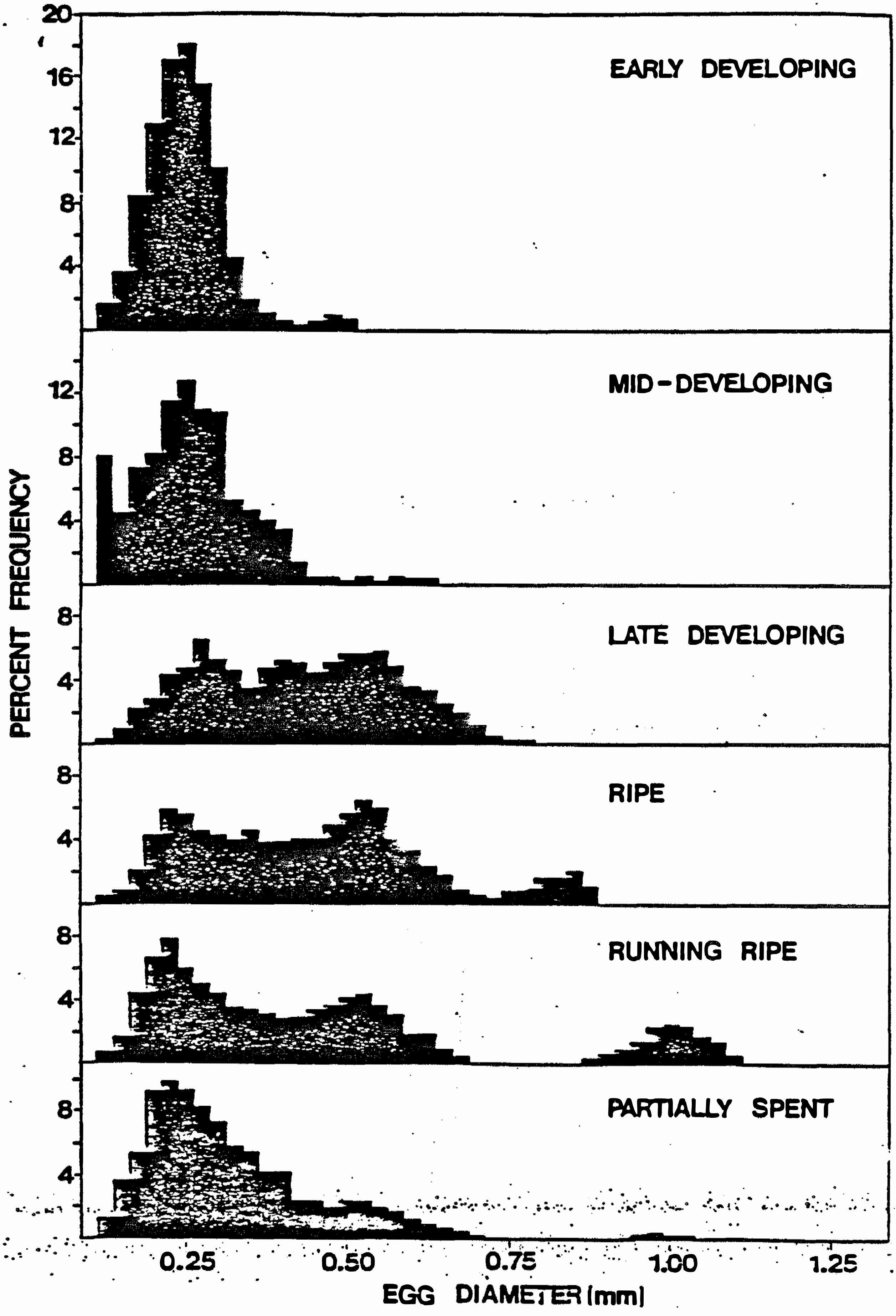
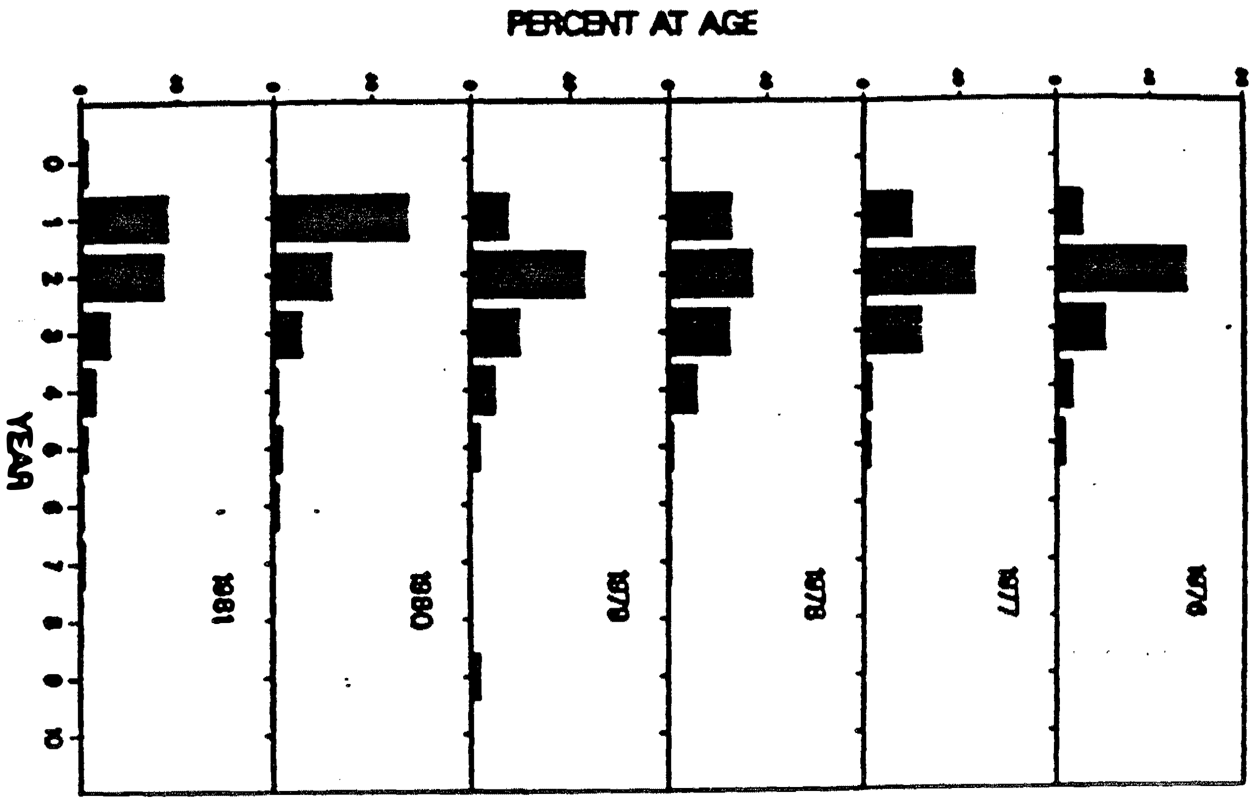


Figure 6. Egg Diameter Frequencies of Summer Flounder.

Source: Morse, 1981.



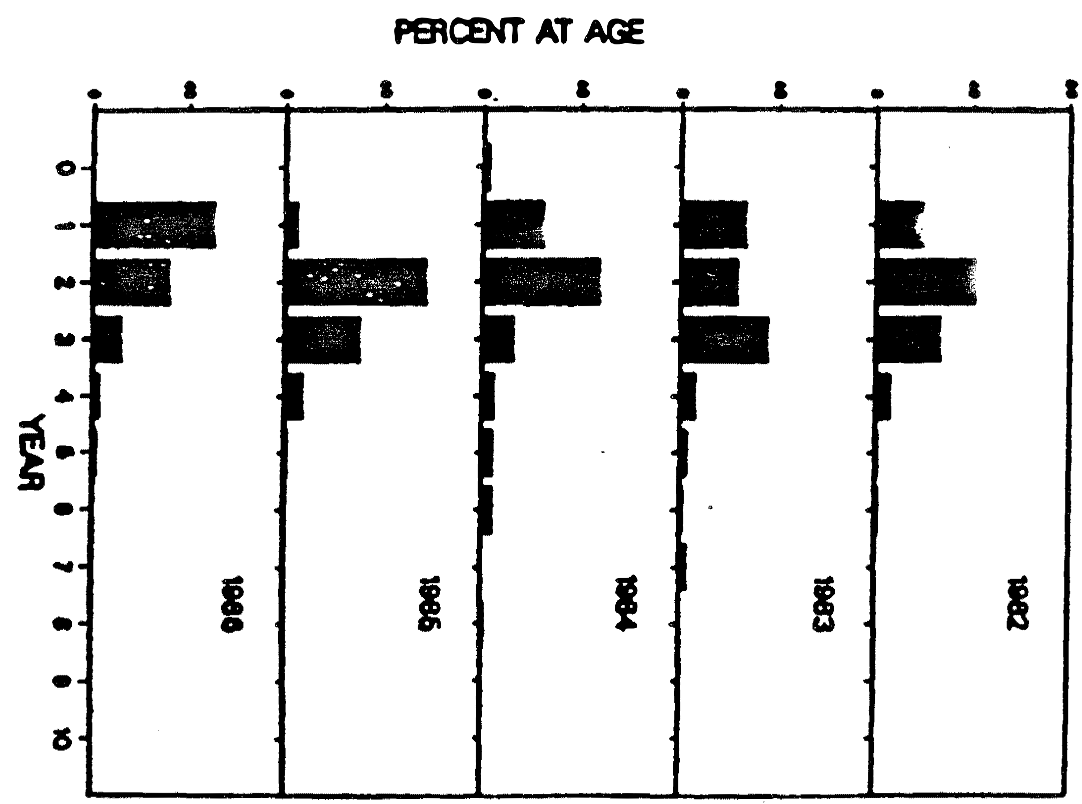


Figure 7. Summer Flounder Mean Number per Tow at Age (Expressed as Percent of Total) for NEFC Spring Offshore Surveys, 1976-1986. Source: USDC, 1986c.

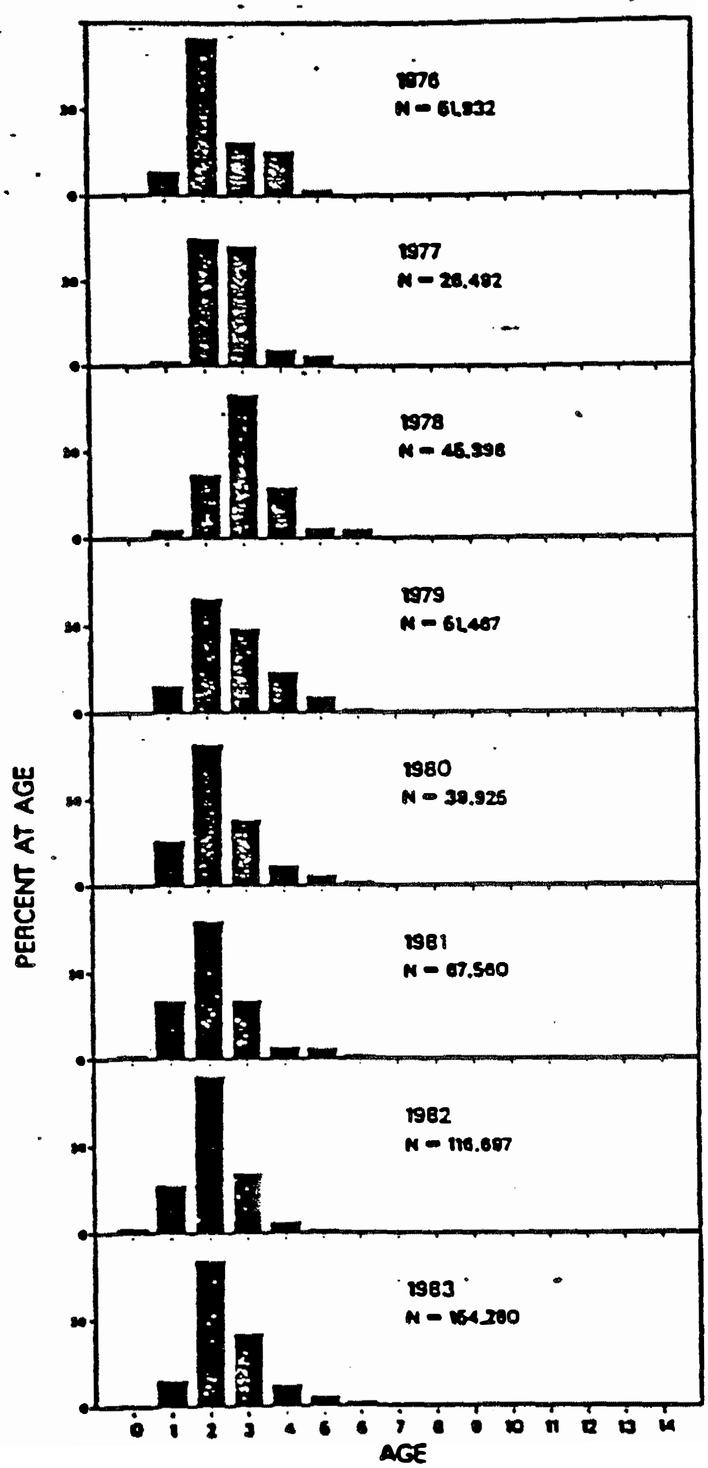


Figure 8. Percent at Age Composition of Commercial Summer Flounder Landings, 1976-1983.

Source: USDC, 1986c.

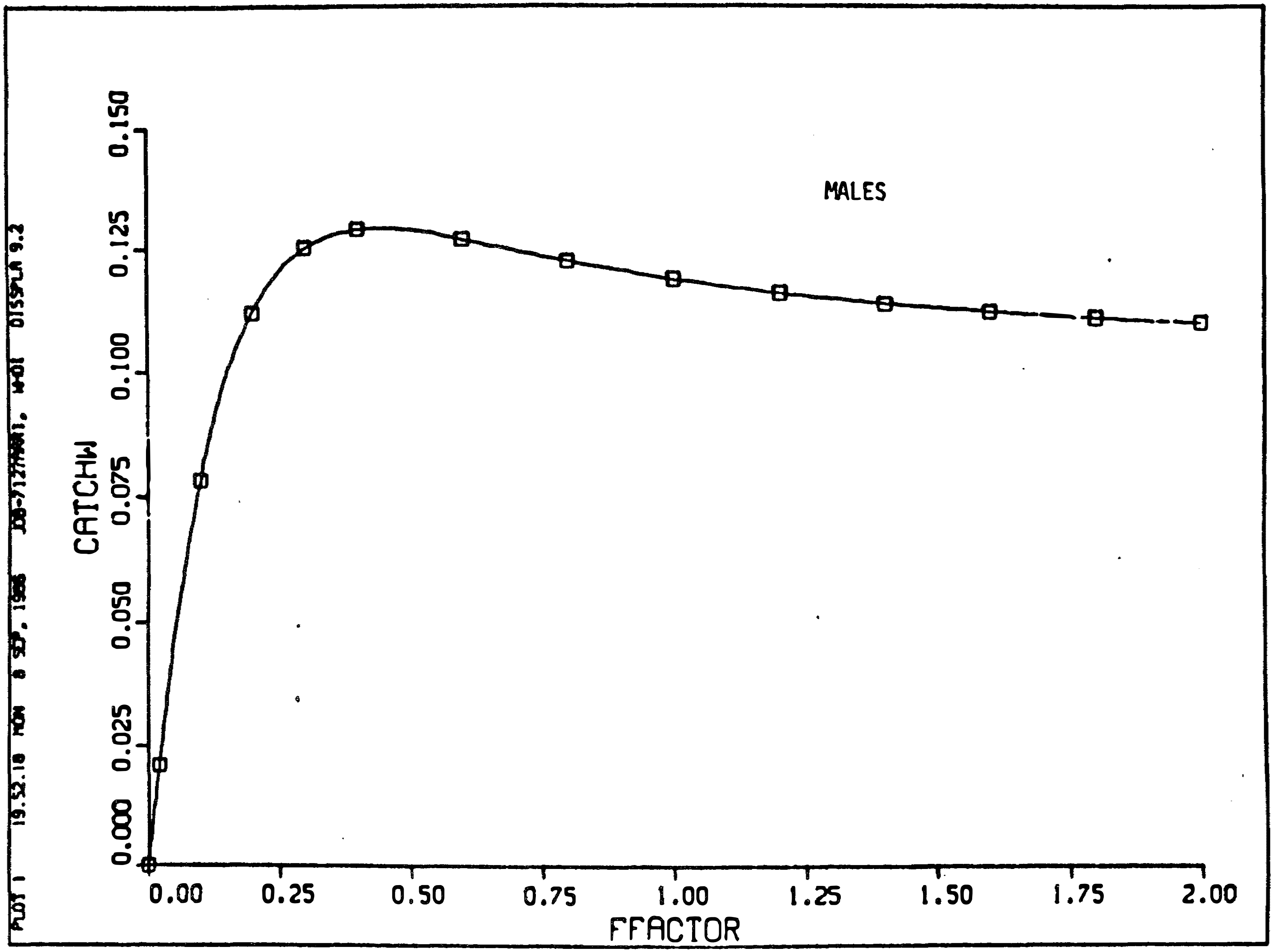


Figure 9. Yield per Recruit as a Function of Fishing Mortality (F) for Male Summer Flounder.

Source: USDC, 1986c.

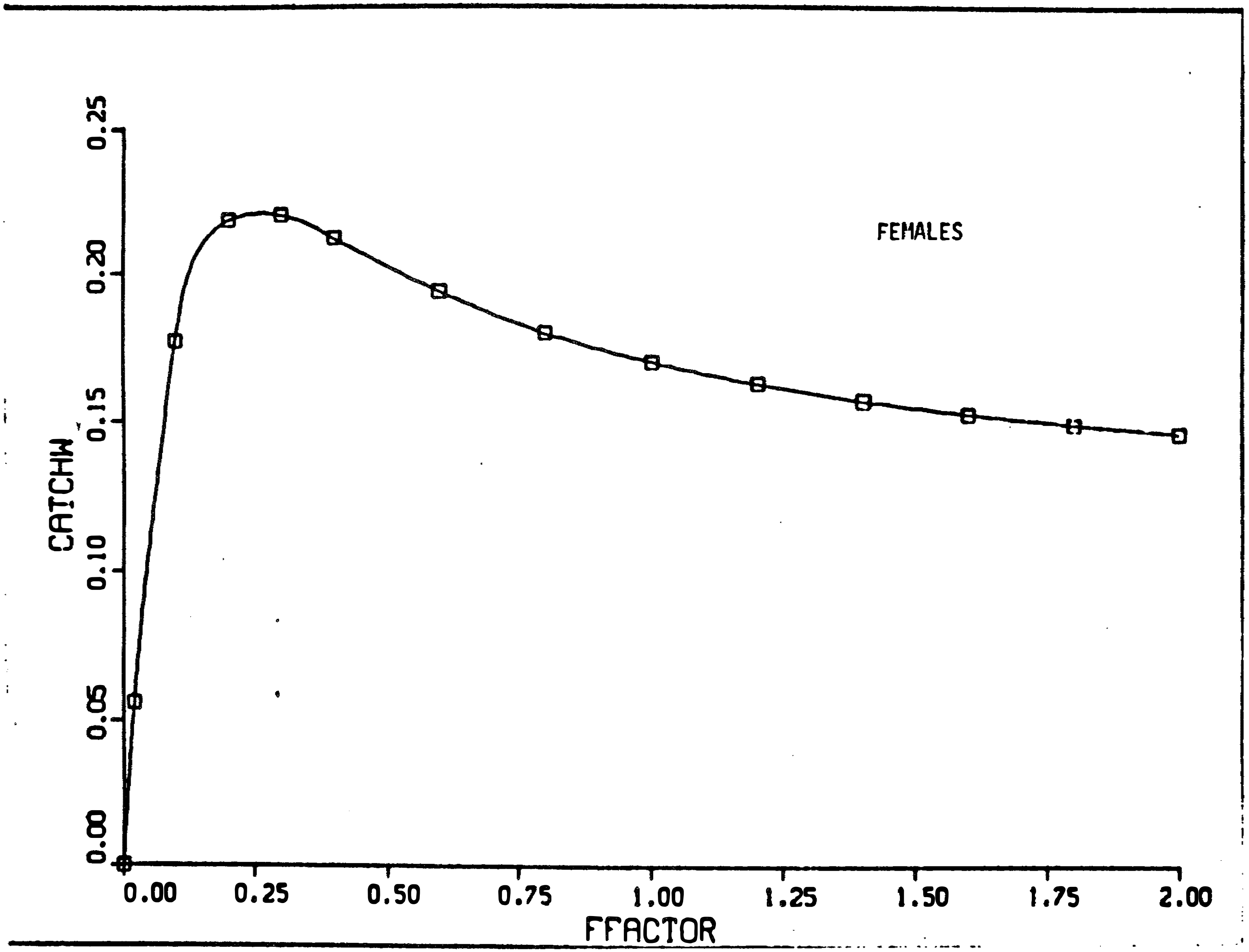


Figure 10. Yield per Recruit as a Function of Fishing Mortality (F) for Female Summer Flounder.

Source: USDC, 1986c.

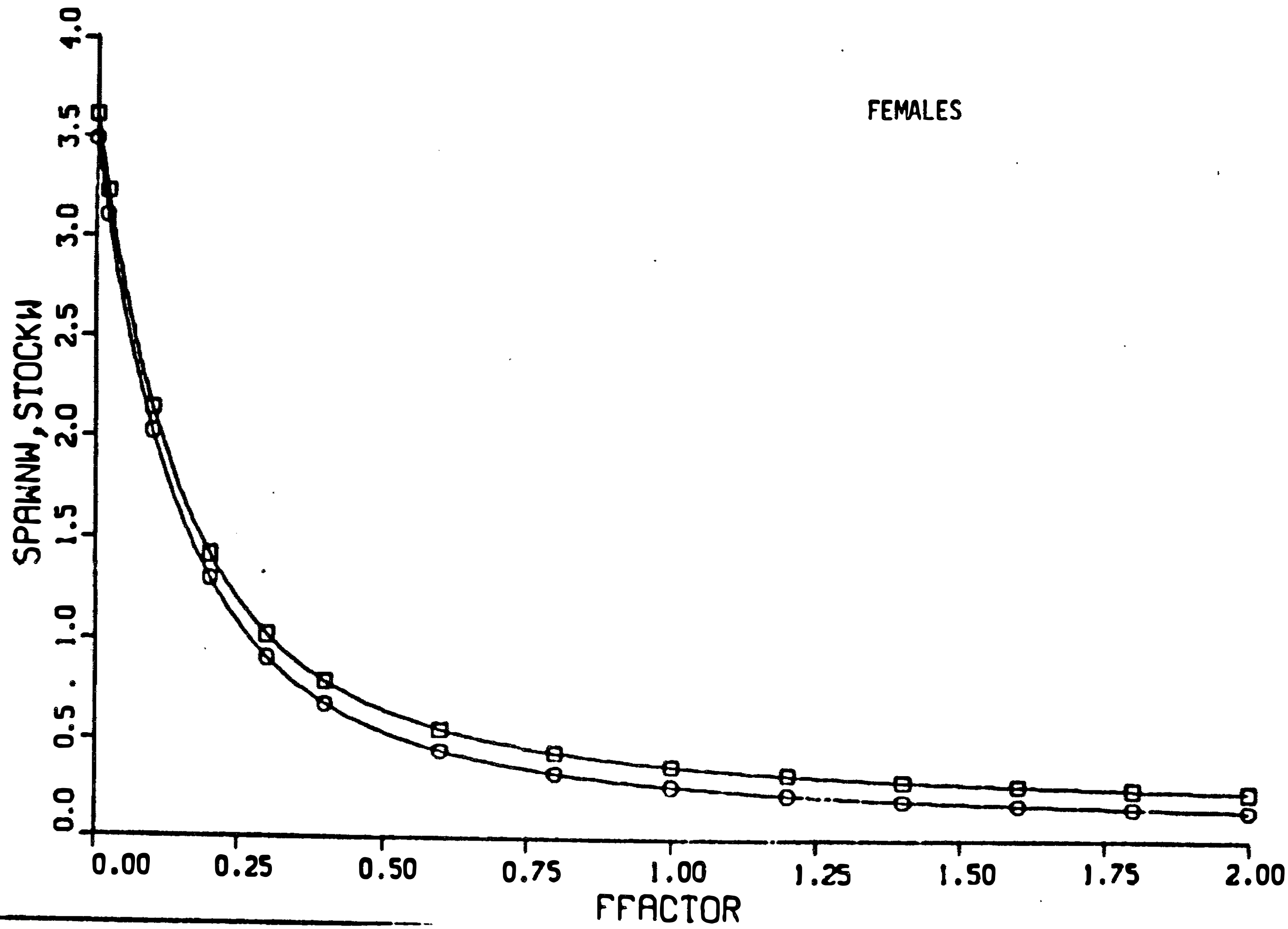


Figure 11. Spawning Stock Biomass per Recruit as a Function of Fishing Mortality (F) for Summer Flounder Females.

Source: USDC, 1986c.

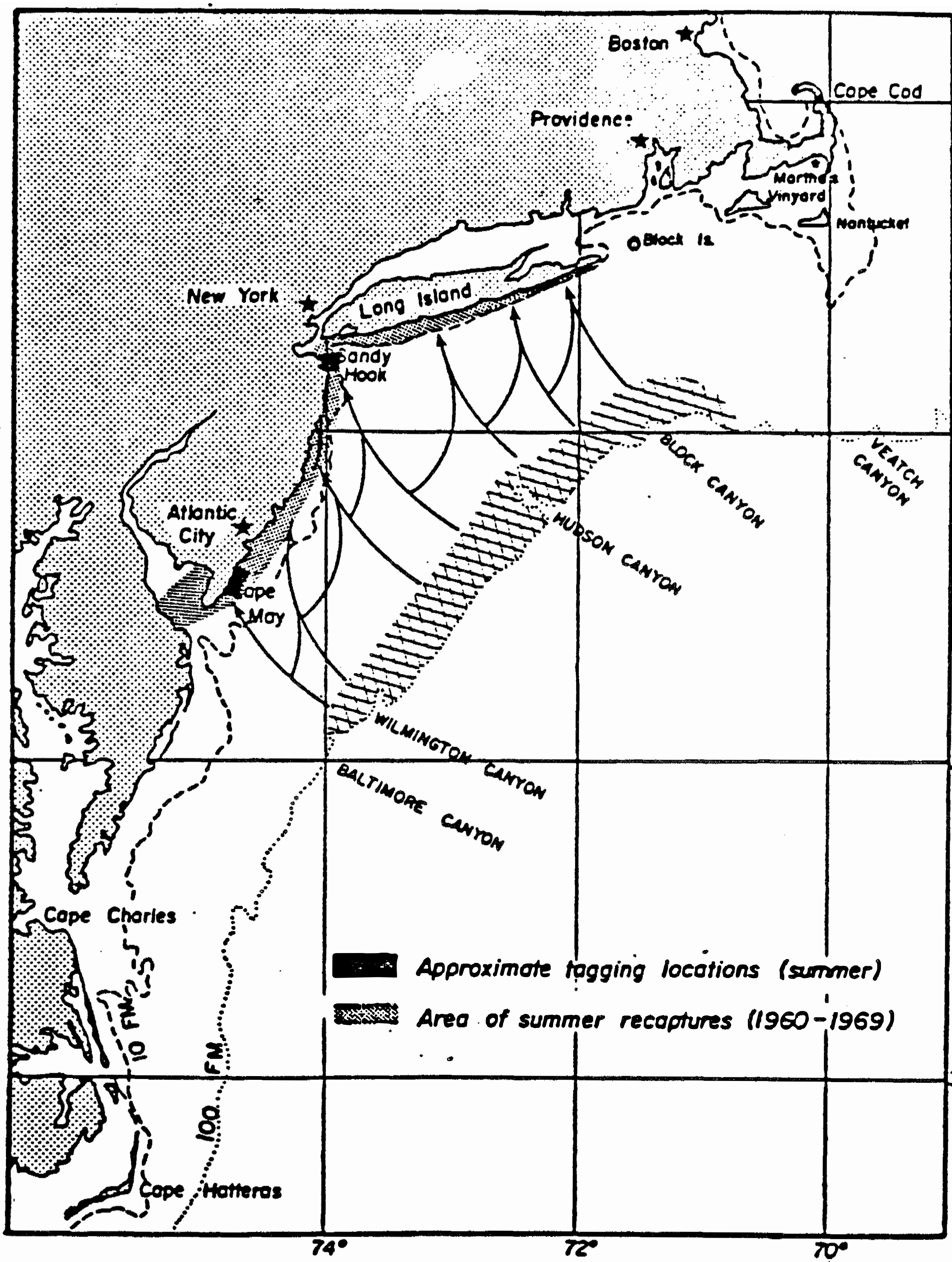


Figure 12. Summer Flounder Inshore Movements and Summer Flounder Distribution from Tagging Study by Murawski (1970).

Source: Freeman, pers. comm.

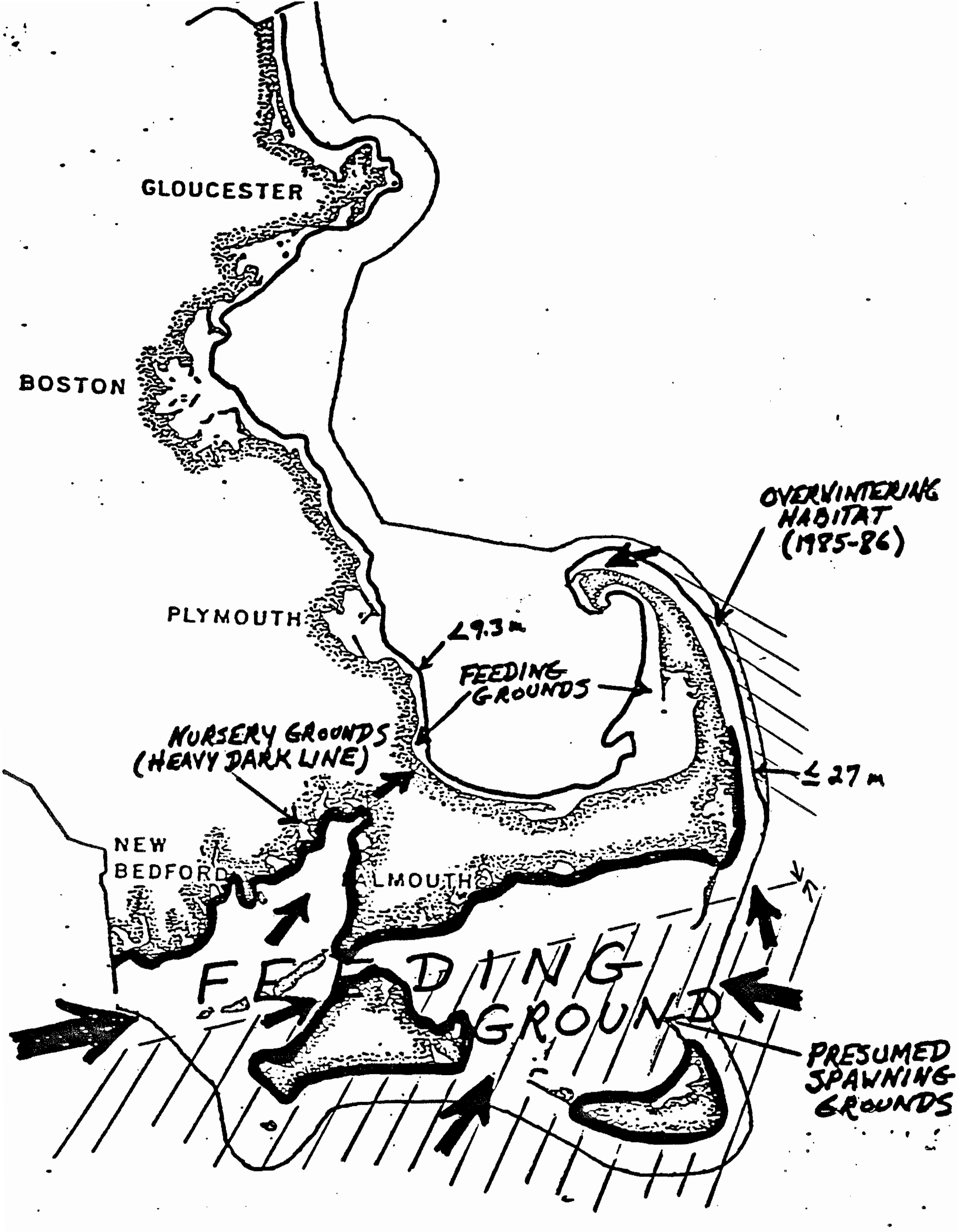


Figure 13. Summer Flounder Habitat in Massachusetts.
Source: Howe, pers. comm.

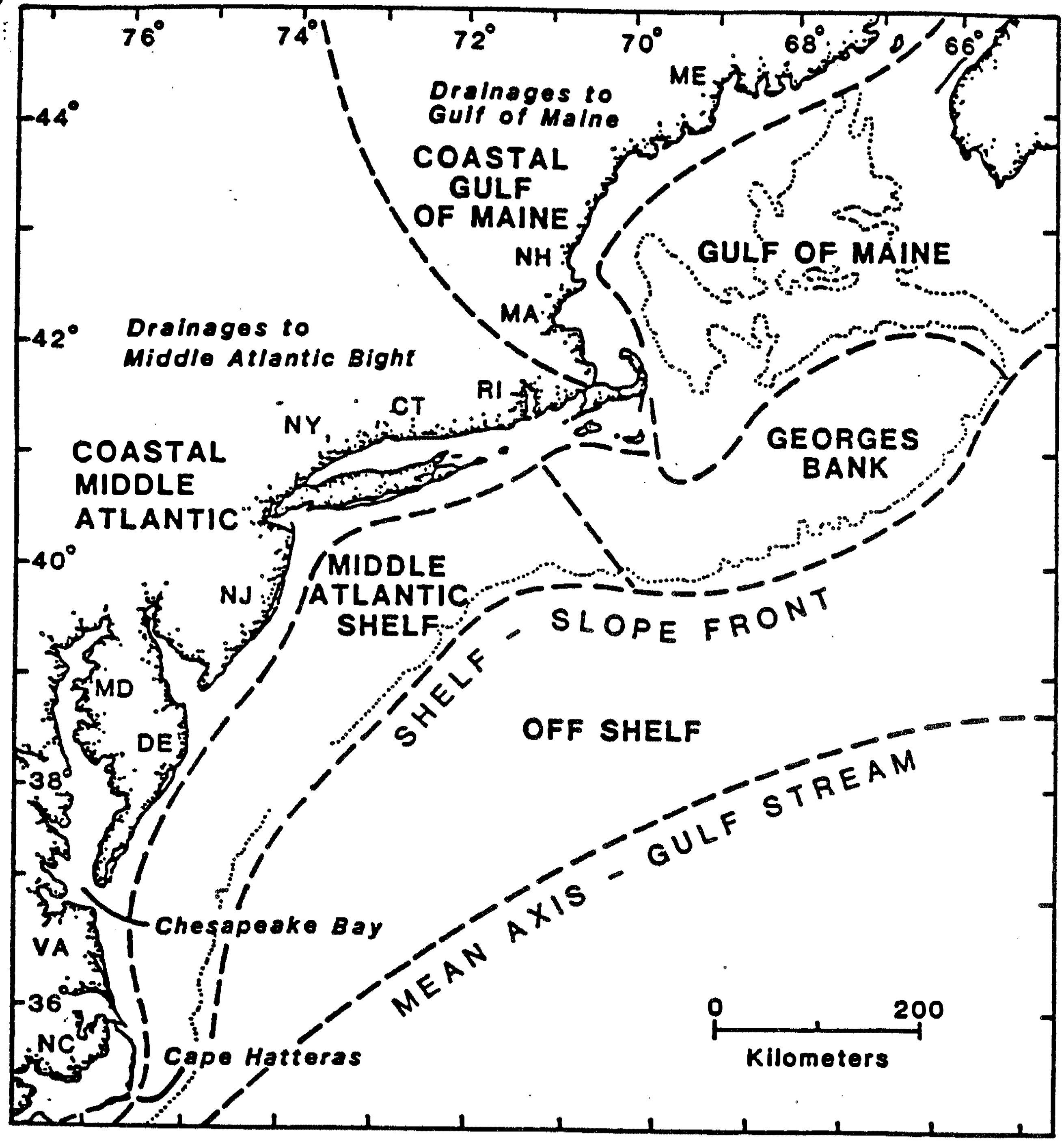


Figure 14. Northeast Regional Action Plan (RAP) Water Management Units.

Source: USDC, 1985 *b*

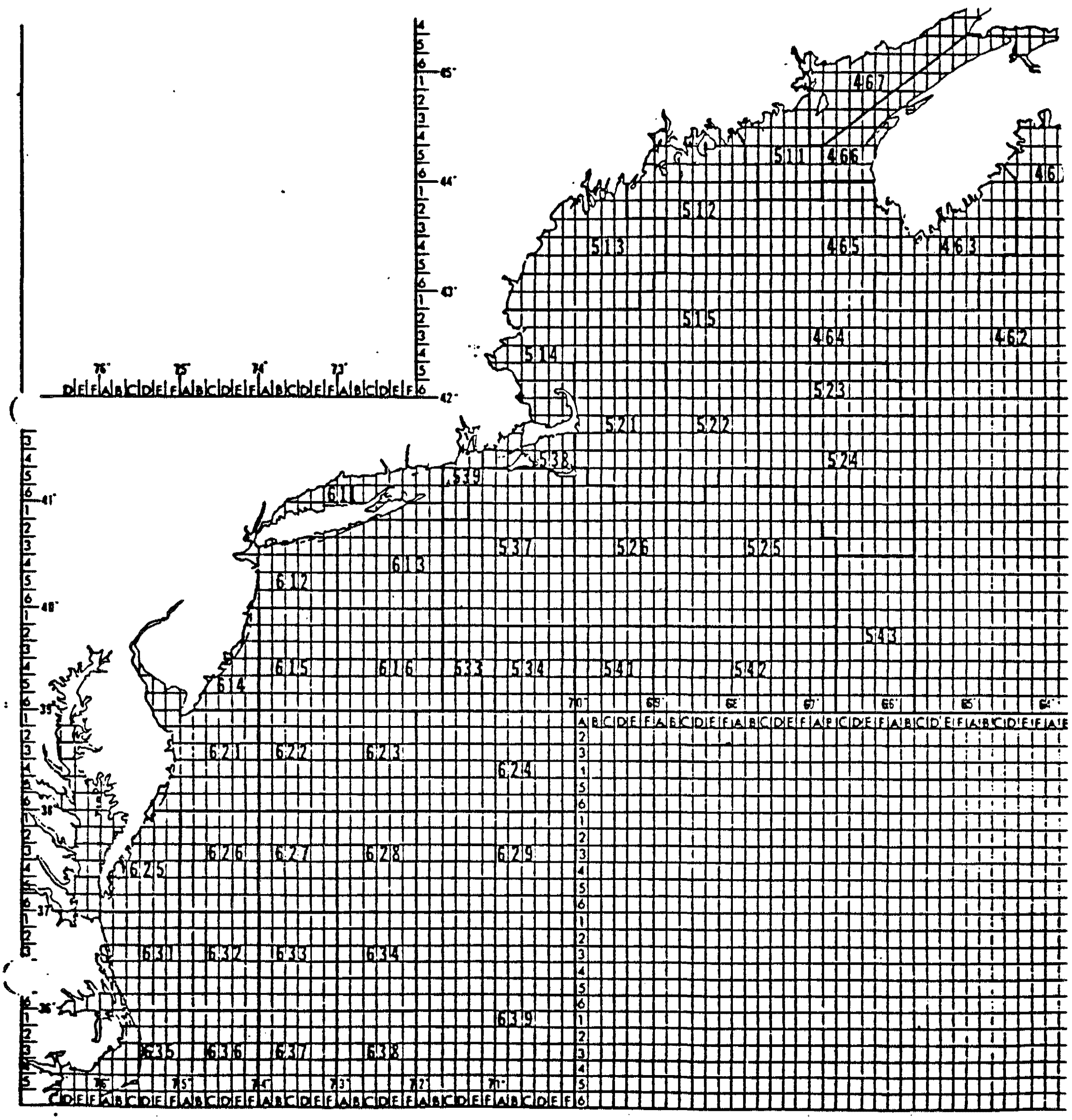


Figure 15. Northwest Atlantic Statistical Reporting Area.

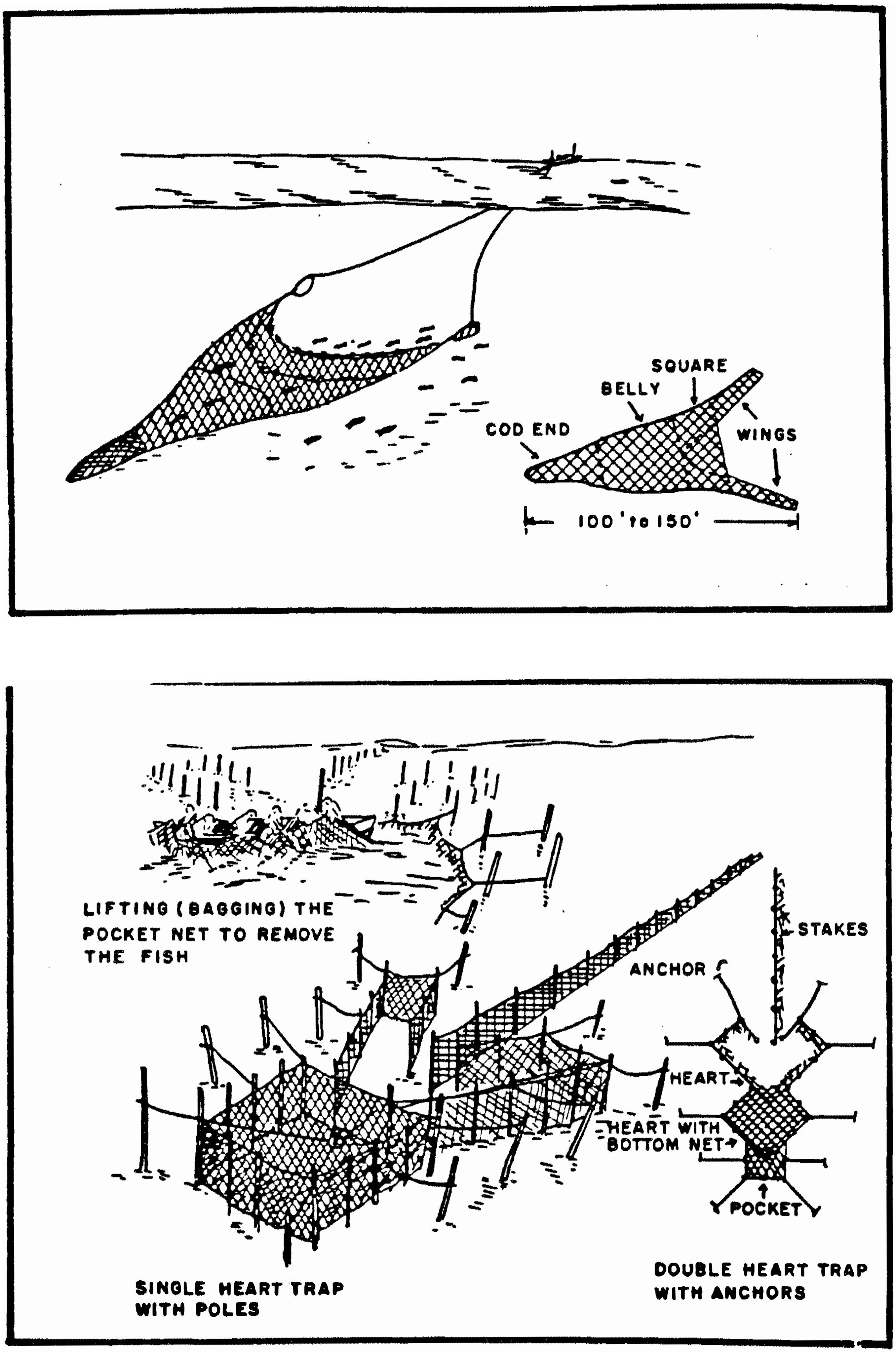


Figure 16. Illustration of Otter Trawl (top) and Pound Net (bottom) Gear; the Two Most Frequent Gear Used to Harvest Summer Flounder.

Source: Everhart et al., 1975.

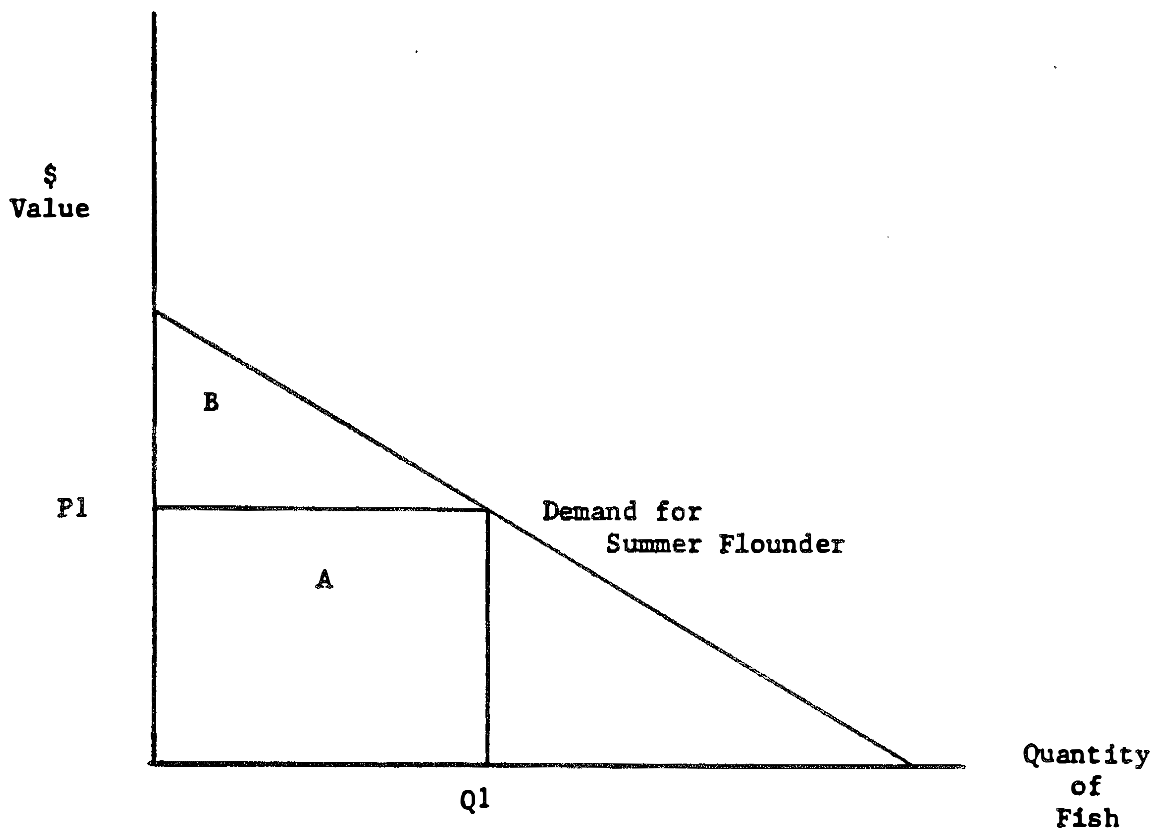


Figure 17. Theoretical Expenditures and Consumer Surplus Associated with Recreational Fishing

A = Actual expenditures incurred catch quantity Q1.
B = Consumer surplus associated with catching quantity Q1.

APPENDIX 1. ALTERNATIVES FOR THE PROPOSED FMP

This Appendix is organized in two sections. The first presents the preferred alternative from the hearing draft. This is followed by the other alternatives presented in the hearing draft. This method was used so that the numbering sequence of the alternatives was not changed, thereby maintaining a consistency between this version of the FMP and comments made during the hearing and review process. The analyses conducted in this appendix were based on the best available data. However, due to the scarcity of data it was not possible to infer that a complete or totally accurate picture of the summer flounder fishery was quantified.

1. HEARING DRAFT PREFERRED ALTERNATIVE

1.1 DESCRIPTION OF ALTERNATIVE

The Council adopted the following management measures for this FMP for purposes of obtaining public hearing comments:

It would be illegal to possess summer flounder or parts thereof less than 13" total length (TL).

It would be illegal to land summer flounder less than 14" TL north of the line connecting the points 40° 31' N latitude, 73° 58.5' W longitude and 40° 23' N latitude, 73° 43' W longitude and extending seaward to the boundary of the EEZ. There would be no minimum mesh size north of the line.

Vessels south of the line specified above would be required to use a 4.5" minimum net mesh size for trips possessing 500 lbs or more of summer flounder.

The 4.5" minimum mesh size south of the line specified above would be increased automatically to 5" two years after plan implementation.

In all cases the minimum net mesh size would apply to finfish otter trawl vessels with trips landing 500 lbs or more of summer flounder. After 500 lbs of summer flounder have been retained, only nets of the legal size would be allowed on deck and in use. In no case does the minimum mesh provision apply to nets with a mesh equal to or greater than 16" in the body and/or wings of the net.

Vessels with permits issued pursuant to this FMP would be required to fish and land pursuant to the provisions of this FMP unless the vessels land in States with larger minimum fish sizes or larger minimum net mesh sizes than those provided in the FMP, then the minimum fish sizes or minimum net mesh sizes would be required to meet the State limits.

Foreign fishermen would not be permitted to retain summer flounder since US fishermen, by definition, would be harvesting the OY.

States with minimum sizes and minimum mesh regulations larger than those in the FMP are encouraged to maintain them.

After three years of Plan implementation the Council would examine certain criteria (see below) to measure the effectiveness of the size and mesh limits relative to the FMP's objectives. If the stock continues to decline and the Council finds that the adjustment criteria have been met and if the NMFS Northeast Regional Director concurs with the Council, the minimum fish length and a minimum mesh size would be increased by the NMFS Northeast Regional Director to a minimum fish length of 14" TL and a minimum net mesh size of 5.5" and the line specified above would be eliminated from the management regime.

The adjustment mechanism would be initiated if both the primary and one of the secondary indicators specified demonstrate continued stock decreases. The following indicators have been selected because of their previous use, the longevity of the data series and the likelihood that the indicator is measuring a real feature of the summer flounder population life history characteristics (i.e., not simply a spurious artifact).

The two primary indicators are both derived from the NEFC spring offshore bottom trawl survey. Annual mortality estimates from the fisheries independent surveys will be developed for ages II to III summer flounder (as in Table 14). (Age I summer flounder are only partially recruited to the commercial and recreational fisheries.) The second primary indicator will be the CPUE from the NEFC survey (Table 5). Two secondary, fisheries dependent, indicators are proposed; a commercial CPUE index (as in Table 8) and a recreational CPUE index. In order not to initiate more stringent management measures unless such measures are truly required, both primary and one of the two secondary indicators must show that the stock is declining.

The annual mortality estimate for Ages II to III allows analyses of the heavily exploited and fully recruited age groups and produces estimates that are more current than those generated with the five year lag time that is required if all age groups are considered in catch curve analysis (Table 19). It is proposed that a trend line (regression) fitting 3 year averages be used to explore these data and test for significant decreases.

The second primary indicator is the NEFC spring survey CPUE. Since results of a recent gear comparison experiment (Fogarty, pers. comm.), which targeted on summer flounder, showed no effect of door type (section 5.2), it is believed that data since 1968 (Table 5) are all comparable. These data are to be explored and, if the recent three year average is in the lowest quartile, then this indicator is met. Both primary indicators must show the stock condition is getting worse for the secondary indicators to be tested.

Either secondary indicator, in conjunction with both primary indicators, is required for implementation of the 14" TL minimum fish size and 5.5" minimum net mesh size throughout the management unit. Both CPUE estimates will be examined with the same statistical approach as the survey CPUE (lowest quartile). The commercial CPUE analysis must focus on the 1986 estimate (since New York data were not part of the NEFC weighout system prior to 1986) and develop comparable estimates for previous years. Also, the estimate needs to be based on the regulated summer flounder commercial fishery defined comparably with the definition of regulated fishery in this FMP. The recreational CPUE will be based on all data since the initiation of the MRFSS in 1979.

Further, exact statistical application and simulation will be needed on the behavioral evaluation of these indicators. Commitments between the NMFS Northeast Regional Office staff, the NEFC staff, and Council staff to perform these evaluations have been reached. Since these modeling efforts and evaluations as proposed will require significant efforts and duration, this FMP will be completed with the best information available.

The provision that allows multiple nets on board a vessel and in use until the 500 lb of summer flounder criteria is met creates a need for significant at sea enforcement. To minimize this demand as much as possible it is necessary to establish a rigorous penalty schedule. The logic is simply that if there is a relatively low probability of detection of an offense, then the penalty for those detected must be sufficient to provide an adequate deterrent. The Council has identified a series of penalty schedule options, which are presented in Appendix II, for which the Council is seeking public comment through the hearing and review process.

No foreign fishing vessel shall conduct a fishery for or retain any summer flounder. Foreign nations catching summer flounder shall be subject to the incidental catch regulations set forth in 50 CFR 611.13, 611.14, and 611.50.

1.2. ANALYSIS OF BENEFICIAL AND ADVERSE IMPACTS OF MANAGEMENT MEASURES

1.2.1. Minimum Fish and Mesh Sizes

All EEZ trips and landings are considered in this analysis (Tables 34, 38, 62, and 63 used extensively). In order to analyze mesh regulations it is necessary to use mesh selectivity studies and to assume that they accurately represent the fishery being described. The term "catch" is used to describe all fish brought on board with the fishing gear. The term "landings" is used to describe all fish sold.

Since the mesh regulation changes from 4.5" to 5.0" after two years, it is necessary to conduct two evaluations. The reduction in mesh related mortality would contribute to higher landings in the second year of the mesh regulation. However, since the landing areas in which this increase would occur are unknown, it is difficult to evaluate in the 5.0" mesh analysis. Therefore, all increases in landings and revenue due to reduced mortality will be accounted for in the future stream of benefits, not in the cost impacts.

For the purpose of this analysis, the EEZ was divided into three areas based on different concentrations of summer flounder, different seasons of fishing, different migration patterns, and different fishing practices. While many different areas could have been delineated, these three were chosen since they can be represented by the limited number of mesh selectivity studies available. Tow times in the commercial fishery during 1985 averaged slightly less than 2 hours (Section 7). The Gillikin *et al.* (1981) and Gillikin (1982) studies used tows ranging from 0.5 to 1 hour while the New Jersey (NJ, 1985) tows varied from 1 to 2.5 hours. However, Anderson *et al.* (1983) felt that the shorter tow time would not affect mesh selectivity. Significant differences exist among the studies (Table 64) in many characteristics (e.g., mesh size, time of year, and sample size) which make direct comparisons among the studies difficult.

Despite the differences among the methodologies of the mesh selectivity studies (Table 64), overall mesh selection factors were calculated by pooling all data (Table 65). Selectivity is expressed as the proportion of fish at each length entering the trawl which are retained in the cod end. Undoubtedly, selection factors vary not only among different species, but with many other variables such as condition of fish, time of year, cod end material, twine construction, etc. However, while the individual studies were designed to be reflective of typical commercial fishing practices in those areas, the best overall coast wide estimate is developed by treating all studies equally (unweighted for sample size).

There are two basic methods for determining the selectivity of trawls. Each involves estimating the numbers of each size fish entering the net. These two are the "covered cod end method" which involved attaching a small mesh cover over the cod end and the "alternate haul method" in which size distribution of fish entering the trawl are estimated from the size comparison of the catches of trawls of smaller meshes fished at approximately the same time and place. All these studies used the alternative haul method.

Selectivity, the relationship between the fish length and the proportion retained, was expressed graphically in the form of length selection curves. These curves were developed for each mesh in each study by smoothing the adjusted proportion retained at length using three point moving averages (Anderson, *et al.*, 1983). Linear regression was used to calculate the various retention percentages (10, 25, 50, 75, and 90%) considered for the three mesh size nets evaluated (Table 65).

The 50% retention length, or the length at which half the fish are retained, is the measure traditionally expressed. The mesh selection factor was calculated as the ratio between the retention percent size and the mesh size (Anderson, *et al.*, 1983). The pooled data had a significant F value (P = .05) and an adjusted R-squared value of 0.88 (Table 65).

The 50% retention length for a 4.5" mesh net means that average mesh net will retain 50% of the fish that are 11.1" TL. Conversely, 50% of the 11.1" TL summer flounder encountered by a 4.5" average mesh net will escape. An average 5.0" mesh net will retain half of the 12.3" TL summer flounder encountered. One half of the 13.5" summer flounder encountered by an average 5.5" mesh net will escape. Of course, more escapement will occur for smaller size fish, whereas more retention occurs for larger fish. These pooled results correspond very well to the individual studies where the 50% retention length was calculated (Table 64).

1.2.1.1. Northern area

The northern area for the purposes of this analysis is considered to be that area north of the dividing line (see 9.1.2.3.). This area includes NMFS water areas 511 through 611, 57% of area 612, 100% of area 613, and 45% of area 616 (Figure 15). All summer flounder taken north of this line are required to be a minimum of 14" but vessels landing them are not subject to mesh regulations attributable to this FMP.

When splitting a NMFS water area it is not possible to determine what actual portion of the landings are from which subarea. Therefore, it will be assumed for the purposes of this analysis that the state of landing reflects which side of the mesh size restriction line the catch was from.

The EEZ portion of area 612 is 57% northeast of the mesh restriction line but only 48% of the landings occur north of the line. This may be because both New Jersey and New York are adjacent but New Jersey currently has a smaller legal minimum size (13") than New York (14"). Differences could also exist due to port and market conditions in the different states. Of the 0.3 million lbs landed north of the line most are landed in New York (Table 62). New York has an overall EEZ finfish otter trawl rate of 28% from the EEZ (Table 26). Therefore, 0.1 million lbs of these landings will be considered to be EEZ landings. Likewise, New Jersey lands 0.3 million lbs from this area and has an EEZ rate of 86%. Therefore, 0.3 million lbs are considered to be New Jersey EEZ landings from south of the line. Area 616 is determined by area to be 45% above the mesh restriction line and 41% of the landings occur above the line. Since this area is entirely EEZ 0.4 million lbs are considered to be landed in the states of New York and north from north of the line and 0.5 million lbs are landed in New Jersey and south from south of the line.

The EEZ portion of the total northern area landings averages 4.8 million lbs per year (Tables 26 and 62). The area of origin of these landings is 4.3 million lbs from areas 511 through 611 and area 613, 0.1 million lbs from area 612 and 0.4 million lbs from area 616. Only 0.3 million lbs are estimated to be landed in New Jersey (13" minimum size) and further south (12" and 11"minimum sizes).

There will be no change in this area after two years when the mesh requirement changes to 5.0" below the dividing line (see 9.1.2.3.).

No reduction in mortality is guaranteed by this regulation in this area since a mesh size is not required. However, it is the opinion of the Council that some modification in fishing behavior to avoid undersized summer flounder will produce a reduction in mortality of summer flounder less than 14". It is not possible to quantify this estimated reduction.

1.2.1.2. Middle Area

The middle area is considered to be NMFS water areas 614 through 624 (less 45% of area 616) and 43% of area 612 (Figure 15). One mesh selectivity study is applicable to this area (NJ, 1985).

The New Jersey mesh selectivity study (NJ, 1985) used the commercial 3" mesh normally used by the vessels as controls. These varied from 2.6" to 3.3" when wet (Table 64). The experimental 5.0" mesh net used (Table 64) averaged 4.5" when wet. The tows are assumed to be representative of the summer flounder encountered in the area.

The percentages of fish and expected weight by size category follow. The total number of fish is the total caught in each set of tows (1,136 and 729). Percentages were then calculated for several size categories. Using the length-weight relationships of Wilk *et al*. (1978) and the actual lengths of the fish, the average pounds per fish was calculated for each category. The length-weight and number of fish calculations were then used to determine the expected total weight of the catch and the percentage of weight in each size category.

	Control for 4.5"			4.5" Experimental		
Size	% fish	% lbs	lb/fish	% fish	% lbs	lb/fish
< 11"	11.2	3.5	0.33	1.8	0.5	0.30
11" - 12"	3.3	1.9	0.62	1.5	0.7	0.59
11" - 13"	21.8	15.8	0.77	16.5	10.6	0.78
11" - 14"	47.9	39.8	0.88	47.6	35.5	0.91
13" - 14"	26.1	24.0	0.97	31.0	24.9	0.98
14" - 16"	30.9	37.6	1.29	37.6	39.9	1.29
16" - 18"	8.3	14.9	1.90	8.7	13.6	1.91
> 18"	1.7	4.2	2.62	4.3	10.5	3.00
Total	1,136	1,203	1.06	729	889	1.22

Based on current state minimum size limits and the above table the following relationships exist:

Currently landed	north of New Jersey (14")	682 lbs
	in New Jersey (13")	971 lbs
	south of New Jersey (12")	1,138 lbs
Post regulation landings (13", 4.5" mesh)	north of New Jersey (14")	569 lbs
	New Jersey and south (13")	790 lbs

The pounds currently landed refers to the expected landing weight from the control catch (above) in a particular region based on the percentage of weight by size category and the State(s) minimum size limit. The post regulation landings are similarly calculated using the experimental catch and the proposed minimum size limits. For example, north of New Jersey all States currently have a 14" minimum size. Therefore, the current landings are calculated to be 56.7% (37.6 + 14.9 + 4.2) of the current catch (above, 1,203 lbs), or 682 lbs (0.567 x 1,203).

Ratios between future catch (889 lbs) and the current landings become: 1.304:1 north of New Jersey, 0.916:1 in New Jersey, and 0.781:1 south of New Jersey.

The EEZ portion of the total middle area landings averages 5.3 million lbs per year (5.8 million lbs from Tables 26 and 62 minus 0.5 million pounds assigned to the northern area). This is composed of 0.1 million lbs north of New Jersey, 4.0 million lbs in New Jersey, and 1.3 million lbs south of New Jersey (due to rounding the numbers do not total 5.3). The New Jersey finfish otter trawl landings from the middle area are 91% of the total finfish otter trawl landings from that state. The weighout data show that 500 lb trips (directed) of summer flounder account for 96% of all summer flounder landings by finfish otter trawlers. This percentage will be applied to the total fishery from this area. Based on this assumption, the current 500 lb trip fishery lands an average of 5.1 million lbs. These landings are assumed to be composed of 0.1 million lbs from north of New Jersey (14" minimum), 3.8 million lbs from New Jersey (13" minimum), and 1.2 million lbs from south of New Jersey (12" minimum).

The post regulation catch from the EEZ would be divided by weight into size classes as follows (see above):

	4.5"	Current	
Discards (< 13")	11%	19%	(including smalls)
Small (13" - 14")	25%	24%	
Medium (14" - 16")	40%	38%	
Large (16" - 18")	14%	15%	
Jumbo (> 18")	10%	4%	

Using the ratios determined above for current landings to future catch, the post regulation catch is expected to be 4.5 million lbs with 0.1 million lbs north of New Jersey, 3.5 million lbs from New Jersey, and 0.9 million lbs from south of New Jersey. This catch is expected to be divided and valued by class (X 1000) as follows (Table 63):

Discards	520 lbs	
Small	1,100 lbs	$506
Medium	1,800 lbs	$1,458
Large	630 lbs	$630
Jumbo	450 lbs	$558
Total landings	3,980 lbs	$3,152

The current summer flounder fishery had an average value of $0.80 per pound (Table 63) or $4.1 million. The expected change in revenue for summer flounder from the 500 lb trip fishery becomes a loss of $1.0 million.

Under current fishing practices in the 500 lb trip fishery, for every 682 lbs of summer flounder landed north of New Jersey (above) there are 127 summer flounder caught less than 11" (11.2% x 1,136 summer flounder) and 544 caught between 11" and 14" (47.9% x 1,136). The same applies to every 971 lbs landed in New Jersey and every 1,138 lbs landed south of New Jersey (determinations above). Expansion ratios (total lbs actually landed/ control lbs expected to be landed) become 147:1 north of New Jersey

(100,0008682), 3,913:1 for New Jersey (3,800,000 8 971), and 1,054:1 for landings south of New Jersey (1,200,000 8 1,138). The total current mortality becomes (e.g., for fish less than 11" north of New Jersey, 127 × 147 = 18,669 or 19,000):

	North of NJ	NJ	South of NJ	Total
< 11"	19,000	497,000	134,000	650,000
11" - 14"	80,000	2,129,000	573,000	2,782,000

Based on the percentages and average weight per fish (above) the post regulation catch is expected to be composed of (e.g., the combined area percentages become 147 + 3,913 + 1,054 = 5,114. The weight of summer flounder less than 11" in the experimental sample is 889 × 0.005 = 4.445 lbs. The total weight of summer flounder less than 11" expected to be caught using 4.5" mesh becomes 5,114 × 4.445 = 22,000 lbs. Using 0.3 lbs per summer flounder under 11" results in 75,000 summer flounder, adjusted for rounding):

< 11"	23,000 lbs	75,000 summer flounder
11" - 14"	1,598,000 lbs	1,755,000 summer flounder

Examining the total mortality using the ratios by area derived above yields the change in mortality for fish greater than 14". Total expanded current mortality becomes 4.8 million summer flounder. The post regulation total mortality is estimated at 3.7 million summer flounder.

The change in mesh related mortality will be:

< 11"	0.6 million summer flounder	(reduced mortality)
11"-14"	1.0 million summer flounder	(reduced mortality)
> 14"	0.5 million summer flounder	(increased mortality)

This change in mortality will occur the first two years of the proposed regulation, everything else held unchanged.

After two years the mesh regulation will change to a 5.0"minimum. This will cause different impacts, which will be evaluated in this analysis, to the catch, landings, and revenues of the 4.5" mesh regulation.

The percentages of fish and expected weight by size category are presented above for the control and in Table 66 for the experimental (the control for the northern area in Table 66 includes data from the Anderson *et al.*, 1983 study). The total number of fish, total weight, and average weight per fish for the experimental 5.0" mesh are in Table 66. The control total was 463 fish weighing a total of 490 pounds for an average of 1.06 lbs per fish.

Based on current state minimum size limits and the above table the following relationships exist:

Currently landed	north of New Jersey (14")	278 lbs
	in New Jersey (13")	395 lbs
	south of New Jersey (12")	464 lbs
Post regulation landings (13", 5.0" mesh Table 67)	north of New Jersey (14")	257 lbs
	New Jersey and south (13")	304 lbs

Ratios between future catch (323 lbs) and the current landings become: 1.162:1 north of New Jersey, 0.818:1 in New Jersey, and 0.696:1 south of New Jersey.

The current catch and landings areas are described above. Using the ratios determined above for current landings to future catch, the post regulation catch is expected to be 4.0 million lbs with 0.1 million lbs from north of New Jersey, 3.1 million lbs from New Jersey, and 0.8 million lbs from south of New Jersey. This catch is expected to be divided and valued by class (X 1000) as follows (Table 63):

Discards	258 lbs	
Small	558 lbs	$257
Medium	1,816 lbs	$1,471
Large	900 lbs	$900
Jumbo	468 lbs	$580
Total landings	3,742 lbs	$3,208

The expected change in revenue for summer flounder from the 4.5"mesh regulation becomes a gain of $0.1 million. The change in landings becomes a loss of 0.3 million pounds.

Based on the percentages and average weight per fish (from above and Table 66) the post regulation catch is expected to be composed of:

< 11"	0 lbs	0 summer flounder
11" - 14"	816,000 lbs	897,000 summer flounder

The post regulation total mortality is estimated at 2.9 million summer flounder.

The change in mesh related mortality from the 4.5" mesh regulation will be:

< 11"	0.1 million summer flounder	(reduced mortality)
11"-14"	0.9 million summer flounder	(reduced mortality)
> 14"	0.1 million summer flounder	(increased mortality)

This change in mortality will occur each year of the proposed regulation, everything else held unchanged.

1.2.1.3. Southern Area

The southern area is considered to be NMFS water areas 625 through 639 (Figure 15). Approximately 1% of the landings from this area are landed in states north of Maryland. They will be considered part of the Maryland and Virginia calculations for the purposes of this study. Two mesh selectivity studies conducted by the State of North Carolina are available for this area (Gillikin *et al.*, 1981 and Gillikin, 1982). The unweighted results of these tows were compared to the unweighted average of all North Carolina mesh studies (Table 64), which are assumed to represent the industry standard (Gillikin, pers. comm.).

The results for the summed experimental and control average catches by percentage are presented in Table 66. The current and post regulation landings and ratios are presented in Table 67. This catch would be distributed by weight into size classes as follows:

	4.5"	Current	
Discards (< 13")	19.6%	21.3%	(including smalls)
Small (13" - 14")	13.7%	9.2%	
Medium (14" - 16")	24.1%	25.0%	
Large (16" - 19.7")	27.9%	32.8%	
Jumbo (> 19.7")	14.7%	11.7%	

The southern area is assumed to consist of 7.5 million lbs of EEZ landings in North Carolina (Table 29) and 4.8 million lbs of EEZ landings in Maryland and Virginia (6.1 million lbs Table 29 minus 1.3 million lbs in the northern and middle areas). This results in total EEZ landings of 12.3 million lbs.

From the weighout data, 89.2% of Virginia finfish otter trawl summer flounder landings are from the southern area. Additionally, 98.9% of the Virginia summer flounder otter trawl landings are from trips landing over 500 lbs of summer flounder. Using 98.9% as an approximation for the entire southern area, the EEZ 500 lb trip (regulated) fishery landings average 12.2 million lbs per year. This is composed of 7.4 million pounds in North Carolina and 4.8 million pounds in Maryland and Virginia.

Post regulation EEZ catch in North Carolina is expected to be 105% of this or 7.8 million lbs and in Maryland and Virginia 109% or 5.2 million lbs (Table 67). The total 13.0 million lbs is expected to be distributed and valued by class as follows (X000) (Table 66):

Discards	2,548 lbs	
Small	1,781 lbs	$ 712
Medium	3,133 lbs	$2,099
Large	3,627 lbs	$2,938
Jumbo	1,911 lbs	$2,159
Total landings	10,452 lbs	$7,908

The current 500 lb trip fishery from the southern area weighs 12.2 million pounds and is valued at $0.67 per pound or $8.2 million. The expected loss for summer flounder becomes 1.7 million pounds valued at $0.3 million.

Based on the determinations in Table 67 combined with the revised landings (above) the ratios become 19,521:1 for North Carolina and 12,968:1 for Maryland and Virginia. The total current mortality becomes:

	NC	MD & VA	Total
< 11"	2,089,000	1,388,000	3,477,000
11" - 13"	1,191,000	791,000	1,982,000
13" - 14"	781,000	519,000	1,300,000

Based on the percentages and average weight per fish (Table 66) the post regulation catch is expected to be composed of:

< 11"	104,000 lbs	242,000 summer flounder
11" - 13"	2,444,000 lbs	3,348,000 summer flounder
13" - 14"	1,781,000 lbs	1,855,000 summer flounder

Examining the change in mortality using the ratios by area derived above and comparing that to the total mortality yields the change in mortality of fish greater than 14". Total expanded current mortality becomes 11.9 million summer flounder. The post regulation mortality is estimated at 9.9 million summer flounder.

The change in mesh related mortality will be:

< 11"	3.2 million summer flounder	(reduced mortality)
11"-14"	1.9 million summer flounder	(increased mortality)
> 14"	0.7 million summer flounder	(reduced mortality)

This reduction in mortality will occur the first two years of the proposed regulation, everything else held unchanged.

After two years the mesh regulation will change to a 5.0" minimum. This will cause different impacts, which will be evaluated in this analysis, to the catch, landings, and revenues of the 4.5" mesh regulation.

The results for the summed experimental and control average catches by percentage are in Table 66. The current and post regulation landings and ratios are in Table 67. This post 5.0"mesh regulation catch would be distributed by weight into size classes as follows:

	5.0"	Current	
Discards (< 13")	8.1%	21.3%	(including smalls)
Small (13"-14")	16.8%	9.2%	
Medium (14"-16")	38.8%	25.0%	
Large (16"-19.7")	27.3%	32.8%	
Jumbo (> 19.7")	9.0%	11.7%	

The current EEZ landings are as described above with the 4.5"mesh regulation. Post regulation catch in North Carolina is expected to be 83% of the current or 6.2 million lbs and in Maryland and Virginia 87% or 4.1 million lbs (Table 67). The total 10.3 million lbs is expected to be distributed and valued by class (X 000) as follows:

Discards	834 lbs	
Small	1,730 lbs	$ 692
Medium	3,996 lbs	$2,678
Large	2,812 lbs	$2,278
Jumbo	927 lbs	$1,048
Total landings	9,465 lbs	$6,696

The expected loss in revenues from the 4.5" mesh net regulation would be a loss of $1.2 million. The expected loss in landings from the 4.5" mesh net regulation would be 1.0 million lbs.

Based on the percentages and average weight per fish (Table 66) the post regulation catch is expected to be composed of:

< 11"	185,000 lbs	515,000 summer flounder
11" - 13"	650,000 lbs	843,000 summer flounder
13" - 14"	1,730,000 lbs	1,748,000 summer flounder

The post regulation total mortality is estimated at 7.4 million summer flounder.

The change in mesh related mortality from the 4.5" mesh regulation will be a reduction of:

< 11"	0.2 million summer flounder
11" - 14"	2.6 million summer flounder
> 14"	0.1 million summer flounder

This reduction in mortality will occur each year of the proposed regulation, everything else held unchanged.

1.2.1.4. Summary of mesh regulated fishery

The total change in mortality expected from a 4.5" mesh restriction and 13" minimum size in the EEZ 500 lb trip commercial fishery is:

< 11"	3.2 million summer flounder (reduced mortality)
11"-14"	0.9 million summer flounder (increased mortality)
> 14"	0.1 million summer flounder (reduced mortality)

Various minimum quantities and percentages of summer flounder commercial landings were examined in order to evaluate the thresholds of what would constitute a regulated trip (Table 68). Regulating trips only that catch a minimum of 500 lbs of summer flounder affects 75% of the pounds landed, whereas regulating only trips which land over 1,500 lbs of summer flounder means that less than half the commercial landings are affected.

The finfish otter trawl fishery landing 500 lbs or more of summer flounder from the EEZ is currently estimated to land 17.3 million pounds of summer flounder valued at $12.3 million during an average year. The post 4.5" mesh regulation fishery is expected to land 14.5 million pounds of summer flounder valued at $11.1 million. The change in summer flounder ex-vessel landings and revenue to the mesh regulated fleet is expected to be a loss of 2.8 million pounds valued at $1.2 million.

The total change in mortality expected changing from a 4.5"mesh restriction to a 5.0" mesh restriction in the EEZ 500 lb trip commercial fishery is:

< 11"	0.2 million summer flounder (increased mortality)
11"-14"	3.5 million summer flounder (reduced mortality)
> 14"	no noticeable change

The post 5.0" mesh regulation fishery is expected to land 13.2 million pounds of summer flounder valued at $9.9 million. The change in summer flounder ex-vessel landings and revenue to the mesh regulated fleet is expected to be an additional loss of 1.3 million pounds valued at $1.2 million.

The total change in mortality expected after two years and the change to the 5.0" mesh regulation is a reduction of:

< 11"	3.7 million summer flounder
11" - 14"	2.6 million summer flounder
> 14"	0.1 million summer flounder

The expected change in summer flounder landings would be 4.1 million pounds valued at $2.4 million.

These conclusions do not include the increase in landings in future years due to the decreased mortality and individual growth. The conclusions also include the assumptions of complete compliance, no tolerance for undersized landings, all smalls less than 14" in length, and an accurate description of the directed fishery presented in the analysis.

1.2.1.5. Non-mesh regulated commercial fishery

Imposition of a commercial size limit will reduce the landing of undersized fish. Only the States of New Jersey (13"), Maryland (12"), Virginia (12"), and North Carolina (11") have size limits allowing landings of summer flounder from the EEZ less than those proposed by this regulation (Section 4.2.2). However, with this regulation there would be no tolerance for possession of undersized summer flounder by Federally permitted vessels, so landings of smalls will be reduced in those States which have a tolerance. The increase of mesh size after two years will not affect these landings.

Based on a coast wide, seven year weighted average (1979 to 1985), the average price (in 1985 adjusted dollars) of unclassified summer flounder is $0.78/lb, while that of the small, medium, large, and jumbo categories combined is $0.77/lb. Therefore, unclassifieds are considered to be composed of relatively the same proportions of smalls, mediums, larges, and jumbos as the overall catch. However, since the trend in recent years has been for unclassifieds to be valued more per pound than an unweighted mix, this will slightly overestimate the actual pounds of smalls affected.

Annual average EEZ summer flounder landings consist of 22.7 million lbs of summer flounder landed by finfish otter trawlers and 0.6 million lbs landed by other gear (Table 26). Of this,17.3 million pounds has been accounted for in the previous analyses of the 500 lb trip (regulated) fishery. The 4.8 million lbs in the analysis of the northern area is included with the other non-mesh regulated harvest. The total is determined as follows (Table 29) (in millions):

State Minimum Size	Finfish Otter Trawlers	Other gear	Total	Smalls (thousands)
14"	4.5	0.3	4.8	505
13"	0.6	0.1	0.5	184
12"	0.2	0.2	0.4	156
11"	0.1	< 0.1	0.1	60

An estimated 0.9 million pounds of smalls are landed.

The states that have a minimum size of 13" or more are assumed to land smalls which are 13" or larger. The states which have a 12" minimum size are assumed to land half their smalls by number less than 13" and North Carolina, which has an 11" minimum size is assumed to land 2/3 of their smalls by number less than 13". Summer flounder 13.5", 12.5", and 11.5" on average weigh approximately 0.97 lbs, 0.77 lbs, and 0.59 lbs (Wilk *et al.*,1978).

Based on the above assumptions, the value of the reduced ex- vessel revenue can be estimated. All 14" minimum size states' smalls will not be landed. In New Jersey, one half of the finfish otter trawl smalls will be caught north of the boundary and therefore not landed while the rest will remain legal. One-half of the 12" minimum size states' will not be landed and 2/3 of the 11" minimum size states' will not be landed.

	Reduced Landings	
Minimum Size	Pounds (x 000)	Value (x 000)
14"	19	295
13"	29	39
12"	69	28
11"	35	14

Therefore, the ex-vessel value of non-mesh regulated fishermen will be reduced by $0.4 million.

1.2.2. Recreational fishery

No state north of the dividing line (see 9.1.2.3.) has possession laws less than 14". Therefore, the theoretical impact would be nonexistent. However, those states do land summer flounder less than 14" from the EEZ (Table 48). Since no tolerance is allowed in this FMP these landings would become illegal. Of the states south of New York, the possession laws are: New Jersey (13"), Delaware (14"), Maryland (12"),Virginia (12"), and North Carolina (11") (Section 4.2.2). By combining the information contained in Tables 46 and 48 it can be determined that approximately 308 thousand summer flounder are landed, on average, in violation of the proposed regulations on a coast wide basis. It is necessary to examine the recreational EEZ fishery on a coast wide basis to analyze the full impacts.

The seven year average of EEZ recreational summer flounder landings was 1.0 million fish (Table 45) and the average estimated number of directed summer flounder trips in the EEZ was 348 thousand (Table 57). In the EEZ an average of 1.8 summer flounder were landed from each directed trip, 5.7 from each successful directed trip (approximately 64% of all directed summer flounder trips result in no summer flounder landed), and 4.2 from each non-directed EEZ trip which landed summer flounder(Table 58). Therefore, an estimated average of 125 thousand directed and 79 thousand non-directed summer flounder trips in the EEZ landed summer flounder.

A number of studies have been conducted which attempt to determine the satisfaction components and their relative weights for recreational fishing. Reviews of these studies (Fedler,1984; Holland, 1985) show that the components of escape (perceived freedom), experiencing nature, relaxation, and companionship seem to be the highest ranked components throughout these studies. The component of catching fish has a"relatively low priority" (Fedler, 1984). Holland (1985) surveyed fishermen from the Gulf Coast Conservation Association and found that only 4% of those responding placed the highest emphasis on catching fish. Interestingly, this emphasis group had twice the rate of fishing trips of any other emphasis group. A study by Dawson and Wilkins (1981) examined the preferences of boating anglers in New York and Virginia in 1980. They found that catching fish was important but consistently ranked below most of the less quantifiable results of a fishing trip. A large percentage of anglers in New York (93%) and Virginia (88%) did not feel they had to catch a lot of fish to be satisfied with a trip as long as they caught something. Nearly half of the New York anglers (47%) and 39% of the Virginia anglers felt they could be satisfied if they did not catch anything.

The 1981 Marine Recreational Fishery Statistical Socioeconomic Survey concluded that "about half (of the anglers) reported a preferred species while fishing, and most of these said they would continue to fish if they knew their preferred species was not available." (USDC, 1986a). The survey results showed that two thirds of those who caught no fish were satisfied with their fishing trip (KCA, 1983).

Agnello and Anderson (1987) examined fishing success for summer flounder as a predictor of satisfaction. The formula used consisted of the respondents' level of satisfaction explained by the number of fish kept (summer flounder and other fish or total fish) and the trip cost. They found that the number of fish kept contributed to satisfaction but the analysis failed to explain 91% of the variability.

Theoretically, a reduction in landings would have an impact on angler behavior. It is expected that a drop in catch per unit effort would lead to a decrease in the number of trips (Anderson, 1977). However, the seven year average EEZ success rate for fishermen targeting on summer flounder was only 34% (Table 57). Since so many fishermen do not catch summer flounder, but a like number try the next year anyway, the reduction in catch attributable to a size limit would be expected to affect only the directed anglers who are successful. These successful anglers have expressed the greatest support for the size limit during the public hearings, however, so it is not clear that participation in the fishery by this group would actually be reduced. The anglers who take summer flounder, but were not targeting on them must also be considered. Summer flounder represents a bycatch and therefore is important even if the anglers were targeting on other species.

Since the regulations impose a *de facto* catch and release policy in the fishery, the actual catch rate for participating fishermen will not decrease. In fact, over time, a catch and release policy is expected to increase the catch rate since the same fish can be caught by more than one angler. The only rate that will change is the retention rate. Schaefer (pers. comm.) stated that one rationale for enacting New York's summer flounder minimum size limit (14") was to allow summer flounder to be caught and released in the spring and landed at a larger size in the fall. He felt that the minimum size achieved this objective and also encouraged a longer season for party and charter boats.

A 1980 survey of Virginia anglers fishing from boats (Dawson and Wilkins, 1981) determined that 93% would maintain their participation rate if faced with a minimum size limit. Of the other 7%, 5% said they would decrease their participation and 2% said they would stop fishing. The absence of a more substantial impact is not surprising, since the majority of the summer flounder caught in the recreational fishery are taken by a small number of relatively more highly skilled anglers.

In these analyses it is assumed that each trip is conducted by a different participant. This is somewhat inaccurate and overestimates the number of individual anglers fishing for summer flounder in the EEZ. The 2% of participants who would stop fishing will be reflected by canceling 2% of the directed trips. The 5% decreased participation will be reflected by assuming 2.5% of both directed and non-directed trips being canceled. These assumptions will overestimate the impacts of the regulation to some unknown but small extent. The losses estimated below for foregone landings, catch, and marginal value are for summer flounder only. For trips that are canceled there is an associated marginal value loss for the other fish which would have been caught and landed. These fish will also be available for other anglers to land, thus the loss may be a transfer within the recreational fishery and possibly to the commercial fishery. It is unknown to what extent this will occur. Summer flounder not landed are assigned a marginal value of $1.13 for the first summer flounder of a trip and $0.61 for the average summer flounder (Section 8.1.2). Each trip is valued at $42.92 (Table 58).

The marginal value for a caught and released summer flounder has not been explicitly determined but, for the purposes of these analyses, is assumed to be half that for one kept. Therefore, the marginal value loss associated with a minimum size must be halved to reflect the marginal value associated with the catch and release of undersized summer flounder.

	Trips lost	Flounder not landed	Expenditures redirected	Value lost
Directed				
2% canceled	2,500	14,300	$107,300	$ 10,000
2.5% reduced	3,100	17,800	$134,100	$ 12,500
Non-directed				
2.5% reduced	2,000	8,300	$ 84,800	$ 6,100
Released summer flounder	-	267,600	-	$ 81,600
Total	7,600	308,000	$326,200	$110,200

Revenues will be lost to the recreational fishing business sector if fishing trips are canceled or not taken due to changes in catch per unit effort or retention per unit effort. However, the money not spent on cancelled fishing trips will be spent elsewhere in the economy on other goods and services. Executive Order 12291 (46

FR 34263) states that regulatory actions shall consider benefits and costs *to society* (emphasis added). Therefore, while the recreational fishing industry may lose this revenue, society as a whole will not and the redirection cannot be considered a cost, but simply a transfer.

Since the States from Massachusetts through North Carolina already have size limits, the change in the number of trips due to an increase in the size limit is unknown. It is expected that those anglers fishing from States already having a size limit of 14" would not change the number of their trips due to an EEZ size limit of 14". In addition, the actual response of anglers to a size limit may not be a reduction in trips but rather a redirection of effort. The assumptions made above concerning lost trips were based on Dawson and Wilkins (1981) and are considered to be conservative.

Increases in future catch because of decreased mortality of small fish will stimulate new interest in fishing for summer flounder. It is difficult to determine how many more summer flounder need be taken to actually motivate one more trip, but it is likely that the release of small fish will increase the catch rates for all anglers. This will augment the value of the fishing experience, regardless of whether the fish are retained.

1.2.3. Bycatch

The weighout data allowed estimation of finfish otter trawl trips landing 500 lbs or more of summer flounder. It was determined that this overall group had a summer flounder composition of 48% by weight and 68% by value (Table 38). These estimates are recorded landings and probably do not include 'shack' (Section 8.1.1).

The New Jersey mesh study (New Jersey, 1985) listed numbers but not weights of several species of fish. The experimental 4.4" (ICES) mesh compared to the control 3" mesh caught 20% of the weakfish, 27% of the butterfish, 24% of the windowpane flounder, and 30% of all other fish species including sharks, rays, and sea robins. Without weight information it is impossible to assess the loss in bycatch revenue.

The North Carolina mesh studies (Gillikin *et al.*, 1981 and Gillikin, 1982) listed weights of summer flounder and several other species caught. The experimental 4.5" (ICES 4.7" and 4.4") meshes compared to the control meshes (industry standard) caught, by weight, 150% of the dogfish, 13% of the weakfish, 6% of the Atlantic croaker, 5% of the butterfish, 3% of the spot and 200% of the "other" fish. Without a determination of the composition and value of the "other" fish it is impossible to accurately determine the actual marketable loss. However, it is obvious that the loss in marketable bycatch is substantial.

For purposes of this analysis the marketable bycatch loss will be estimated at 70%. This figure will also be used when evaluating the 5.0" mesh regulation. To the extent that the actual bycatch loss is less or greater than this the reduction in ex-vessel revenue will be less or greater.

At this time it is impossible to accurately estimate the loss in bycatch associated with the mesh regulation. The weighout data show that the 500 lb or more fishery was predominately summer flounder with only 52% of the weight and 32% of the value from all "other" species. Another way to view this is that the bycatch was 111% of the weight and 48% of the value of the summer flounder from this 500 lb trip fishery. The summer flounder from the proposed regulated fishery weighed 17.3 million pounds and were valued at $12.3 million. Therefore, the bycatch associated with the regulated fishery was estimated to be 19.2 million pounds valued at $5.9 million. It is estimated that about 70% of the bycatch may be lost with a 4.5" mesh. The maximum bycatch loss due to the mesh regulation is estimated to be 13.4 million pounds valued at $4.1 million.

An important factor to remember when considering bycatch reductions is that the fish not caught by these nets will be available to other fishermen. These fish may be caught in the same or future years by the same fishermen or by different fishermen. Some of the fish will also be eaten by other fish which will be caught by fishermen. To the extent that this occurs it is necessary to consider some of the lost bycatch as a transfer to other parts of the fishing fleet and not an actual cost. The extent of this transfer is presently not quantifiable. While both estimates (bycatch loss as a cost and as a transfer) are presented as the extreme possibilities it is certain that reality is between the two.

1.2.4. Summary of selected costs and benefits

The estimated costs (X 000) are:

		1st & 2nd years	3rd & later
Commercial			
	Mesh regulated fishery	$1,200	$2,400
	Minimum size regulated fishery	$ 400	$ 400
	Bycatch (- transfer*)	$4,100	$4,100
Recreational			
	Marginal value	$ 110	$ 110
	Total (- transfer*)	$5,810	$7,010
Commercial landing loss:			
	Summer flounder (million lbs)	3.7	5.0
	Bycatch (million lbs)	13.4	13.4
	Recreational loss (trips)	7,600	7,600

* Transfers are those fish caught during other commercial fishing trips or by recreational anglers during the present or future years, and, to some lesser extent, those fish which subsequently enter the food chain.

1.2.5. Commercial, and Recreational Summer Flounder Revenues and Increased Landings Over Time due to Decreased Mortality

Assumptions

- The best estimate of current fishing mortality rate (F) is 0.65.
- The future fishing mortality rate (F) is assumed to be 0.60.
- The best estimate of natural mortality rate (M) is 0.20.
- The proportion of landings is assumed to continue and is described by the seven year average of 59% commercial and 41% recreational.
- A commercial discard mortality rate of 60% is used.
- An annual discount rate of 3% is applied.

- Commercial Fishery 1979-85 average price per pound coast wide:

Small	$0.44	S,M,L & J	$0.77
Medium	$0.75	Unclassified	$0.78
Large	$0.94	Overall	$0.78
Jumbo	$1.22		

- All fish of the same age are assumed to be the same weight.
- The marginal values for recreationally caught fish as estimated by Agnello and Anderson (1987) are used.

Benefits from reduced summer flounder mortality (millions) from current level:

	Commercial	Recreational
1st & 2nd years	3.1	0.3
3rd & later years	6.4	0.3

Increased Landings

Year	Recreational (000 fish)	Recreational (000 lbs)	Commercial (000 lbs)
2	320	223	200
3	487	368	409
4	1,085	899	1,182
5	1,359	1,179	1,586
6	1,488	1,327	1,796
7	1,547	1,397	1,902
8	1,576	1,434	1,956
9	1,576	1,434	1,956
10	1,576	1,434	1,956

Revenue Due to Regulation Change (in 000's of $)

Year	Commercial	Recreational	Total
2	85	190	275
3	231	280	511
4	776	606	1,382
5	1,108	737	1,845
6	1,298	783	2,081
7	1,369	791	2,159
8	1,382	781	2,163
9	1,341	758	2,099
10	1,303	736	2,039

Note: All values are adjusted to 1985 dollars.

1.2.6. Comparison of Discounted Yearly Costs and Benefits

The costs are listed above. However, the costs used for this comparison have two alternative assumptions concerning bycatch: (1) all bycatch is transferred (caught another time) or (2) all bycatch is lost with the increased mesh size. While the real effect would be somewhere between these two extremes (some transferred and some lost), there was no way to realistically assume the shares in each category, so only the extremes were evaluated. Total yearly costs are determined to be $1.7 million for the first two years and $2.9 million thereafter ($5.8 and $7.0 million if bycatch is considered lost). Likewise, the effect of a commercial discard mortality rate between 60% and 100% (values derived from survey tabulated in Appendix 5) was evaluated simultaneously at the extremes.

Discounted Benefits and Costs (in millions of $)

Year	Benefits	Costs	Net Benefits
1	0	1.7	- 1.7
2	0.3	1.7	- 1.4
3	0.5	2.7	- 2.2
4	1.4	2.7	- 1.3
5	1.8	2.6	- 0.7
6	2.1	2.5	- 0.4
7	2.2	2.4	- 0.3
8	2.2	2.4	- 0.2
9	2.1	2.3	- 0.2
10	2.0	2.2	- 0.2
Total	14.6	23.2	- 8.6

Given the assumptions stated above, the net benefit of moving to a size limit of 14" for EEZ caught summer flounder north of the line and a 4.5"/5.0" minimum mesh south of the line for the EEZ directed fishery, amounts to a negative $8.6 million in 1985 dollars for a ten year horizon discounted at 3%. If the commercial discard mortality rate is in fact greater than 60% and/or the bycatch from the mesh regulated fishery is not completely transferred, a lesser increase in commercial revenue will occur (absent a behavioral or gear change to reduce the take of undersized fish). As a worst case scenario, the above analysis was repeated under the assumption of 100% commercial discard mortality and the maximum 70% loss of bycatch. The results projected a loss of $42.9 million for the same ten year time horizon. To the extent that the true discard mortality rate lies somewhere between 60% and 100% or changes in commercial fishing practices reduce discarding and the true bycatch loss lies between 0 and $5.6 million, the net benefits of the proposed 14" size limit north of the line with a 4.5"/5.0" mesh south of the line will lie within a range of negative $42.9 million to negative $8.6 million.

It must be noted, however, that the benefits specified above do not include the value of increased reproductive stability of the population which will occur with decreased fishing mortality. Any increase in recruitment resulting from survival of more summer flounder to reproductive maturity will result in more highly valued commercial and recreational fisheries. To be sure, it is chiefly this increase in spawning potential which is the aim of the proposed size limit. Unfortunately, this benefit cannot be quantified given present knowledge of summer flounder recruitment dynamics.

Apart from potential gains in recruitment, an additional benefit will result from survival of more summer flounder to older age classes. The benefit of a balanced age structure is most apparent when one considers the risk associated with compressing the age composition of the catch to where only one or two year classes dominate. Such compression of the age structure increases the risk of a year class failure resulting in collapse of the fishery. The costs of closing the fishery to allow rebuilding of the summer flounder stock are likely to be far greater than costs incurred to maintain a stable and balanced age structure.

1.2.7. Other costs and benefits

Many of the vessels which would be affected in the EEZ by the mesh regulation are already affected by state 4.5" minimum mesh regulations or the 5.5" minimum groundfish mesh regulation. Therefore, these vessels will not necessarily have to purchase new nets in order to be in compliance. Those vessels purchasing new nets in order to be in compliance with the EEZ regulations will be aware that in 2 years they will be required to use a minimum 5.0" mesh. Therefore, they will make their own economic decisions concerning net wear, etc. and purchase a 4.5", 5.0", or larger net. Only one purchase per current net is deemed related to this FMP.

Gear costs attributable to this FMP will be: a one time replacement of nets not already fished in State or Federal waters requiring 4.5" mesh or larger and not usable in other fisheries; and a one time replacement of nets currently in use with mesh between 4.5" and 5.0", not replaced due to wear in 2 years, and not usable in other fisheries.

Finfish otter trawl nets (webbing only) cost approximately $3,500 and vessels normally own 2 (Stevenson, pers. comm.). It is not possible to know the number of vessels currently fishing in State or Federal mesh regulated waters. Neither is it possible to know the distribution of mesh sizes owned by the fleet. Without this knowledge it is not possible to estimate the gear replacement cost required by this regulation.

Non-quantified benefits and costs are listed below. Based on a subjective analysis of available data, a comparative value of small, medium, or large was assigned to each.

	Cost	Benefit
Commercial fishermen's willingness to pay	Small	
Consumers' willingness to pay	Small	
Deck hands' income	Small-Medium	
Employment change	Small	
Enforcement and judicial expenses	Small	Small
Non-quantified direct expenses	Small	
Overall recreational experience	Small	Small
Preventing stock failure		Small-Large
Redirection of effort	Small	Small
Reduced fuel consumption	Small	
Regional sociological effects	Small	
Overall potential costs and benefits	Small-Medium	Small-Large

As can be seen, the costs are numerous but of relatively small size each. The benefits are considered to be few and, with the exception of preventing stock failure, are also relatively small. Although not quantifiable at this time, the benefits of increased recruitment, a more balanced age structure, and reduced risk of stock failure are the most important.

2. OTHER HEARING DRAFT ALTERNATIVES

2.1. TAKE NO ACTION AT THIS TIME

2.1.1. Description

This would mean that the Preliminary Fishery Management Plan (PMP) prepared by NMFS would remain in effect. The PMP regulates only foreign fishing.

2.1.2. Analysis

No control over the US fishery would probably lead to further excessive fishing mortality and to decreased yields. The summer flounder stock is currently experiencing high levels of fishing mortality (double to triple the Fmax rate) and the stock has experienced low levels in the past. Although a defined stock-recruitment relationship for summer flounder is not yet known (and it is not clear what role environmental factors play in controlling recruitment) it certainly is probable that at low levels of abundance, spawning stock size and recruitment (i.e., future abundance) are related. The stock should not be drastically reduced if the economic and biological future of this fishery is to be safeguarded and the objectives of this FMP are to be attained.

2.2. LIMIT CATCH

2.2.1. Description

This would be accomplished by imposing quotas in the commercial fishery and bag limits in the recreational fishery.

2.2.2. Analysis

Since there is no valid current quantified MSY estimate at this time (Section 5.4), there is no scientific basis for establishing quotas.

2.3. IMPOSE SEASONAL OR AREA CLOSURES

2.3.1. Description

This would be accomplished by prohibiting fishing for summer flounder during specified seasons or in specified areas.

2.3.2. Analysis

Information is not available at this time to determine if the closure of specific areas or at specific times would be beneficial to the stock. Specific areas would be very difficult to identify since spawning occurs during at least six months and over nearly the entire continental shelf. In addition, closures are neither biologically nor economically effective in the absence of entry limitation and effort control. These measures make it more expensive to fish and effort simply gets more concentrated prior to and after the closures. The classic example of this is the Pacific halibut fishery. Additionally, enforcement resources would need to be increased significantly to assure at sea enforcement at an adequate level.

2.4. IMPOSE A 14" TOTAL LENGTH SUMMER FLOUNDER MINIMUM SIZE LIMIT, IMPLEMENT AN EEZ PERMIT SYSTEM WHEREBY OPERATORS OF VESSELS THAT PARTICIPATE IN THE FISHERY WILL NEED TO APPLY FOR AN ANNUAL PERMIT, AND REQUIRE THAT VESSELS WITH FEDERAL PERMITS COMPLY WITH THE MORE STRINGENT OF STATE OR FEDERAL REGULATIONS.

2.4.1. Description

OY would equal all summer flounder 14" total length or larger caught by US fishermen. Under this alternative it would be illegal for fishermen, processors, or dealers to possess any summer flounder less than 14" in total length taken from Federal waters or by a Federally permitted vessel unless the fish were landed in a State with a larger minimum fish size limit, in which case the State limit would prevail. Foreign fishermen would not be permitted to retain summer flounder since US fishermen, by definition, would be harvesting the OY. Vessels fishing commercially for summer flounder, either directly or as a bycatch in other fisheries, and vessels for hire in the recreational fishery (party and charter boats) would be required to obtain annually renewed permits.

2.4.2. Analysis

2.4.2.1. Commercial fishery

Imposition of a 14" commercial size limit will reduce the landing of undersized fish. Only the States of New Jersey (13"), Maryland (12"), Virginia (12"), and North Carolina (11") have size limits which allow landings of summer flounder from the EEZ less than 14" (Section 4.2.2). However, with this alternative there would be no tolerance for possession of undersized summer flounder by Federally permitted vessels, so landings of smalls will be reduced in those States which have a tolerance.

The reduction in the catch of smalls in the four affected States can be estimated from historical landings. The 1979-85 coast wide yearly average landings of summer flounder from the EEZ was 23.3 million pounds (Table 2). The proportions of EEZ landings from New Jersey, Maryland, Virginia and North Carolina averaged 19.0%, 3.4%, 24.0% and 32.6%, respectively. Of these state average annual EEZ landings, 28.7%, 34.2%, 42.0% and 33.4%, respectively, were made up of smalls assuming unclassifieds were distributed similarly to classified landings (Table 29). Multiplying the above percentages by the EEZ total landings, and assuming an average weight of .77 lb per small (a 12.5" fish), estimates of the annual number of smalls landed by state are: 1,651,000 for New Jersey, 352,000 for Maryland, 3,052,000 for Virginia, and 3,297,000 for North Carolina. The total reduction in summer flounder mortality under a 14" EEZ minimum size will therefore be 8.35 million fish of about 6.4 million pounds.

Using the seven year average of $0.44/lb for smalls (Table 53), the ex-vessel value will be reduced by $2.8 million. It is expected that there will be a reduction in the catch of undersized summer flounder since fishermen will likely alter their fishing practices to reduce discarding simply to reduce the time labor costs associated with discarding. In addition, the extent to which summer flounder fishing mortality is actually reduced due to the size limit depends on the survivability of discarded fish. Based on a survey taken during the public hearings, discard mortality rates are thought to lie within the range of 60% to 100% (see Appendix 5 for survey tabulation), depending on handling and the speed of sorting trawl contents.

2.4.2.2. Recreational fishery

The states where anglers would be directly impacted by a 14" minimum size limit in the recreational fishery are New Jersey (13"), Maryland (12"), Virginia (12"), and North Carolina (11"; Section 4.2.2). However, it is necessary to examine the recreational EEZ fishery on a coast wide basis to analyze the full impacts.

The seven year average of EEZ recreational summer flounder landings was 1.0 million fish (Table 45) and the average estimated number of directed summer flounder trips in the EEZ was 348,000 (Table 58). In the EEZ an average of 1.8 summer flounder were landed from each directed trip, 5.7 from each successful directed trip (approximately 64% of all directed summer flounder trips result in no summer flounder landed), and 4.2 from each non-directed EEZ trip which landed summer flounder(Table 57). Therefore, an estimated average of 125,000 directed and 79,000 non-directed summer flounder trips in the EEZ landed summer flounder. In addition, on average, 46% of the EEZ summer flounder landings were less than 14" in length (Table 48). This results in an average of 328,000 summer flounder less than 14" in length being landed from directed EEZ trips and an additional 153,000 summer flounder less than 14" in length landed from the EEZ on non-directed fishing trips.

A number of studies have been conducted which attempt to determine the satisfaction components and their relative weights for recreational fishing. Reviews of these studies (Fedler, 1984; Holland, 1985) show that the components of escape (perceived freedom), experiencing nature, relaxation, and companionship seem to be the highest components ranked throughout these studies. The component of catching fish has a "relatively low priority"(Fedler, 1984). Holland (1985) surveyed fishermen from the Gulf Coast Conservation Association and found that only 4% of those responding placed the highest emphasis on catching fish. Interestingly, this responding group had twice the rate of fishing trips of any other emphasis group. A study by Dawson and Wilkins (1981) examined the preferences of boating anglers in New York and Virginia in 1980. They found that catching fish was important but consistently ranked below most of the less quantifiable results of a fishing trip. A large percentage of anglers in New York (93%) and Virginia (88%) did not feel they had to catch a lot of fish to be satisfied with a trip as long as they caught something. Nearly half of the New York anglers (47%) and 39% of the Virginia anglers felt they could be satisfied if they did not catch anything.

The 1981 Marine Recreational Socioeconomic Survey concluded that "about half (of the anglers) reported a preferred species while fishing, and most of these said they would continue to fish if they knew their preferred species was not available." (USDC, 1986a). The survey results showed that two thirds of those who caught no fish were satisfied with their fishing trip (KCA, 1983).

Agnello and Anderson (1987) examined fishing success for summer flounder as a predictor of satisfaction. The formula used consisted of the respondents' level of satisfaction explained by the number of fish kept (summer flounder and other fish or total fish) and the trip cost. They found that the number of fish kept contributed to satisfaction but the analysis failed to explain 91% of the variability.

Theoretically, a reduction in landings would have an impact on angler behavior. It is expected that a drop in catch per unit effort would lead to a decrease in the number of trips (Anderson, 1977). However, the seven year average EEZ success rate for fishermen targeting on summer flounder was only 34% (Table 57). Since so many fishermen do not catch summer flounder, but a like number try the next year anyway, the reduction in catch attributable to a size limit would be expected to affect only the directed anglers who are successful. These successful anglers have expressed the greatest support for the size limit during the public hearings, however, so it is not clear that participation in the fishery by this group would actually be reduced. The anglers who take summer flounder, but were not targeting on them must also be considered. Summer flounder represents a bycatch and therefore is important even if the anglers were targeting on other species.

Since the regulations impose a *de facto* catch and release policy in the fishery, the actual catch rate for participating fishermen will not decrease. In fact, over time, a catch and release policy is expected to increase the catch rate since the same fish can be caught by more than one angler. The only rate that will change is the retention rate. Schaefer (pers. comm.) stated that one rationale for enacting New York's summer flounder minimum size limit (14") was to allow summer flounder to be caught and released in the spring and landed at a larger size in the fall. He felt that the minimum size achieved this objective and also encouraged a longer season for party and charter boats.

A 1980 survey of Virginia anglers fishing from boats (Dawson and Wilkins, 1981) determined that 93% would maintain their participation rate if faced with a minimum size limit. Of the other 7%, 5% said they would decrease their participation and 2% said they would stop fishing. The absence of a more substantial impact is not surprising, since the majority of the summer flounder caught in the recreational fishery are taken by a small number of relatively more highly skilled anglers.

In these analyses it is assumed that each trip is conducted by a different participant. This is somewhat inaccurate and overestimates the number of individual anglers fishing for summer flounder in the EEZ. The 2% of participants who would stop fishing will be reflected by canceling 2% of the directed trips. The 5% decreased participation will be reflected by assuming 2.5% of both directed and non-directed trips being canceled. These assumptions will overestimate the impacts of the regulation to some unknown but small extent. The losses estimated below for foregone landings, catch, and consumer surplus are for summer flounder only. For trips that are canceled there is an associated consumer surplus loss for the other fish which would have been caught and landed. These fish will also be available for other anglers to land, thus the loss may be a transfer within the recreational fishery and possibly to the commercial fishery. It is unknown to what extent this will occur. Summer flounder not landed are assigned a marginal value loss of $1.13 for the first summer flounder of a trip and $0.61 for the average summer flounder (Section 8.1.2). Each trip is valued at $42.92 (Table 58).

The marginal value for a caught and released summer flounder has not been explicitly determined but, for the purposes of these analyses, is assumed to be half that for one kept. Therefore, the marginal value loss associated with a minimum size must be halved to reflect the marginal value associated with the catch and release of undersized summer flounder.

		Trips lost	Flounder not landed	Expenditures redirected	Value lost
Directed	2% canceled	2,500	14,300	$107,300	$ 8,700
	2.5% reduced	3,100	17,800	$134,100	$ 10,850
Non-directed	2.5% reduced	2,000	8,300	$ 84,800	$ 5,100
Released summer flounder		-	460,000	-	$140,300
Total		7,600	500,400	$326,200	$164,950

Revenues will be lost to the recreational fishing business sector if fishing trips are canceled or not taken due to changes in catch per unit effort or retention per unit effort. However,the money not spent on cancelled fishing trips will be spent elsewhere in the economy on other goods and services. Executive Order 12291 (46 FR 34263) states that regulatory actions shall consider benefits and costs *to society* (emphasis added). Therefore, while the recreational fishing industry may lose this revenue, society as a whole will not and the redirection cannot be considered a cost, but simply a transfer.

Since the States from Massachusetts through North Carolina already have size limits, the change in the number of trips due to an increase in the size limit is unknown. It is expected that those anglers fishing from States already having a size limit of 14" would not change the number of their trips due to an EEZ size limit of 14". In addition, the actual response of anglers to a size limit may not be a reduction in trips but rather a redirection of effort. The assumptions made above concerning lost trips were based on Dawson and Wilkins (1981) and are considered to be conservative.

Increases in future catch because of decreased mortality of small fish will stimulate new interest in fishing for summer flounder. It is difficult to determine how many more summer flounder need be taken to actually motivate one more trip, but it is likely that the release of small fish will increase the catch rates for all anglers. This will augment the value of the fishing experience, regardless of whether the fish are retained.

2.4.2.3. Enforcement

Commercial fishery enforcement for this measure would be entirely dockside with increased surveillance of all EEZ landings and finfish otter trawl landings in particular. Since sale of EEZ landed smalls would be illegal, the surveillance could occur at the dock or at the processor, thereby centralizing effort. Based on the joint NMFS/Coast Guard enforcement document (USDC, 1985c) and the assumption of 900 vessels affected by the regulation (Section 8.1.1 and Table 33) approximately 2,300 contacts would be necessary per year (each vessel contacted 2.5 times per year). This would require approximately 2.6 man-years of enforcement effort at $50,000 per year or $130,000. The Council believes that this measure is designed for dockside enforcement only. In order to cut costs, efforts to include state enforcement officers, many of whom are already inspecting summer flounder for a minimum size, could be utilized.

The joint enforcement document does not address the enforcement costs of recreational fishing. Therefore, an estimate will be made based on the number of trips involved and the area covered. There were an estimated 427,000 recreational trips in the EEZ that landed or directed on summer flounder. This number is misleading, however, since there was an average of 2.8 participants per party (Section 8.1.2). Therefore, an estimated 155,000 vessel trips are involved in the EEZ summer flounder recreational fishery. Even this may be an overestimate since party and charter boats landed 28% of the summer flounder from the EEZ. It must be remembered that 63% of the EEZ landings are in states that have a possession or landing limit less than 14" (Table 46). Therefore, assuming that landing rates are constant along the coast, only 63% of the trips need to be intercepted by federal enforcement efforts.

This analysis is conducted assuming an arbitrary 5% coverage of the trips and an average of 15 contacts per day. The requirements become 2.2 man years of effort costing $110,000. To the extent that trips are monitored in states already having a minimum size, assistance is given to state agencies, or state regulations change, this requirement will vary.

To the extent that enforcement resources must be drawn from existing assignments the actual cost increases will be zero, and considered as transfers. The internal agency opportunity costs of such transfers would be the cost of the previous assignment. The cost to society would be the difference between the combined enforcement and avoidance costs in the current assignment and those in the summer flounder fishery. Since the societal costs are not quantifiable at this time all enforcement costs will be considered transfers.

2.4.2.4. Summary of selected costs and benefits

The costs and benefits during the first year of the regulations are estimated as follows:

Costs:	Commercial fishery lost revenue	$ 2,793,000
	Recreational marginal value	164,950
	Total	$ 2,957,950
Loss of:	Commercial landings	- 6.4 million pounds
	Recreational trips	- 7,600 trips
Benefits:	Reduced mortality	3.71 million summer flounder saved

2.4.2.5. Commercial, and Recreational Summer Flounder Revenues and Increased Landings Over Time due to Decreased Mortality

Assumptions

- The best estimate of current fishing mortality rate (F) is 0.65.
- The future fishing mortality rate (F) is assumed to be 0.60.
- The best estimate of the natural mortality rate (M) is 0.20.
- The proportion of landings by fishery is assumed to continue and is described by the seven year average of 59% commercial and 41% recreational.
- A commercial discard mortality rate of 60% is used.
- An annual discount rate of 3% is applied.

●The following commercial fishery 1979 to 1985 average price per pound, coast wide were used to calculate future benefits:

Small	$0.44	S,M,L & J	$0.77
Medium	$0.75	Unclassified	$0.78
Large	$0.94	Overall	$0.78
Jumbo	$1.22		

●All fish of the same age are assumed to be the same weight.

●The marginal values for recreationally caught fish as estimated by Agnello and Anderson (1987) are used.

Increased Landings

	Recreational		Commercial
Year	(000 fish)	(000 lbs)	(000 lbs)
2	564	841	1,210
3	821	1,422	2,047
4	936	1,787	2,571
5	988	1,999	2,876
6	1,011	2,119	3,050
7	1,022	2,188	3,148
8	1,027	2,221	3,197
9	1,027	2,222	3,197
10	1,027	2,222	3,197

Increased Revenues Due to Regulation Change (in 000's of $)

Year	Commercial	Recreational	Total
2	880	334	1,215
3	1,590	472	2,062
4	2,131	523	2,654
5	2,402	536	2,937
6	2,516	532	3,048
7	2,544	522	3,066
8	2,519	509	3,028
9	2,446	494	2,940
10	2,375	480	2,856

Note: All values are adjusted to 1985 dollars.

2.4.2.6. Comparisons of Discounted Yearly Costs and Benefits

The costs are listed above. Total yearly costs are determined to be $2,957,950.

Discounted Benefits and Costs (in millions of $)

Year	Benefits	Costs	Net Benefits
1	0	3.0	-3.0
2	1.2	2.9	-1.7
3	2.1	2.8	-0.7
4	2.7	2.7	-0.1
5	2.9	2.6	0.3
6	3.0	2.6	0.5
7	3.1	2.5	0.6
8	3.0	2.4	0.6
9	2.9	2.3	0.6
10	2.9	2.3	0.7
Total	23.8	26.0	-2.2

Given the assumptions stated above, the net benefit of moving to a size limit of 14" for EEZ caught summer flounder amounts to a negative $2.2 million in 1985 dollars for a ten year horizon discounted at 3%. If the commercial discard mortality rate is in fact greater than 60%, a lesser increase in commercial revenue will occur (absent a behavioral or gear change to reduce the take of undersized fish). As a worst case scenario, the above analysis was repeated under the assumption of 100% commercial discard mortality. The results projected a loss of $23.4 million for the same ten year time horizon. To the extent that the true discard mortality rate lies somewhere between 60% and 100%, or changes in commercial fishing practices reduce discarding, the net benefits of the proposed 14" size limit will lie within a range of negative $23.4 million to negative $2.2 million.

It must be noted, however, that the benefits specified above do not include the value of increased reproductive stability of the population which will occur with decreased fishing mortality. Any increase in recruitment resulting from survival of more summer flounder to reproductive maturity will result in more highly valued commercial and recreational fisheries. To be sure, it is chiefly this increase in spawning potential which is the aim of the proposed size limit. Unfortunately, this benefit cannot be quantified given present knowledge of summer flounder recruitment dynamics.

Apart from potential gains in recruitment, an additional benefit will result from survival of more summer flounder to older age classes. The benefit of a balanced age structure is most apparent when one considers the risk associated with compressing the age composition of the catch to where only one or two year classes dominate. Such compression of the age structure increases the risk of a year class failure resulting in collapse of the fishery. The costs of closing the fishery to allow rebuilding of the summer flounder stock are likely to be far greater than costs incurred to maintain a stable and balanced age structure.

2.4.2.7. Other costs and benefits

Non-quantified benefits and costs are the same as those listed for the adopted management measures. Refer to Chapter 9, Section 9.2.2.7.

2.5. IMPOSE A 14" TOTAL LENGTH SUMMER FLOUNDER MINIMUM SIZE LIMIT IN ALL FISHERIES, A 5.5" MINIMUM MESH APPLIED THROUGHOUT THE BODY OF THE NET FOR TRIPS LANDING 500 LBS OR MORE OF SUMMER FLOUNDER, ONCE 500 LBS OF SUMMER FLOUNDER HAVE BEEN RETAINED ONLY THE MESH SPECIFIED BY THE FMP MAY BE ON DECK OR IN USE, IMPLEMENT AN EEZ PERMIT SYSTEM WHEREBY OPERATORS OF VESSELS THAT PARTICIPATE IN THE FISHERY WILL NEED TO APPLY FOR AN ANNUAL PERMIT, AND REQUIRE THAT PERMITTEES MUST COMPLY WITH THE MORE STRINGENT OF STATE OR FEDERAL REGULATIONS.

2.5.1. Description

Initially, OY would equal all summer flounder 14" total length or larger caught by US fishermen. It would be illegal for fishermen, processors, or dealers to possess any summer flounder less than 14" in total length taken from Federal waters or by a Federally permitted vessel unless the fish were landed in a State with a larger minimum fish size limit, in which case the State limit would prevail. Otter trawl vessels landing 500 lbs or more of summer flounder would be required to fish with a 5.5"net unless the fish were landed in a State with a larger minimum mesh size limit, in which case the State limit would prevail. After 500 lbs of summer flounder have been retained , only nets of the legal size would be allowed on deck and in use. Foreign fishermen would not be permitted to retain summer flounder since US fishermen, by definition, would be harvesting the OY. Vessels fishing commercially for summer flounder, either directly or as a bycatch in other fisheries, and vessels for hire in the recreational fishery (party and charter boats) would be required to obtain annually renewable permits.

States with minimum sizes and minimum mesh regulations larger than in the FMP are encouraged to maintain them.

The provision that allows multiple nets on board a vessel and in use until the 500 lb of summer flounder criteria is met creates a need for significant at sea enforcement. To minimize this demand as much as possible it is necessary to establish a rigorous penalty schedule. The logic is simply that if there is a relatively low probability of detection of an offense, then the penalty for those detected must be sufficient to provide an adequate deterrent. The Council has identified a series of penalty schedule options, which are presented in Appendix II, for which the Council is seeking public comment through the hearing and review process.

2.5.2. Analysis

2.5.2.1. Commercial fishery

Since a federal permit will be required for all finfish otter trawlers operating in federal waters, all finfish otter trawl trips and landings from the EEZ are considered. Data from tables 34, 38, 62, 63, 66, and 67 primarily were used to conduct this analysis. In order to analyze mesh regulations it is necessary to use mesh selectivity studies. The term "catch" is used to describe all fish brought on board with the fishing gear. The term "landings" is used to describe all fish sold.

Four studies have been conducted (Anderson *et al.*, 1983; Gillikin *et al.*, 1981; Gillikin, 1982; and New Jersey, 1985) along different sections of the coast, during different seasons, and studying different types of summer flounder finfish otter trawling. For these reasons the studies cannot be combined and it is necessary to divide the summer flounder commercial fishery into three different fisheries areas. The areas are the northern area, encompassing NMFS water areas 511 through 611 and 613 (Figure 15), the middle area, encompassing NMFS water areas 612 and areas 614 through 624, and the southern area, encompassing NMFS water areas 625 through 639. The areas reflect different concentrations of summer flounder, different fishing seasons, and different migratory patterns. While many different areas could have been delineated, these three were chosen since they can be represented by the limited number of mesh selectivity studies available. Tow times in the commercial fishery average slightly less than 2 hours (Section 7). The Anderson *et al.* (1983), Gillikin *et al.* (1981), and Gillikin (1982) studies used tows ranging from .5 to 1 hour while the New Jersey tows varied from 1 to 2.5 hours. However, Anderson *et al.* (1983) felt that the shorter tow time would not affect mesh selectivity.

2.5.2.1.1. Northern Area

The northern area, for the purposes of this study, is considered to be NMFS water areas 511 through 611 and area 613. Less than 8% of this catch was landed in States south of New York. The only mesh selectivity study conducted in this area was Anderson *et al.* (1983) which used a 5.5" mesh net. Only the Shinnecock tows will be analyzed since the Montauk portion of the study was incomplete.

The control used codend meshes of 2.3" and 2.5" (Table 64) and the experimental codend used meshes that averaged 5.6". The control codends were those normally used by the commercial vessels and the experimental codend was used to determine the catchability of a 5.5" mesh. The tows are assumed to be representative of the summer flounder encountered in the region.

The results from all tows in the study were summed to arrive at the percentage of summer flounder caught by size by each set of nets (Table 66). Current landings were tabulated from the NMFS Weighout File and the ratios used to estimate overall landings and mortality following FMP implementation and post-FMP landings were calculated (Table 67.)

The catch would be divided by weight into size classes as follows:

	5.5"	Current	
Discards (< 14")	16%	38%	(including smalls)
Medium (14" - 16")	45%	40%	
Large (16" - 18")	30%	15%	
Jumbo (> 18")	9%	7%	

The weighout system shows an average of 4.7 million lbs of summer flounder landed in Maine, New Hampshire, Massachusetts,and Rhode Island by all finfish otter trawlers. The landings in the same states by finfish otter trawlers with 500 lbs or more per trip averaged 4.3 million or 90.1% of the total (Table 34). The NMFS general canvas data show that 96.6% of these four states' summer flounder landings are from the northern area. The total finfish otter trawl landings from the northern area average 6.7 million lbs composed of 6.2 million lbs north of New Jersey (including New York and Connecticut), 0.4 million lbs in New Jersey, and 20,000 lbs south of New Jersey. Therefore,using 90.1% as an approximation and 6.7 million lbs as the total finfish otter trawl landings, it is estimated that 6.0 million lbs of summer flounder are landed in the 500 lb regulated trip fishery. Of these, 5.6 million lbs are north of New Jersey, 0.4 million lbs are in New Jersey, and 20,000 lbs are south of New Jersey.

The EEZ portion of the total northern area landings averages 4.3 million lbs per year (Tables 26 and 62) and the 500 lb trip portion averages 3.9 million lbs. These landings are assumed to be composed of 3.7 million lbs from north of New Jersey (14"minimum) and 0.2 million lbs from New Jersey (13" minimum).

The post regulation catch from the EEZ is expected to be 4.8 million lbs with 4.6 million lbs north of New Jersey (3.7 million X 1.255) and 0.2 million lbs from New Jersey (0.2 million X 0.965) (Table 67). This catch was divided and valued by class as follows (Tables 63 and 66) (X 1000):

Discards	787 lbs	
Medium	2,141 lbs	$1,841
Large	1,416 lbs	$1,543
Jumbo	456 lbs	$ 570
Total landings	4,013 lbs	$3,954

The current summer flounder fishery was valued at $1.03 per average pound (Table 63) or $4.0 million. The expected change in revenue for summer flounder from the 500 lb trip fishery becomes less than $50,000.

Under current fishing practices in the directed finfish otter trawl fishery, for every 3,631 lbs of summer flounder landed north of New Jersey and 4,723 lbs landed in New Jersey there are 39 summer flounder caught less than 11" and 2,057 caught between 11" and 14". Expanding this to the 3.7 million lbs and 0.2 million lbs calculated above (ratios of 1,074:1 and 42: 1) yields the following mortalities:

	North of NJ	NJ	Total
< 11"	42	2	44
11" - 14"	2,209	86	2,295

Based on the percentages and average weight per fish (Table 66) the post regulation catch is expected to be composed of:

< 11"	5,000 lbs	14,000 summer flounder
11" - 14"	782,000 lbs	889,000 summer flounder

Examining the total mortality using the ratios by area derived above yields the change in mortality for fish greater than 14". Total expanded current mortality becomes 5.5 million summer flounder. The post regulation mortality is estimated at 3.8 million summer flounder.

The change in mesh related mortality will be a reduction of:

< 11"	30,000 summer flounder
11" - 14"	1,406,000 summer flounder
> 14"	264,000 summer flounder

This reduction in mortality will occur each year of the proposed regulation, everything else held unchanged.

2.5.2.1.2. Middle Area

The middle area is considered to be NMFS water areas 614 through 624 and area 612. According to NMFS data, 10.4% of the landings from these areas occur north of New Jersey, 69.4% are in New Jersey, and 20.2% are south of New Jersey. One mesh selectivity study is applicable to this area. (New Jersey, 1985)

The New Jersey mesh selectivity study (New Jersey, 1985) used the commercial 3" mesh normally used by the vessels as controls. These varied from 2.6" to 3.3" when wet. (Table 64) The experimental 5.5" mesh net used (Table 64, NJ C) measured 5.7"when wet. The tows are assumed to be representative of the summer flounder encountered in the area.

The results from all tows in the study were summed to arrive at the percentage of summer flounder caught by size by each set of nets (Table 66). The current and post regulation ratios and landings are shown in Table 67. The post regulation catch would be divided by weight into size classes as follows:

	5.5"	Current	
Discards (< 14")	27%	43%	(including smalls)
Medium (14" - 16")	41%	38%	
Large (16" - 18")	20%	15%	
Jumbo (> 18")	12%	4%	

Current average finfish otter trawl landings from this area are 6.7 million lbs of which 0.7 million lbs are landed north of New Jersey, 4.6 million lbs are landed in New Jersey, and 1.4 million lbs are landed south of New Jersey. The New Jersey finfish otter trawl landings from the middle area are 91.2% of the total finfish otter trawl landings from that state. The weighout data show that 500 lb trips of summer flounder account for 96.3% of all summer flounder landings by finfish otter trawlers. This percentage will be applied to the total fishery from this area. Based on this assumption, the current 500 lb trip fishery accounts for 6.4 million lbs of which 0.7 million lbs are landed north of New Jersey, 4.5 million lbs are landed in New Jersey, and 1.3 million lbs are landed south of New Jersey. The EEZ portion of the total middle area landings averages 5.8 million lbs per year (Tables 26 and 62) and the 500 lb trip portion averages 5.6 million lbs. These landings are assumed to be composed of 0.6 million lbs from north of New Jersey (14" minimum), 3.8 million lbs from New Jersey (13"minimum), and 1.2 million lbs from south of New Jersey (12"minimum).

The post regulation catch from the EEZ is expected to be 4.0 million lbs with 0.6 million lbs north of New Jersey, 2.7 million lbs from New Jersey, and 0.7 million lbs from south of New Jersey (Table 67). This catch was divided and valued (X 1000) by class as follows:

Discards	1,084 lbs	
Medium	1,644 lbs	$1,332
Large	788 lbs	$ 788
Jumbo	484 lbs	$ 600
Total landings	2,916 lbs	$2,720

The current summer flounder fishery had an average value of $0.80/lb (Table 63) or $4.5 million. The expected change in revenue for summer flounder from the 500 lb trip fishery becomes a loss of $1.8 million.

Under current fishing practices in the 500 lb trip fishery, for every 294 lbs of summer flounder landed north of New Jersey there are 55 summer flounder caught less than 11" and 235 caught between 11" and 14". The same applies to every 418.4 lbs landed in New Jersey and every 490.5 lbs landed south of New Jersey (Table 67). Expansion ratios become 2,041:1 north of New Jersey, 6,453:1 for New Jersey, and 1,427:1 for landings south of New Jersey. The total current mortality (X000) becomes:

	North of NJ	NJ	South of NJ	Total
< 11"	112	355	78	545
11" - 14"	480	1,516	335	2,331

Based on the percentages and average weight per fish (Table 66) the post regulation catch is expected to be composed of:

< 11"	32,000 lbs	110,000 summer flounder
11" - 14"	1,052,000 lbs	1,119,000 summer flounder

Examining the total mortality using the ratios by area derived above yields the change in mortality for fish greater than 14". Total expanded current mortality becomes 4.9 million summer flounder. The post regulation mortality is estimated at 2.2 million summer flounder.

The change in mesh related mortality will be a reduction of:

< 11"0.4 million summer flounder
11" - 14" 1.2 million summer flounder
> 14" 1.1 million summer flounder

This reduction in mortality will occur each year of the proposed regulation, *everything else held unchanged*.

2.5.2.1.3. Southern Area

The southern area is considered to be NMFS water areas 625 through 639. Approximately 1% of the landings from this area are landed in States north of Virginia. They will be considered part of the Virginia calculations for the purposes of this analysis. One mesh selectivity study conducted by the State of North Carolina is available for this area (Gillikin *et al.*, 1981).

The North Carolina mesh selectivity study (Gillikin *et al.*,1981) used 5.2" and 5.7" experimental codend meshes. The results of the experimental tows are averaged to approximate the results of a 5.5" codend mesh. These results may not be directly additive, however, since the magnitude of inaccuracy is unknown, it was assumed to be negligible for the purposes of this analysis. The weighted results of these tows were compared to the control tows for all North Carolina mesh studies (Table 64), which are assumed to represent the industry standard (Gillikin, pers. comm.).

The results for the summed experimental and control average catches by percentage are presented in Table 66. The current and post regulation landings and ratios are presented in Table 67. The catch would be distributed by weight into size classes as follows:

	5.5"	Current	
Discards (< 14")	9%	30%	(including smalls)
Medium (14" - 16")	31%	25%	
Large (16" - 19.7")	45%	33%	
Jumbo (> 19.7")	15%	12%	

The post regulation EEZ catch is expected to be 13.7 million lbs with 5.5 million lbs landed in Maryland and Virginia and 8.2 million lbs landed in North Carolina (Table 67). This EEZ catch is expected to be divided and valued (X000) by class as follows:

Discards	1,260 lbs	
Medium	4,316 lbs	$ 2,891
Large	6,124 lbs	$ 4,960
Jumbo	2,000 lbs	$ 2,260
Total landings	12,440 lbs	$10,111

The current summer flounder fishery was valued at $0.67 per average pound (Table 63) or $8.2 million. The expected change in revenue for summer flounder from the directed fishery becomes a gain of $1.9 million.

Under current fishing practices in the directed fishery, for every 339 lbs of summer flounder landed in North Carolina and every 327 lbs landed north of North Carolina there are 96 summer flounder caught less than 11" and 90 caught between 11" and 14". Expansion ratios become 21,833:1 for North Carolina and 14,507:1 for Virginia and Maryland. The total current mortality (X000) becomes:

	MD & VA	North Carolina	Total
< 11"	1,393	2,096	3,489
11" - 14"	1,306	1,965	3,271

Based on the percentages and average weight per fish (Table 66) the post regulation catch is expected to be composed of:

< 11"	96,000 lbs	309,000 summer flounder
11" - 14"	1,165,000 lbs	1,266,000 summer flounder

Examining the total mortality using the ratios by area derived above yields the change in mortality for fish greater than 14". Total expanded current mortality becomes 11.9 million summer flounder. The post regulation mortality is estimated at 8.1 million summer flounder.

The change in mesh related mortality will be:

< 11"	3.2 million summer flounder (gain)
11" - 14"	2.0 million summer flounder (gain)
> 14"	1.4 million summer flounder (loss)

This reduction in mortality will occur each year of the proposed regulation, everything else held unchanged.

2.5.2.1.4. Summary of mesh studies

The total reduction in mortality expected from a 5.5" mesh restriction and 14" minimum size in the EEZ directed commercial fishery is:

< 11"	3.6 million summer flounder
11" - 14"	8.6 million summer flounder
> 14"	2.8 million summer flounder

Landings will be reduced by 10.5 million pounds and the loss in ex-vessel revenue is estimated at $5.55 million.

These conclusions include the assumptions of complete compliance, no tolerance for undersized landings, all smalls less than 14" in length, and an accurate description of the directed fishery presented in the analysis.

2.5.2.1.5. Non-mesh regulated fishery effects

Based on weighout data (Tables 33 and 35) 95.5% of the summer flounder landed by finfish otter trawlers were landed from trips with more than 500 lbs of summer flounder. Alternative 4 estimated the EEZ landings of smalls from finfish otter trawlers to average 6.3 million lbs. Therefore, it is estimated that, on average, 6.0 million lbs of smalls are landed from the regulated summer flounder finfish otter trawl fishery.

The loss to fishermen making non-regulated trips is expected to be 0.3 million lbs for finfish otter trawlers and 0.1 million lbs for other gear types. The total estimated 0.4 million lbs valued at $0.44 per lb (Table 53) results in a yearly loss of $176,000.

2.5.2.1.6. Bycatch

The weighout data allowed estimation of finfish otter trawl trips landing 500 lbs or more of summer flounder which had a summer flounder composition of 48% by weight and 68% by value (Table 38). These estimates are recorded landings and probably do not include "shack" (Section 8.1.1).

The Anderson *et al.* (1983) mesh study listed weights of summer flounder, winter flounder, black sea bass, scup, butterfish, *Loligo* squid, and other fish. The experimental 5.5" (range 5.6" to 5.8") mesh net compared to the control mesh (industry standard) caught 26% of the weight of the named species other than summer flounder and 71% of the weight of the other fish. The change in value of the identified bycatch species (other than summer flounder) was a loss of approximately 72%.

The New Jersey mesh study (New Jersey, 1985) listed numbers of squid, butterfish, spot, windowpane flounder, porgy, smooth dogfish, skates, rays, sea robins, and horseshoe crabs. The experimental 5.5" (5.7") mesh compared to the control 3" mesh caught 21% of the first 5 species by number and 48% of the last 5 species by number. Without weight information it is impossible to assess the loss in bycatch revenue although it may probably be approximately 70%.

The North Carolina mesh study (Gillikin *et al.*, 1981) listed weights of summer flounder, weakfish, spot, Atlantic croaker, butterfish, dogfish, and "other" fish. The experimental 5.5"(5.7") mesh compared to the control mesh (industry standard) caught 12% of the weight of the dogfish, 0% of the remaining named species other than summer flounder, and 34% of the 'other fish'. Without a determination of the composition and value of the 'other fish' it is impossible to accurately determine the actual marketable loss. However, it is obvious that the loss in marketable bycatch is substantial.

At this time it is impossible to accurately estimate the loss in bycatch associated with the mesh regulation. The weighout data show that the 500 lb or more fishery was predominately summer flounder with only 32% of the value and 52% of the weight from all "other" species. Another way to view this is that the bycatch was 48% of the value and 111% of the weight of the summer flounder from the 500 lb trip regulated fishery. The summer flounder value of the proposed regulated fishery was $16.7 million and the weight was 21.7 million pounds. Therefore, the bycatch associated with the regulated fishery was estimated to be $8.0 million weighing 24.1 million pounds. The mesh selectivity studies show that about 70% of the bycatch may be lost with a 5.5" mesh. The maximum bycatch loss due to the mesh regulation is estimated to be $5.6 million weighing 16.9 million pounds.

An important factor to remember when considering bycatch reductions is that the fish not caught by these nets will be available to other fishermen. These fish may be caught in the same or future years by the same fishermen or by different fishermen. Some of the fish will also be eaten by other fish which will be caught by fishermen. To the extent that this occurs it is necessary to consider some of the lost bycatch as a transfer to other parts of the fishing fleet and not an actual loss. The extent of this transfer is presently unquantifiable. While both estimates (bycatch loss as a cost or as a transfer) are presented as the extreme possibilities, it is certain that reality is between the two.

2.5.2.1.7. Enforcement

Due to the requirement of one mesh on deck this alternative requires at sea enforcement in addition to dockside enforcement of minimum size landings. The at sea enforcement efforts will be modified by excluding the groundfish minimum mesh area (which has already had enforcement allocations) and by estimating the number of vessels fishing for summer flounder in the EEZ in the remaining areas.

The number of vessels that landed any summer flounder caught in the EEZ south of the large mesh area specified in the Multi-Species FMP (NEFMC, 1986) in 1985 is estimated to be 617 (471 from the Weighout files, 76 in New York, and 70 in North Carolina). However, the analysis is based on 650 vessels requiring at sea inspection to reflect the redirection of groundfish otter trawlers to summer flounder and some vessels which will not be fishing for summer flounder but will be trawling in the same area and therefore need to be checked. The number requiring dockside inspection remains at 900 (Alternative 4)

Dockside enforcement would involve approximately 3.3 contacts per vessel per year and require 4.1 man-years ($50,000 per year).

At sea enforcement is estimated to require 2 contacts per vessel per year (1,300 contacts) with an average of 4 contacts per enforcement vessel per day (325 days). It is estimated that patrol vessels ($6,828 per day) would be used for most if not all of the at sea enforcement contacts.

In addition, one extra man year (costed at dockside enforcement time) would be necessary to coordinate the at sea and dockside enforcement efforts. This coordination is envisioned as an improved use of the permit and weighout files to deploy Coast Guard or dock side efforts toward vessels known to have been in the summer flounder fishery in the past. Note that the intent is not to use the weighout file to write violations, but to use all available data to dispatch enforcement resources. The concept is that an individual with computer access to the weighout file and the permit file can respond on a real time basis to Coast Guard queries concerning whether a particular vessel has ever landed summer flounder (no information concerning actual quantities landed need be on file). This would reduce the number of random boardings, thus reducing cost. Obviously, some boardings of vessels that had no history of landing summer flounder would be necessary, but a strategy could be developed to optimize enforcement while minimizing costs.

The total annual enforcement costs for commercial regulations would be approximately $2.5 million.

To the extent that enforcement resources must be drawn from existing assignments the actual cost increases will be zero, and considered as transfers. The internal agency opportunity costs of such transfers would be the cost of the previous assignment. The cost to society would be the difference between the combined enforcement and avoidance costs in the current assignment and those in the summer flounder fishery. Since the societal costs are not quantifiable at this time all enforcement costs will be considered transfers.

2.5.2.2 Recreational fishery

The impacts on the recreational fishery will be the same as presented in Alternative 4.

2.5.2.3. Summary of selected costs and benefits

The costs and benefits during the first year of the regulations as estimated above are as follows:

Costs:		
	Commercial fishery lost revenue	
	Mesh regulated	$5,550,000
	Non-mesh regulated	$176,000
	Bycatch	$5,600,000 (transfer *)
	Recreational marginal value	$164,950
	Total	$11,490,950 (- transfer *)
Loss of:		
	Commercial landings	- 10.5 million pounds
	Bycatch	- 16.9 million pounds
	Recreational trips	- 7,600 trips
Benefits:	Reduced mortality	13.07 million summer flounder saved

* Transfers are those fish caught during other commercial fishing trips or by recreational anglers during the present or future years, and, to some lesser extent, those fish which subsequently enter the food chain.

2.5.2.4. Commercial, and Recreational Summer Flounder Revenues and Increased Landings Over Time due to Decreased Mortality

Assumptions

- The best estimate of current fishing mortality rate (F) is 0.65.
- The future fishing mortality rate (F) is assumed to be 0.50.
- The best estimate of the natural mortality rate (M) is 0.20.
- The proportion of landings by fishery is assumed to continue and is described by the seven year average of 59% commercial and 41% recreational.
- A commercial discard mortality rate of 60% is used.
- An annual discount rate of 3% is applied.
- The following commercial fishery 1979-1985 average price per pound, coast wide were used to calculate future benefits:

Small	$0.44	S,M,L & J	$0.77
Medium	$0.75	Unclassified	$0.78
Large	$0.94	Overall	$0.78
Jumbo	$1.22		

- All fish of the same age are assumed to be the same weight.
- The marginal values for recreationally caught fish as estimated by Agnello and Anderson (1987) are used.

Increased Landings

	Recreational		Commercial
Year	(000 fish)	(000 lbs)	(000 lbs)
2	1,490	2,451	3,527
3	2,463	4,614	6,641
4	2,946	6,108	8,790
5	3,186	7,079	10,187
6	3,305	7,693	11,070
7	3,364	8,064	11,604
8	3,386	8,221	11,830
9	3,391	8,225	11,879
10	3,391	8,225	11,879

Increased Revenues Due to Regulation Change (in 000's of $)

Year	Commercial	Recreational	Total
2	2,515	883	3,398
3	4,442	1,416	5,858
4	6,990	1,664	8,634
5	8,562	1,726	10,289
6	9,404	1,739	11,143
7	9,794	1,718	11,513
8	9,874	1,680	11,554
9	9,634	1,633	11,266
10	9,353	1,585	10,938

Note: All values are adjusted to 1985 dollars.

2.5.2.5. Comparisons of Discounted Yearly Costs and Benefits

The costs are listed above. Total yearly costs are determined to be $5,890,950, assuming all bycatch lost to the mesh regulated fishery is transferred to other fisheries.

Discounted Benefits and Costs (in millions of $)

Year	Benefits	Costs	Net Benefits
1	0	5.9	- 5.9
2	3.4	5.7	- 2.3
3	5.9	5.6	0.3
4	8.6	5.4	3.2
5	10.3	5.2	5.1
6	11.1	5.1	6.1
7	11.5	4.9	6.6
8	11.6	4.8	6.8
9	11.3	4.6	6.6
10	10.9	4.5	6.4
Total	84.6	51.7	32.9

Given the assumptions stated above, the net benefit of moving to a size limit of 14" for EEZ caught summer flounder and a mesh size of 5.5" for the EEZ directed fishery amounts to $32.9 million in 1985 dollars for a ten year horizon discounted at 3%. If the commercial discard mortality rate is in fact greater than 60% and/or the bycatch from the mesh regulated fishery is not completely transferred, a lesser increase in commercial revenue will occur (absent a behavioral or gear change to reduce the take of undersized fish). As a worst case scenario, the above analysis was repeated under the assumption of 100% commercial discard mortality and the maximum 70% loss of bycatch. The results projected a loss of $28.2 million for the same ten year time horizon. To the extent that the true discard mortality rate lies somewhere between 60% and 100% or changes in commercial fishing practices reduce discarding and the true bycatch loss lies between 0 and $5.6 million, the net benefits of the proposed 14" size limit with a 5.5" mesh will lie within a range of negative $28.2 million to positive $32.9 million.

It must be noted, however, that the benefits specified above do not include the value of increased reproductive stability of the population which will occur with decreased fishing mortality. Any increase in recruitment resulting from survival of more summer flounder to reproductive maturity will result in more highly valued commercial and recreational fisheries. To be sure, it is chiefly this increase in spawning potential which is the aim of the proposed size limit. Unfortunately, this benefit cannot be quantified given present knowledge of summer flounder recruitment dynamics.

Apart from potential gains in recruitment, an additional benefit will result from survival of more summer flounder to older age classes. The benefit of a balanced age structure is most apparent when one considers the risk associated with compressing the age composition of the catch to where only one or two year classes dominate. Such compression of the age structure increases the risk of a year class failure resulting in collapse of the fishery. The costs of closing the fishery to allow rebuilding of the summer flounder stock are likely to be far greater than costs incurred to maintain a stable and balanced age structure.

2.5.2.6. Other costs and benefits

Non-quantified benefits and costs are the same as those listed for the adopted management measures. Refer to Chapter 9, Section 9.2.2.7.

6. IMPOSE A 13" TOTAL LENGTH SUMMER FLOUNDER MINIMUM SIZE LIMIT, IMPLEMENT AN EEZ PERMIT SYSTEM WHEREBY OPERATORS OF VESSELS THAT PARTICIPATE IN THE FISHERY WILL NEED TO APPLY FOR AN ANNUAL PERMIT, AND REQUIRE THAT PERMITTEES MUST COMPLY WITH THE MORE STRINGENT OF STATE OR FEDERAL REGULATIONS.

This now appears in chapter 9 as the adopted management measures.

2.7. IMPOSE A 13" TOTAL LENGTH SUMMER FLOUNDER MINIMUM SIZE LIMIT IN ALL FISHERIES, A 5.0" MINIMUM MESH APPLIED THROUGHOUT THE NET FOR TRIPS LANDING 500 LBS OR MORE OF SUMMER FLOUNDER, ONCE 500 LBS OF SUMMER FLOUNDER HAVE BEEN RETAINED ONLY THE MESH SPECIFIED BY THE FMP MAY BE ON DECK OR IN USE, IMPLEMENT AN EEZ PERMIT SYSTEM WHEREBY OPERATORS OF VESSELS THAT PARTICIPATE IN THE FISHERY WILL NEED TO APPLY FOR AN ANNUAL PERMIT, AND REQUIRE THAT PERMITTEES MUST COMPLY WITH THE MORE STRINGENT OF STATE OR FEDERAL REGULATIONS.

2.7.1. Description

Initially, OY would equal all summer flounder 13" total length or larger caught by US fishermen. It would be illegal for fishermen, processors, or dealers to possess any summer flounder less than 13" in total length taken from Federal waters or by a Federally permitted vessel unless the fish were landed in a State with a larger minimum fish size limit, in which case the State limit would prevail. Otter trawl vessels landing 500 lbs or more of summer flounder would be required to fish with a 5.0"net unless the fish were landed in a State with a larger minimum mesh size limit, in which case the State limit would prevail. After 500 lbs of summer flounder have been retained , only nets of the legal size would be allowed on deck and in use. Foreign fishermen would not be permitted to retain summer flounder since US fishermen, by definition, would be harvesting the OY. Vessels fishing commercially for summer flounder, either directly or as a bycatch in other fisheries, and vessels for hire in the recreational fishery (party and charter boats) would be required to obtain annually renewable permits.

States with minimum sizes and minimum mesh regulations larger than in the FMP are encouraged to maintain them.

The provision that allows multiple nets on board a vessel and in use until the 500 lb of summer flounder criteria is met creates a need for significant at sea enforcement. To minimize this demand as much as possible it is necessary to establish a rigorous penalty schedule. The logic is simply that if there is a relatively low probability of detection of an offense, then the penalty for those detected must be sufficient to provide an adequate deterrent. The Council has identified a series of penalty schedule options, which are presented in Appendix II, for which the Council is seeking public comment through the hearing and review process.

2.7.2. Analysis

2.7.2.1. General

The imposition of a 14" minimum length and a 5.5" mesh size coast wide at this time would result in a large loss of income due to marketable flounder passing through the mesh and particularly in the reduction of other species normally taken in the mixed trawl fishery.

The Council believes that this alternative would result in a definite improvement in the stocks due to the above factors and is cognizant that there is only a small difference (6%) in yield per recruit between 13" and 14" female summer flounder at the assumed current fishing mortality level (0.65).

This alternative should result in less economic disruption while working toward achieving the FMP's objectives.

2.7.2.2. Commercial fishery

Since a federal permit will be required for all finfish otter trawlers operating in federal waters, all finfish otter trawl trips and landings from the EEZ are considered. Data from tables 34, 38, 62, 63, 66, and 67 are used to conduct this analysis. In order to analyze mesh regulations it is necessary to use mesh selectivity studies. The term "catch" is used to describe all fish brought on board with the fishing gear. The term "landings" is used to describe all fish sold.

Three studies have been conducted using approximately 5.0" measured codend meshes (Gillikin, *et al*, 1981; Gillikin, 1982; and New Jersey, 1985) which occurred along different sections of the coast, during different seasons, and addressed different types of summer flounder finfish otter trawling. For these reasons the three studies cannot be combined and it is necessary to divide the summer flounder commercial fishery into two different fisheries areas. The areas are the northern area, encompassing NMFS water areas 511 through 624 (Figure 15) and the southern area, encompassing NMFS water areas 625 through 639. The areas reflect different concentrations of summer flounder, different fishing seasons, and different migratory patterns. While many different areas could have been delineated, these were chosen since they can be represented by the limited number of mesh selectivity studies available. Tow times in the commercial fishery average slightly less than 2 hours (Section 7.1). The Gillikin studies used tows ranging from .5 to 1 hour while the New Jersey tows varied from 1 to 2.5 hours.

2.7.2.2.1. Northern Area

For the purposes of this study, the combined water areas of 511 through 624 are considered part of the northern area. This is necessary since only one mesh study (New Jersey, 1985) has been conducted north of Virginia using a 5.0" measured codend mesh.

According to NMFS data, 49.6% of the seven year average commercial landings from these water areas are north of New Jersey (14" minimum size), 39.6% are in New Jersey (13" minimum size), and 10.8% are south of New Jersey (12" minimum size). In order to more accurately represent the current fishery conditions in the area, the control portions of both the Long Island (Anderson *et al.*, 1983) and New Jersey (New Jersey, 1985) studies are averaged. This averaged control is then compared to the New Jersey experimental mesh measuring 5.0" with an ICES gauge. It is expected that this new analysis will overestimate the reduction in catch mortality to some unknown but relatively small degree since fewer summer flounder less than 13" are caught in waters north of New Jersey than south.

The State of New Jersey mesh selectivity study (New Jersey, 1985) used control codends of the commercial 3" mesh normally used by the vessels. These varied from 2.6" to 2.8" when wet (Table 64, NJ N and NJ S). The Long Island study used control codends which measured 2.3 and 2.5". The experimental 5" codend meshes used were 4.8" and 5.0" when wet. The tows are assumed to be representative of the summer flounder encountered in the area.

Due to the larger number of summer flounder caught in the Long Island control tows (analysis for 5.5" codend mesh), a direct average of the number of summer flounder and their weight is not possible between the combined controls and the New Jersey 5.0"ICES measured experimental mesh. Therefore, the averaged control will be assumed to be composed of 463 summer flounder as was the New Jersey control. However, the distribution by size and average weight per fish will be based on the averaged control.

The results from all tows in the study were summed to arrive at the number and percentage of summer flounder caught by size by each set of nets (Table 66). The current and post regulation landings and ratios are shown in Table 67. The post regulation catch would be divided by weight into size classes as follows:

	5.0"	Current	
Discards (< 13")	6%	19%	(including smalls)
Smalls (13" - 14")	14%	21%	
Medium (14" - 16")	45%	39%	
Large (16" - 18")	23%	15%	
Jumbo (> 18")	12%	6%	

The average finfish otter trawl ex-vessel value (in 1985 adjusted dollars) for summer flounder from this area (a combination of the Northern and Middle areas used to evaluate Alternatives 4 and 5) over the past seven years is as follows:

Small	$0.50
Medium	$0.83
Large	$1.05
Jumbo	$1.24
Unclassified	$0.99
Average	$0.92

The total landings of summer flounders from finfish otter trawlers from the northern area was determined to be 13.4 million lbs (Alternative 5, northern and middle areas). The 500 lb regulated trip fishery portion of these landings was determined to be 12.4 million lbs or 92.5% (Alternative 5, northern and middle areas). Assuming that the 92.5% is applicable to EEZ only landings, the 500 lb per trip directed fishery in the northern area from the EEZ was 9.5 million lbs. These landings are assumed to be composed of 4.3 million lbs from north of New Jersey (14" minimum), 4.0 million lbs from New Jersey (13"minimum), and 1.2 million lbs south of New Jersey (12" minimum).

The post regulation catch for landings north of New Jersey is expected to be 104% of this or 4.5 million lbs. The catch for New Jersey landings is expected to be 76.5% of this or 3.1 million lbs. The catch for landings south of New Jersey is expected to be 65% of this or 0.8 million lbs. The total post regulation catch of 8.4 million lbs is expected to be divided and valued by class (X000) as follows:

Discards	1,156 lbs	
Small	558 lbs	$ 279
Medium	3,814 lbs	$3,165
Large	1,890 lbs	$1,985
Jumbo	983 lbs	$1,219
Total landings	7,245 lbs	$6,648

The current summer flounder directed fishery landings were valued at $0.92 per pound or $8.5 million. The expected loss in revenue for summer flounder becomes $1.9 million.

Based on the determinations in Table 67 combined with the revised landings (above) the ratios become 13,822:1 for north of New Jersey, 9,456:1 for New Jersey, and 2,396:1 for south of New Jersey. The total current mortality (X000) becomes:

	North of NJ	NJ	South of NJ	Total
< 11"	387	265	67	719
11" - 13"	1,189	813	206	2,208
13" - 14"	1,672	1,144	290	3,106

Based on the percentages and average weight per fish (Table 66) the post regulation catch (X000) is expected to be composed of:

< 11"	0 lbs	0 summer flounder
11" - 13"	512 lbs	665 summer flounder
13" - 14"	1,201 lbs	1,201 summer flounder

Examining the change in mortality using the ratios by area derived above and comparing that to the total current mortality yields the change in mortality for fish greater than 14". Total expanded current mortality becomes 11.8 million summer flounder. The post regulation mortality is estimated at 6.0 million summer flounder.

The change in mesh related mortality will be a reduction of:

< 11"	0.7 million summer flounder
11" - 14"	3.4 million summer flounder
> 14"	1.8 million summer flounder

This reduction in mortality will occur each year of the proposed regulation, everything else held unchanged.

2.7.2.2.2. Southern Area

The southern area (water areas 625 through 639, Figure 15) is assumed to consist of 7.5 million lbs of EEZ landings in North Carolina (Table 29) and 4.8 million lbs of EEZ landings in Maryland and Virginia (6.1 million lbs from Table 29 minus 1.3 million lbs in the northern area, above). This results in total EEZ landings of 12.3 million lbs and a 500 lbs trip directed fishery total of 12.2 million lbs (98.8% of total landings, Alternative 5).

Post regulation catch from the EEZ in North Carolina is expected to be 83% of this or 6.2 million lbs and in Virginia and Maryland 87% or 4.1 million lbs. The total 10.3 million lbs is expected to be distributed and valued by class (X000) as follows:

Discards	834 lbs	
Small	1,730 lbs	$ 692
Medium	3,996 lbs	$2,678
Large	2,812 lbs	$2,278
Jumbo	927 lbs	$1,048
Total landings	9,465 lbs	$6,696

The current directed fishery from the southern area is valued at $0.67 per pound or $8.2 million. The expected loss in revenue for summer flounder becomes $1.5 million.

Based on the determinations in Table 67 combined with the revised landings (above) the ratios become 18,604:1 for North Carolina and 12,360:1 for Virginia and Maryland. The total current mortality (X000) becomes:

	NC	MD & VA	Total
< 11"	2,084	1,384	3,468
11" - 13"	1,191	791	1,982
13" - 14"	781	519	1,300

Based on the percentages and average weight per fish (Table 66) the post regulation catch (X000) is expected to be composed of:

< 11"	185 lbs	515 summer flounder
11" - 13"	650 lbs	843 summer flounder
13" - 14"	1,730 lbs	1,748 summer flounder

Examining the change in mortality using the ratios by area derived above and comparing that to the total current mortality yields the change in mortality for fish greater than 14". Total expanded current mortality becomes 11.9 million summer flounder. The post regulation mortality is estimated at 7.4 million summer flounder.

The change in mesh related mortality will be a reduction of:

< 11"	3.0 million summer flounder
11" - 14"	0.7 million summer flounder
> 14"	0.8 million summer flounder

This reduction in mortality will occur each year of the proposed regulation, everything else held unchanged.

2.7.2.2.3. Summary of mesh studies

The total reduction in mortality expected from a 5.0" mesh restriction and 13" minimum size in the EEZ directed commercial fishery is:

< 11"	3.7 million summer flounder
11" - 14"	4.1 million summer flounder
> 14"	2.6 million summer flounder

Landings will be reduced by 6.9 million pounds and the loss in ex-vessel revenue is estimated at $4.1 million.

These conclusions include the assumptions of complete compliance, no tolerance for undersized landings, all smalls less than 14" in length, and an accurate description of the directed fishery presented in the analysis.

2.7.2.3. Non-mesh regulated fishery effects

It was estimated in Alternative 5 that from the EEZ, 0.3 million lbs of smalls would be landed by non-mesh regulated finfish otter trawl trips and 0.1 million lbs by other gear types.

Using the analysis from the 13" minimum size only alternative (section 9.2), 4.5% of the summer flounder landings form the 11" and 12"minimum size state should be considered along with the other gear landings from those states. This results in 187,000 lbs from the 12" states and 138,000 lbs from the 11" state. Again based on the analysis in the 13" minimum only alternative, 83,000 lbs is expected to be discarded in the 12" states and 81,000 lbs in the 11 " state.

Using the seven year average value of $0.44 per pound for smalls (Table 53) and the total of 163,000 lbs of smalls less than 13", the ex-vessel value will be reduced by $72,000.

2.7.2.4. Bycatch

The effect on bycatch of this regulation is similar to that analyzed in Alternative 5. Bycatch was determined to compose 48% of the value and 111% of the weight of the summer flounder from the 500 lb regulated trip fishery. The summer flounder valued of the proposed regulated fishery was $16.7 million and the weight was 21.7 million lbs. The associated bycatch is expected to weigh 24.1 million lbs and be valued at $8.0 million. While it is probable that a 5.0" mesh net will retain more bycatch than a 5.5"mesh, the mesh studies, as conducted, do not allow full assessment of the market value of the bycatch. Therefore, this analysis will be conservative and assume a maximum of 70% bycatch loss. A 70% bycatch loss is expected to be 16.9 million lbs valued at $5.6 million.

An important factor to remember when considering bycatch reductions is that the fish not caught by these nets will be available to other fishermen. These fish may be caught in the same or future years by the same fishermen or by different fishermen. Some of the fish will also be eaten by other fish which will be caught by fishermen. To the extent that this occurs it is necessary to consider some of the lost bycatch as a transfer to other parts of the fishing fleet and not an actual loss. The extent of this transfer is presently unquantifiable. While both estimates (bycatch loss as a cost or as a transfer) are presented as the extreme possibilities, it is certain that reality is between the two.

2.7.2.5. Enforcement

The enforcement parameters and costs for this regulation are the same as Alternative 5 for the commercial sector and Alternative 6 for the recreational sector. The total annual enforcement costs for the regulations would be approximately $2.5 million.

To the extent that enforcement resources must be drawn from existing assignments the actual cost increases will be zero, and considered as transfers. The internal agency opportunity costs of such transfers would be the cost of the previous assignment. The cost to society would be the difference between the combined enforcement and avoidance costs in the current assignment and those in the summer flounder fishery. Since the societal costs are not quantifiable at this time all enforcement costs will be considered transfers.

2.7.3. Recreational Fishery

The impacts are the same as for the adopted management measures (see Section 9.2).

2.7.4. Summary of selected costs and benefits

The costs and benefits during the first year of the regulations as estimated above are as follows:

Costs:

Commercial fishery		
Lost revenue		
Mesh regulated	$4,100,000	
Non-mesh regulated	72,000	
Bycatch	5,600,000	(- transfer*)
Recreational marginal value	104,400	
Total	$ 9,876,400	(- transfer*)
Loss of:		
Commercial landings	- 6.9 million pounds	
Bycatch	- 16.9 million pounds	
Recreational trips	- 7,600 trips	

Benefits: Reduced mortality 10.84 million summer flounder saved

* Transfers are those fish caught during other commercial fishing trips or by recreational anglers during the present or future years, and, to some lesser extent, those fish which subsequently enter the food chain.

2.7.5. Commercial, and Recreational Summer Flounder Revenues and Increased Landings Over Time due to Decreased Mortality

Assumptions

- The best estimate of current fishing mortality rate (F) is 0.65.
- The future fishing mortality rate (F) is assumed to be 0.55.
- The best estimate of the natural mortality rate (M) is 0.20.
- The proportion of landings by fishery is assumed to continue and is described by the seven year average of 59% commercial and 41% recreational.
- A commercial discard mortality rate of 60% is used.
- An annual discount rate of 3% is applied.
- The following commercial fishery 1979
- 1985 average price per pound, coast wide were used to calculate future benefits:

Small	$0.44	S,M,L & J	$0.77
Medium	$0.75	Unclassified	$0.78
Large	$0.94	Overall	$0.78
Jumbo	$1.22		

- All fish of the same age are assumed to be the same weight.
- The marginal values for recreationally caught fish as estimated by Agnello and Anderson (1987) are used.

Increased Landings

Year	Recreational (000 fish)	(000 lbs)	Commercial (000 lbs)
2	1,273	2,122	3,053
3	2,126	3,990	5,742
4	2,530	5,219	7,510
5	2,720	5,982	8,609
6	2,810	6,441	9,269
7	2,852	6,704	9,648
8	2,867	6,808	9,796
9	2,871	6,835	9,835
10	2,871	6,835	9,835

Increased Revenues Due to Regulation Change (in 000's of $)

Year	Commercial	Recreational	Total
2	2,165	754	2,919
3	3,752	1,223	4,975
4	5,912	1,412	7,324
5	7,191	1,474	8,665
6	7,830	1,479	9,308
7	8,093	1,457	9,550
8	8,115	1,422	9,538
9	7,916	1,383	9,299
10	7,686	1,342	9,028

Note: All values are adjusted to 1985 dollars.

2.7.6. Comparisons of Discounted Yearly Costs and Benefits

The costs are listed above. Total yearly costs are determined to be $4,260,000, assuming all bycatch lost to the mesh regulated fishery is transferred to other fisheries.

Discounted Benefits and Costs (in millions of $)

Year	Benefits	Costs	Net Benefits
1	0	4.3	- 4.3
2	2.9	4.1	- 1.2
3	5.0	4.0	1.0
4	7.3	3.9	3.4
5	8.7	3.8	4.9
6	9.3	3.7	5.6
7	9.5	3.6	6.0
8	9.5	3.5	6.1
9	9.3	3.4	5.9
10	9.0	3.3	5.8
Total	70.6	37.4	33.2

Given the assumptions stated above, the net benefit of moving to a size limit of 13" for EEZ caught summer flounder and a mesh size of 5.0" for the EEZ directed fishery amounts to $33.2 million in 1985 dollars for a ten year horizon discounted at 3%. If the commercial discard mortality rate is in fact greater than 60% and/or the bycatch from the mesh regulated fishery is not completely transferred, a lesser increase in commercial revenue will occur (absent a behavioral or gear change to reduce the take of undersized fish). As a worst case scenario, the above analysis was repeated under the assumptions of 100% commercial discard mortality and the maximum 70% loss of bycatch. The results projected a loss of $18.8 million for the same ten year time horizon. To the extent that the true discard mortality rate lies somewhere between 60% and 100% or changes in commercial fishing practices reduce discarding and the true bycatch loss lies between 0 and $5.6 million, the net benefits of the proposed 13" size limit with a 5.0" mesh will lie within a range of negative $18.8 million to positive $33.2 million.

It must be noted, however, that the benefits specified above do not include the value of increased reproductive stability of the population which will occur with decreased fishing mortality. Any increase in recruitment resulting from survival of more summer flounder to reproductive maturity will result in more highly valued commercial and recreational fisheries. To be sure, it is chiefly this increase in spawning potential which is the aim of the proposed size limit. Unfortunately, this benefit cannot be quantified given present knowledge of summer flounder recruitment dynamics.

Apart from potential gains in recruitment, an additional benefit will result from survival of more summer flounder to older age classes. The benefit of a balanced age structure is most apparent when one considers the risk associated with compressing the age composition of the catch to where only one or two year classes dominate. Such compression of the age structure increases the risk of a year class failure resulting in collapse of the fishery. The costs of closing the fishery to allow rebuilding of the summer flounder stock are likely to be far greater than costs incurred to maintain a stable and balanced age structure.

2.7.7. Other costs and benefits

Non-quantified benefits and costs are the same as those listed for the adopted management measures. Refer to Chapter 9, Section 9.2.2.7.

2.8. IMPOSE A 13" TOTAL LENGTH SUMMER FLOUNDER MINIMUM SIZE LIMIT IN ALL FISHERIES, A 5.0" MINIMUM MESH APPLIED THROUGHOUT THE NET FOR TRIPS LANDING 500 LBS OR MORE OF SUMMER FLOUNDER, ONCE 500 LBS OF SUMMER FLOUNDER HAVE BEEN RETAINED ONLY THE MESH SPECIFIED BY THE FMP MAY BE ON DECK OR IN USE, IMPLEMENT AN EEZ PERMIT SYSTEM WHEREBY OPERATORS OF VESSELS THAT PARTICIPATE IN THE FISHERY WILL NEED TO APPLY FOR AN ANNUAL PERMIT, AND REQUIRE THAT PERMITTEES MUST COMPLY WITH THE MORE STRINGENT OF STATE OR FEDERAL REGULATIONS. ALSO INCLUDED IS A BIOLOGICAL TRIGGER TO TAKE EFFECT IN 3 YEARS FROM PLAN IMPLEMENTATION; IF THE TRIGGER CRITERIA ARE MET, THE MINIMUM FISH LENGTH WOULD BE INCREASED TO 14" AND MINIMUM MESH SIZE WOULD BE INCREASED TO 5.5".

2.8.1. Description

Initially, OY would equal all summer flounder 13" total length or larger caught by US fishermen. It would be illegal for fishermen, processors, or dealers to possess any summer flounder less than 13" in total length taken from Federal waters or by a Federally permitted vessel unless the fish were landed in a State with a larger minimum fish size limit, in which case the State limit would prevail. Otter trawl vessels landing 500 lbs or more of summer flounder would be required to fish with a 5.0"net unless the fish were landed in a State with a larger minimum mesh size limit, in which case the State limit would prevail. After 500 lbs of summer flounder have been retained , only nets of the legal size would be allowed on deck and in use. Foreign fishermen would not be permitted to retain summer flounder since US fishermen, by definition, would be harvesting the OY. Vessels fishing commercially for summer flounder, either directly or as a bycatch in other fisheries, and vessels for hire in the recreational fishery (party and charter boats) would be required to obtain annually renewable permits.

States with minimum sizes and minimum mesh regulations larger than in the FMP are encouraged to maintain them.

The provision that allows multiple nets on board a vessel and in use until the 500 lb of summer flounder criteria is met creates a need for significant at sea enforcement. To minimize this demand as much as possible it is necessary to establish a rigorous penalty schedule. The logic is simply that if there is a relatively low probability of detection of an offense, then the penalty for those detected must be sufficient to provide an adequate deterrent. The Council has identified a series of penalty schedule options, which are presented in Appendix II, for which the Council is seeking public comment through the hearing and review process.

After three years of Plan implementation certain criteria would be examined to measure the effectiveness of the management measures relative to the FMP's objectives. If the fish length and mesh sizes are found to be inadequate, they would be increased by the NMFS Northeast Regional Director with the concurrence of the Council to a minimum fish length of 14" and a minimum mesh size of 5.5".

Many indicators could serve as this adjustment mechanism. However it is imperative that the mechanism be tied to the FMP's objectives. Presently, objectives 1 (reduce fishing mortality on immature summer flounder) and 2 (increase the yield from the fishery) yield some general guidance in the development of this mechanism. Without question, the above two objectives respond to the problems addressed in the FMP, and in fact, nearly all the Alternatives try to decrease the fishing mortality (since current fishing mortality is more than double Fmax) and spread the composition of the catch over more than just a few very young ages. Without exact and precise objectives (i.e. decrease the fishing mortality from the current level of 0.65 to 0.30) however, specification of a precise point trigger is impossible. (Inherent biological variability, coupled with our current level of understanding of the marine ecosystem, precludes specification of an exact, valid point estimator.)

Several indicators were cursorily explored through discussions among MAFMC staff, with NMFS personnel, and with several Demersal Committee members. In general, the current consensus would be that the adjustment mechanism would be reached and prompt further action if both the primary and a majority of the secondary indicators demonstrate three consecutive, three year moving average statistically significant decreases. The following indicators have been selected because of their previous use, the longevity of the data series and the likelihood that the indicator is measuring a real feature of the summer flounder population life history characteristics (i.e., not simply a spurious artifact).

The primary indicator is the overall summer flounder length frequency (and/or age) derived from the NMFS spring bottom trawl survey. The five secondary indicators are: (1) NMFS spring bottom trawl survey CPUE, (2) length frequency (and/or age) of the commercial catch, (3) CPUE of the commercial catch, (4) total pounds landed in the commercial fishery, and (5) length frequency (and/or age) of the recreational catch. Although some of the secondary indicators (the two CPUE indicators) may theoretically be as good or even better than the length frequency of the survey catch, data difficulties with comparability or duration limit their usefulness singularly (i.e., comparability of the CPUE from the bottom trawl survey was interrupted in 1985 with a change in the design of the trawl doors). Note that those indicators would need to include North Carolina data.

In order to initiate an increase in the fish length and net mesh size limit, two tests must be met:

1. There must be three consecutive statistically significant decreases in a three year moving average of the primary indicator, i.e., the overall summer flounder length frequency (and/or age) derived from the NMFS spring bottom trawl survey. For example, if three consecutive (e.g. 1987, 1988, and 1989) three year moving averages (e.g. 1985-1987, 1986-1988, and 1987-1989) show a statistically significant compression of the length categories, then step 2, the secondary indicator, would be evaluated.

2. A majority of the secondary indicators would also have to show the same decreasing trend of statistically significant three consecutive three year moving averages.

Other indicators were discussed but were dismissed because of even more associated difficulties and/or inherent variability. Included in this group were such indicators as: (1) MSY (there is no current estimate and the methodology is really not appropriate because by definition MSY is a long term average and should not be evaluated on an annual basis); (2) annual fishing mortality rates (because of tremendous variability within the very short time frame for which estimates have been developed, Table 19); (3) estuarine indices (which have been developed recently by only a few States and therefore may not have coastwide applicability); and (4) CPUE in the recreational fishery (hours of hooks in the water needs further extensive evaluation).

2.8.2. Analysis

The imposition of a 14" minimum length and a 5.5" mesh size coast wide at this time would result in a large loss of income due to marketable flounder passing through the mesh and particularly in the reduction of other species normally taken in the mixed trawl fishery.

The Council believes that this alternative would result in a definite improvement in the stocks due to the above factors and is cognizant that there is only a small difference (6%) in yield per recruit between 13" and 14" female summer flounder at the current assumed fishing mortality level (0.65).

The Council has provided for more stringent measures via the adjustment mechanism should they be necessary. It is certainly to the advantage of the fishermen to assist the Council in every way possible to assure this measure is effective in meeting the FMP's objectives in an effort to avoid the more stringent measures that would result should the adjustment mechanism criteria be met.

This alternative should result in less economic disruption while working toward achieving the FMP's objectives.

The analysis of this alternative is the same as that for Alternative 7.

2.9. IMPOSE A 13" TOTAL LENGTH SUMMER FLOUNDER MINIMUM SIZE LIMIT IN ALL FISHERIES, A 4.5" MINIMUM MESH APPLIED THROUGHOUT THE NET FOR TRIPS LANDING 500 LBS OR MORE OF SUMMER FLOUNDER, ONCE 500 LBS OF SUMMER FLOUNDER HAVE BEEN RETAINED ONLY THE MESH SPECIFIED BY THE FMP MAY BE ON DECK OR IN USE, IMPLEMENT AN EEZ PERMIT SYSTEM WHEREBY OPERATORS OF VESSELS THAT PARTICIPATE IN THE FISHERY WILL NEED TO APPLY FOR AN ANNUAL PERMIT, AND REQUIRE THAT PERMITTEES MUST COMPLY WITH THE MORE STRINGENT OF STATE OR FEDERAL REGULATIONS.

2.9.1. Description

Initially, OY would equal all summer flounder 13" total length or larger caught by US fishermen. It would be illegal for fishermen, processors, or dealers to possess any summer flounder less than 13" in total length taken from Federal waters or by a Federally permitted vessel unless the fish were landed in a State with a larger minimum fish size limit, in which case the State limit would prevail. Otter trawl vessels landing 500 lbs or more of summer flounder would be required to fish with a 4.5"net unless the fish were landed in a State with a larger minimum mesh size limit, in which case the State limit would prevail. After 500 lbs of summer flounder have been retained, only nets of the legal size would be allowed on deck and in use. Foreign fishermen would not be permitted to retain summer flounder since US fishermen, by definition, would be harvesting the OY. Vessels fishing commercially for summer flounder, either directly or as a bycatch in other fisheries, and vessels for hire in the recreational fishery (party and charter boats) would be required to obtain annually renewable permits.

States with minimum sizes and minimum mesh regulations larger than in the FMP are encouraged to maintain them.

The provision that allows multiple nets on board a vessel and in use until the 500 lb of summer flounder criteria is met creates a need for significant at sea enforcement. To minimize this demand as much as possible it is necessary to establish a rigorous penalty schedule. The logic is simply that if there is a relatively low probability of detection of an offense, then the penalty for those detected must be sufficient to provide an adequate deterrent. The Council has identified a series of penalty schedule options, which are presented in Appendix II, for which the Council is seeking public comment through the hearing and review process.

2.9.2. Analysis

2.9.2.1. General

The Council believes that this alternative would result in a definite improvement in the stocks due to the above factors and is cognizant that there is only a small difference (6%) in yield per recruit between 13" and 14" female summer flounder at the current assumed fishing mortality level (0.65).

This alternative should result in less economic disruption while working toward achieving the FMP's objectives.

2.9.2.2. Commercial fishery

The analysis for the 13" minimum size, 4.5" mesh for the 500 lb trip fishery in the EEZ is similar to the analysis for Alternative 7. Alternative 7 has a 5.0" rather than a 4.5"minimum mesh. Rather than replicate all of the analysis from Alternative 7 only the new landings by area, ratios, and necessary percentages will be utilized.

2.9.2.2.1. Northern Area

All finfish otter trawl landings from Maine through New Jersey are considered to be from the northern area (NMFS water areas 511 through 624, Figure 15) for this analysis (Table 62). The EEZ portion of these landings averages 9.0 million lbs per year (Table 29). The examination of Table 62 indicates that 1.4 million lbs of otter trawl summer flounder landings in Maryland and Virginia are from the northern area also. Weighout data from 1982 through 1985 indicate that 94.4% of the Maryland and Virginia landings in the northern area are from the EEZ. This additional 1.3 million lbs brings the total northern area EEZ finfish otter trawl summer flounder landings to an average 10.3 million lbs. All North Carolina landings are considered to be from the southern area.

The total landings of summer flounders from finfish otter trawlers from the northern area was determined to be 13.4 million lbs (Alternative 5, northern and middle areas). The 500 lb trip regulated fishery portion of these landings was determined to be 12.4 million lbs or 92.5% (Alternative 7, northern area). Assuming that the 92.5% is applicable to EEZ only landings, the 500 lb per trip fishery in the northern area from the EEZ was 9.5 million lbs. These landings are assumed to be composed of 4.3 million lbs from north of New Jersey (14" minimum), 4.0 million lbs from New Jersey (13" minimum), and 1.2 million lbs south of New Jersey (12" minimum).

The post regulation catch for landings north of New Jersey is expected to be 119% of this or 5.1 million lbs. The catch for New Jersey landings is expected to be 88% of this or 3.5 million lbs. The catch for landings south of New Jersey is expected to be 74% of this or 0.9 million lbs. The total post regulation catch of 9.5 million lbs is expected to be divided and valued by class (X000) as follows:

Discards	2,324 lbs	
Small	1,096 lbs	$ 548
Medium	3,791 lbs	$3,146
Large	1,292 lbs	$1,357
Jumbo	997 lbs	$1,237
Total landings	7,176 lbs	$6,288

The current summer flounder 500 lb trip regulated fishery landings were valued at $0.92 per pound or $8.5 million. The expected loss in revenue for summer flounder becomes $2.2 million.

Based on the determinations in Table 67 combined with the revised landings (above) the ratios become 6,692:1 for north of New Jersey, 4,578:1 for New Jersey, and 1,160:1 for south of New Jersey. The total current mortality (X000) becomes:

	North of NJ	NJ	South of NJ	Total
< 11"	381	261	66	708
11" - 13"	1,191	815	206	2,212
13" - 14"	1,666	1,140	289	3,095

Based on the percentages and average weight per fish (Table 66) the post regulation catch (X000) is expected to be composed of:

< 11"	47 lbs	158 summer flounder
11" - 13"	1,007 lbs	1,291 summer flounder
13" - 14"	2,366 lbs	2,404 summer flounder

Examining the change in mortality using the ratios by area derived above and comparing that to the total current mortality yields the change in mortality for fish greater than 14". Total expanded current mortality becomes 11.8 million summer flounder. The post regulation mortality is estimated at 7.8 million summer flounder.

The change in mesh related mortality will be a reduction of:

< 11"	0.6 million summer flounder
11" - 14"	1.6 million summer flounder
> 14"	1.8 million summer flounder

This reduction in mortality will occur each year of the proposed regulation, everything else held unchanged.

2.9.2.2.2. Southern Area

The southern area (water areas 625 through 639, Figure 15) is assumed to consist of 7.5 million lbs of EEZ landings in North Carolina (Table 29) and 4.8 million lbs of EEZ landings in Maryland and Virginia (6.1 million lbs from Table 29 minus 1.3 million lbs in the northern area, above). This results in total EEZ landings of 12.3 million lbs and a 500 lbs trip fishery total of 12.2 million lbs (98.8% of total landings, Table 67).

Post regulation catch from the EEZ in North Carolina is expected to be 105%of this or 7.8 million lbs and in Virginia and Maryland 109% or 5.2 million lbs. The total 13.0 million lbs is expected to be distributed and valued by class (X000) as follows:

Discards	2,548 lbs	
Small	1,781 lbs	$ 712
Medium	3,133 lbs	$2,099
Large	3,627 lbs	$2,938
Jumbo	1,911 lbs	$2,159
Total landings	10,452 lbs	$7,908

The current 500 lb trip fishery from the southern area is valued at $0.67 per pound or $8.2 million. The expected loss in revenue for summer flounder becomes $0.3 million.

Based on the determinations in Table 67 combined with the revised landings (above) the ratios become 19,521:1 for North Carolina and 12,968:1 for Virginia and Maryland. The total current mortality (X000) becomes:

	NC	MD & VA	Total
< 11"	2,089	1,388	3,477
11" - 13"	1,191	791	1,982
13" - 14"	781	519	1,300

Based on the percentages and average weight per fish (Table 66)the post regulation catch (X000) is expected to be composed of:

< 11"	104 lbs	242 summer flounder
11" - 13"	2,444 lbs	3,348 summer flounder
13" - 14"	1,781 lbs	1,855 summer flounder

Examining the change in mortality using the ratios by area derived above and comparing that to the total mortality yields the change in mortality for fish greater than 14". Total expanded current mortality becomes 11.9 million summer flounder. The post regulation mortality is estimated at 9.9 million summer flounder.

The change in mesh related mortality will be a change of:

< 11"	3.2 million summer flounder (gain)
11" - 14"	1.9 million summer flounder (loss)
> 14"	0.7 million summer flounder (gain)

This reduction in mortality will occur each year of the proposed regulation, everything else held unchanged.

2.9.2.2.3. Summary of mesh studies

The total change in mortality expected from a 4.5" mesh restriction and 13" minimum size in the EEZ 500 lb trip commercial fishery is:

< 11"	3.8 million summer flounder (gain)
11" - 14"	1.9 million summer flounder (loss)
> 14"	2.5 million summer flounder (gain)

Landings will be reduced by 6.9 million pounds and the loss in ex-vessel revenue is estimated at $3.98 million.

These conclusions include the assumptions of complete compliance, no tolerance for undersized landings, all smalls less than 14" in length, and an accurate description of the directed fishery presented in the analysis.

2.9.2.3. Non-mesh regulated fishery effects

The results are the same as those calculated in Alternative 7, a reduction in summer flounder ex-vessel value of $72,000.

2.9.2.4. Bycatch

The effect on bycatch of this regulation is similar to that analyzed in Alternative 7. Bycatch was determined to compose 48% of the value and 111% of the weight of the summer flounder from the directed fishery. The summer flounder valued of the proposed directed fishery was $16.7 million and the weight was 21.7 million lbs. The associated bycatch is expected to weigh 24.1 million lbs and be valued at $8.0 million. While it is certain that a 4.5" mesh net will retain more bycatch than a 5.0" or a 5.5" mesh net, the mesh studies as conducted do not allow full assessment of the market value of the bycatch. Therefore, this analysis is similar to the previous ones and will assume a maximum 70% bycatch loss. A 70% bycatch loss is expected to be 16.9 million lbs valued at $5.6 million.

An important factor to remember when considering bycatch reductions is that the fish not caught by these nets will be available to other fishermen. These fish may be caught in the same or future years by the same fishermen or by different fishermen. Some of the fish will also be eaten by other fish which will be caught by fishermen. To the extent that this occurs it is necessary to consider some of the lost bycatch as a transfer to other parts of the fishing fleet and not an actual loss. The extent of this transfer is presently unquantifiable. While both estimates (bycatch loss as a cost or as a transfer) are presented as the extreme possibilities, it is certain that reality is between the two.

2.9.2.5. Enforcement

The enforcement requirements, costs, and caveats are the same as those presented in Alternative 7.

2.9.3. Recreational Fishery

The impacts are the same as for the adopted management measures (see Section 9.2).

2.9.4. Summary of selected costs and benefits

The estimated costs and benefits during the first year of the regulations are as follows:

Costs:

Commercial fishery lost revenue		
Mesh regulated	$ 3,980,000	
Non-mesh regulated	$ 72,000	
Bycatch	$ 5,600,000	(- transfer*)
Recreational marginal value	$ 104,400	
Total	$ 9,756,400	(- transfer*)
Loss of:		
Commercial landings	- 6.9	million pounds
Bycatch	- 16.9	million pounds
Recreational trips	- 7,600	trips
Benefits: Reduced mortality	9.52	million summer flounder saved

* Transfers are those fish caught during other commercial fishing trips or by recreational anglers during the present or future years, and, to some lesser extent, those fish which subsequently enter the food chain.

2.9.5. Commercial, and Recreational Summer Flounder Revenues and Increased Landings Over Time due to Decreased Mortality

Assumptions

- The best estimate of current fishing mortality rate (F) is 0.65.
- The future fishing mortality rate (F) is assumed to be 0.60.
- The best estimate of the natural mortality rate (M) is 0.20.
- The proportion of landings by fishery is assumed to continue and is described by the seven year average of 59% commercial and 41% recreational.
- A commercial discard mortality rate of 60% is used.
- An annual discount rate of 3% is applied.
- The following commercial fishery 1979-1985 average price per pound, coast wide were used to calculate future benefits:

Small	$0.44	S,M,L & J	$0.77
Medium	$0.75	Unclassified	$0.78
Large	$0.94	Overall	$0.78
Jumbo	$1.22		

- All fish of the same age are assumed to be the same weight.
- The marginal values for recreationally caught fish as estimated by Agnello and Anderson (1987) are used.

Increased Landings

	Recreational		Commercial
Year	(000 fish)	(000 lbs)	(000 lbs)
2	1,144	1,927	2,773
3	1,931	3,622	5,212
4	2,286	4,685	6,742
5	2,444	5,315	7,649
6	2,516	5,676	8,168
7	2,548	5,872	8,450
8	2,559	5,944	8,554
9	2,562	5,966	8,585
10	2,562	5,966	8,585

Increased Revenues Due to Regulation Change (in 000's of $)

Year	Commercial	Recreational	Total
2	1,956	678	2,634
3	3,346	1,111	4,456
4	5,270	1,276	6,546
5	6,359	1,325	7,683
6	6,865	1,324	8,189
7	7,046	1,302	8,348
8	7,032	1,269	8,301
9	6,857	1,233	8,091
10	6,657	1,198	7,855

Note: All values are adjusted to 1985 dollars.

2.9.6. Comparisons of Discounted Yearly Costs and Benefits

The costs are listed above. Total yearly costs are determined to be $4,260,000, assuming all bycatch lost to the mesh regulated fishery is transferred to other fisheries.

Discounted Benefits and Costs (in millions of $)

Year	Benefits	Costs	Net Benefits
1	0	4.2	- 4.2
2	2.6	4.0	- 1.4
3	4.5	3.9	.5
4	6.5	3.8	2.7
5	7.7	3.7	4.0
6	8.2	3.6	4.6
7	8.3	3.5	4.9
8	8.3	3.4	4.9
9	8.1	3.3	4.8
10	7.9	3.2	4.7
Total	62.1	36.5	25.6

Given the assumptions stated above, the net benefit of moving to a size limit of 13" for EEZ caught summer flounder and a mesh size of 4.5" for the EEZ directed fishery amounts to $25.6 million in 1985 dollars for a ten year horizon discounted at 3%. If the commercial discard mortality rate is in fact greater than 60% and/or the bycatch from the mesh regulated fishery is not completely transferred, a lesser increase in commercial revenue will occur (absent a behavioral or gear change to reduce the take of undersized fish). As a worst case scenario, the above analysis was repeated under the assumptions of 100% commercial discard mortality and the maximum 70% loss of bycatch. The results projected a loss of $32.2 million for the same ten year time horizon. To the extent that the true discard mortality rate lies somewhere between 60% and 100% or changes in commercial fishing practices reduce discarding and the true bycatch loss lies between 0 and $5.6 million, the net benefits of the proposed 13" size limit with a 4.5" mesh will lie within a range of negative $32.2 million to positive $25.6 million.

It must be noted, however, that the benefits specified above do not include the value of increased reproductive stability of the population which will occur with decreased fishing mortality. Any increase in recruitment resulting from survival of more summer flounder to reproductive maturity will result in more highly valued commercial and recreational fisheries. To be sure, it is chiefly this increase in spawning potential which is the aim of the proposed size limit. Unfortunately, this benefit cannot be quantified given present knowledge of summer flounder recruitment dynamics.

Apart from potential gains in recruitment, an additional benefit will result from survival of more summer flounder to older age classes. The benefit of a balanced age structure is most apparent when one considers the risk associated with compressing the age composition of the catch to where only one or two year classes dominate. Such compression of the age structure increases the risk of a year class failure resulting in collapse of the fishery. The costs of closing the fishery to allow rebuilding of the summer flounder stock are likely to be far greater than costs incurred to maintain a stable and balanced age structure.

2.9.7. Other costs and benefits

Non-quantified benefits and costs are the same as those listed for the adopted management measures. Refer to Chapter 9, Section 9.2.2.7.

2.10. IMPOSE A 13" TOTAL LENGTH SUMMER FLOUNDER MINIMUM SIZE LIMIT IN ALL FISHERIES, WITH AN INCREASE TO 14" AFTER TWO YEARS FOLLOWING PLAN IMPLEMENTATION, IMPLEMENT AN EEZ PERMIT SYSTEM WHEREBY OPERATORS OF VESSELS THAT PARTICIPATE IN THE FISHERY WILL NEED TO APPLY FOR AN ANNUAL PERMIT, AND REQUIRE THAT PERMITTEES MUST COMPLY WITH THE MORE STRINGENT OF STATE OR FEDERAL REGULATIONS. ALSO INCLUDED IS A BIOLOGICAL TRIGGER TO TAKE EFFECT IN 3 YEARS FROM PLAN IMPLEMENTATION; IF THE TRIGGER CRITERIA ARE MET, A 5.5" MINIMUM MESH SIZE WOULD BE IMPOSED TO BE APPLIED THROUGHOUT THE NET FOR TRIPS LANDING 500 LBS OR MORE OF SUMMER FLOUNDER, ONCE 500 LBS OF SUMMER FLOUNDER HAVE BEEN RETAINED ONLY THE MESH SPECIFIED BY THE FMP MAY BE ON DECK OR IN USE.

2.10.1. Description

There is a 13" total length summer flounder minimum length.

Two years after plan implementation the 13" total length summer flounder minimum length will be automatically increased to 14".

If vessels land in States with larger minimum fish sizes or larger minimum mesh sizes (if a mesh regulation is implemented) than those provided in the FMP, then the State limits would be imposed on the vessel.

No foreign fishing vessel shall conduct a fishery for or retain any summer flounder. Foreign nations catching summer flounder shall be subject to the incidental catch regulations set forth in 50 CFR 611.13, 611.14, and 611.50.

Vessels fishing commercially for summer flounder, either directly or as a bycatch in other fisheries, and vessels for hire in the recreational fishery (party and charter boats) would be required to obtain annually renewable permits.

States with minimum sizes and minimum mesh regulations larger than in the FMP are encouraged to maintain them.

After three years of Plan implementation certain criteria would be examined to measure the effectiveness of the size limit relative to the FMP's objectives. If the fish length is found to be inadequate, the NMFS Northeast Regional Director with the concurrence of the Council may implement a minimum mesh size of 5.5". If it is implement, in all cases the minimum mesh size applies to finfish otter trawl vessels with trips landing 500 lbs or more of summer flounder. After 500 lbs of summer flounder have been retained, only nets of the legal size would be allowed on deck and in use. In no case does the minimum mesh provision apply to nets with a mesh equal to or greater than 16" in the body and/or wings of the net.

The adjustment mechanism would be initiated if both the primary and a majority of the secondary indicators specified demonstrate three consecutive, three year moving average statistically significant decreases. The following indicators have been selected because of their previous use, the longevity of the data series and the likelihood that the indicator is measuring a real feature of the summer flounder population life history characteristics (i.e., not simply a spurious artifact).

The primary indicator is the overall summer flounder length frequency (and/or age) derived from the NMFS spring bottom trawl survey. The five secondary indicators are: (1) NMFS spring bottom trawl survey CPUE, (2) length frequency (and/or age) of the commercial catch, (3) CPUE of the commercial catch, (4) total pounds landed in the commercial fishery, and (5) length frequency (and/or age) of the recreational catch. Although some of the secondary indicators (the two CPUE indicators) may theoretically be as good or even better than the length frequency of the survey catch, data difficulties with comparability or duration limit their usefulness singularly (i.e. comparability of the CPUE from the bottom trawl survey was interrupted in 1985 with a change in the design of the trawl doors). Note that those indicators using commercial catch data would need to include North Carolina.

In order to initiate an increase in the fish length and mesh size limit, two tests must be met:

1. There must be three consecutive statistically significant decreases in a three year moving average of the primary indicator, i.e., the overall summer flounder length frequency (and/or age) derived from the NMFS spring bottom trawl survey. For example, if three consecutive (e.g. 1987, 1988, and 1989) three year moving averages (e.g. 1985-1987, 1986-1988, and 1987-1989) show a statistically significant compression of the length categories, then step 2, secondary indicator, would be evaluated.

2. A majority of the secondary indicators would also have to show the same decreasing trend of statistically significant three consecutive three year moving averages.

The Council considers the appropriate statistical test for the primary indicator to be a Chi-square test, where a three year moving sum would be compared over consecutive years (e.g., the sum frequency of each age class during the 1984-1986 spring bottom trawl survey compared to the 1985-1987 sum frequency of each age class). If the Chi-square values were significantly different (alpha = 0.05 level); that is, the age groups becoming more compressed towards younger fish, for three consecutive three year periods, then step 2 would be evaluated. In other words, if a significant Chi-square value occurred among the age groups between the 1984-1986 period and the 1985-1987 period, and then for 2 more 3 year periods, it would indicate the amounts of younger, smaller fish would be increasing. This change in age/size structure could be attributable to two events. First, strong year classes could have been spawned. Second, further growth overfishing could be occurring. Both of these causes can be detected in step 2, the secondary indicator evaluation.

The five secondary indicators should be tested with either a Chi-square (indicators 2 and 5) or a t-test (indicators 1, 3, and 4). All testing should occur at the alpha = 0.05 level. The Chi-square for the secondary indicators is identical to the analysis for the primary indicator. The t-tests would simply compare the three year (e.g., 1984-1986) mean CPUE or total catch to the following three year (e.g., 1985-1987) period mean CPUE or catch. Three significantly smaller 3 year means would be a valid indicator that revisions to the management measures were needed.

The provision that allows multiple nets on board a vessel and in use until the 500 lb of summer flounder criteria is met creates a need for significant at sea enforcement. To minimize this demand as much as possible it is necessary to establish a rigorous penalty schedule. The logic is simply that if there is a relatively low probability of detection of an offense, then the penalty for those detected must be sufficient to provide an adequate deterrent. The Council has identified a series of penalty schedule options, which are presented in Appendix II, for which the Council is seeking public comment through the hearing and review process.

2.10.2. Analysis

Since the minimum size regulation changes from 13" to 14" after two years, it is necessary to conduct two evaluations. The reduction in fishing mortality would contribute to higher landings in the second year of the regulations. However, since landing areas in which this increase would occur are unknown, it is difficult to evaluate the 14" minimum size analysis. Therefore, all increases in landings and revenue due to reduced mortality will be accounted for in the future stream of benefits, but not in the cost impacts.

2.10.2.1. Commercial fishery

Imposition of a 13" commercial size limit will prevent the landing of undersized fish. Only the States of Maryland (12"),Virginia (12"), and North Carolina (11") have size limits allowing landings of summer flounder from the EEZ less than 13" (Section 4.2.2). However, with this alternative there would be no tolerance for possession of undersized summer flounder by Federally permitted vessels, so landings of smalls will be reduced in those States which have a tolerance.

Based on a coast wide, seven year weighted average (1979 to 1985), the average price (in 1985 adjusted dollars) of unclassified summer flounder is $0.78/lb, while that of the small, medium, large, and jumbo categories combined is $0.77/lb. Therefore, unclassifieds are considered to be composed of relatively the same proportions of smalls, mediums, larges, and jumbos as the overall catch. However, since the trend in recent years has been for unclassifieds to be valued more per pound than an unweighted mix, this will slightly overestimate the actual pounds of smalls affected.

The percentage of smalls included in unclassifieds can be estimated (Table 29) and these smalls combined with the classified smalls results in 6.3 million lbs of smalls landed from finfish otter trawls from the EEZ and 0.1 million lbs of smalls landed from other gear types from the EEZ. The total yearly average landings of smalls covered by the regulations is therefore estimated at 6.4 million lbs. Since the small category is composed of summer flounder less than 14" all along the coast and since no means to separate those less than 13"exists, only a rough estimation is possible.

The states that have a minimum size of 13" or more are assumed to land smalls which are 13" or larger. The states which have a 12" minimum size are assumed to land half their smalls by number less than 13" and North Carolina, which has an 11" minimum size is assumed to land 2/3 of their smalls by number less than 13".Summer flounder 13.5", 12.5", and 11.5" on average weigh approximately 0.97 lbs, 0.77 lbs, and 0.59 lbs (Wilk *et al.*,1978).

The following is a summary of the seven year average landing weight of smalls by gear and minimum size from the States with a minimum size less than 13" (Table 29). The total weight involved is 5.1 million lbs from finfish otter trawlers in the EEZ and 0.1 million lbs from other gear in the EEZ.

State Minimum Size	Finfish otter trawlers	Other gear	Total
12"	2,543,000	73,000	2,616,000
11"	2,516,000	26,000	2,542,000

Based on the above assumptions, it can be estimated that EEZ landings will be reduced by 3.0 million lbs in the three states with minimum sizes less than 13". Using the seven year average value of $0.44 per lb for smalls (Table 53), the ex-vessel value will be reduced by $1.3 million. It is expected that there will be a reduction in the catch of undersized summer flounder since fishermen will likely alter their fishing practices to reduce discarding simply to reduce the time labor costs associated with discarding. In addition, the extent to which summer flounder fishing mortality is actually reduced due to the size limit depends on the survivability of discarded fish. Based on a survey taken during the public hearings, discard mortality rates are thought to lie within the range of 60% to 100% (see Appendix 5 for survey tabulation), depending on handling and the speed of sorting trawl contents.

After two years the size regulation will change to a 14" minimum. This will cause different impacts which will be evaluated in this analysis, to the catch, landings, and revenues of the 13" minimum size regulation.

Imposition of a 14" commercial size limit will reduce the landing of undersized fish. The states mentioned above with the addition of New Jersey (13") would be the only states to have EEZ size limits different than state size limits. The lack of tolerance for possession of undersized summer flounder by Federally permitted vessels would still exist so landings of smalls will still be reduced in those States which have a tolerance.

The full 6.4 million pounds of smalls currently landed from the EEZ would be illegal under this regulation. This amounts to an additional loss in landings of 3.7 million pounds. Using the seven year average of $0.44/lb for smalls (Table 53), the ex- vessel value will be reduced by an additional $1.6 million. Since a size limit is the only regulation under this alternative, there is no assurance that a reduction in summer flounder mortality will occur unless fishermen alter their fishing practices.

2.10.2.2. Recreational fishery

The states where anglers would be directly impacted by a 13" minimum size limit in the recreational fishery are Maryland (12"), Virginia (12"), and North Carolina (11") (Section 4.2.2). However, it is necessary to examine the recreational EEZ fishery on a coast wide basis to analyze the full impacts.

The seven year average EEZ recreational summer flounder landings was 1.0 million fish (Table 45) and the average estimated number of directed summer flounder trips in the EEZ was 348,000 (Table 57). In the EEZ, an average of 1.8 summer flounder were landed from each directed trip, 5.7 from each successful directed trip(approximately 64% of all directed summer flounder trips result in no summer flounder landed), and 4.2 from each non- directed trip which lands summer flounder (Table 58). Therefore, an estimated average of 125,000 directed trips and 79,000 non- directed summer flounder trips in the EEZ landed summer flounder. In addition, on average, 26% of the EEZ summer flounder landings were less than 13" in length (Table 48). Assuming homogeneity of distribution of size of landed summer flounder between directed and non-directed trips, this results in approximately 272,000 summer flounder less than 13" in length being landed from the EEZ. The directed EEZ trips are expected to land 186,000 summer flounder less than 13" and an additional 86,000 summer flounder less than 13" in length are expected to be landed from non- directed fishing trips.

A number of studies have been conducted to attempt to determine satisfaction components and their relative weights for recreational fishing. Reviews of these studies (Fedler, 1984; Holland, 1985) show that the components of escape (perceived freedom), experiencing nature, relaxation, and companionship seem to be the highest ranked throughout these studies. The component of catching fish has a "relatively low priority" (Fedler, 1984). Holland (1985) surveyed fishermen from the Gulf Coast Conservation Association and found that only 4% of those responding placed the highest emphasis on catching fish. Interestingly, this group had twice the rate of fishing trips of each other emphasis group. A study by Dawson and Wilkins (1981) examined the preferences of boating anglers in New York and Virginia in 1980. They found that catching fish was important but consistently ranked below most of the less quantifiable results of a fishing trip. A large percentage of anglers in New York (93%) and Virginia (88%) did not feel they had to catch a lot of fish to be satisfied with a trip as long as they caught something. Nearly half of the New York anglers (47%) and 39% of the Virginia anglers felt they could be satisfied if they did not catch anything.

The 1981 Marine Recreational Fishery Statistics Socioeconomic survey concluded that "about half (of the anglers) reported a preferred species while fishing, and most of these said they would continue to fish if they knew their preferred species was not available." (USDC, 1986a). The survey results showed that two thirds of those who caught no fish were satisfied with their fishing trip (KCA, 1983).

Agnello and Anderson (1986) examined fishing success for summer flounder as a predictor of satisfaction. The formula used consisted of the respondents' level of satisfaction explained by the number of fish kept (summer flounder and other fish or total fish) and the trip cost. They found that the number of fish kept contributed to satisfaction but the analysis failed to explain 91% of the variability.

Theoretically, a reduction in landings would have an impact on angler behavior. It is expected that a drop in catch per unit effort would lead to a decrease in the number of trips (Anderson, 1977). However, the seven year average EEZ success rate for fishermen targeting on summer flounder was only 34% (Table 57). Since so many fishermen do not catch summer flounder, but a like number try the next year anyway, the reduction in catch attributable to a size limit would be expected to affect only the directed anglers who are successful. These successful anglers have expressed the greatest support for the size limit during the public hearings, however, so it is not clear that participation in the fishery by this group would actually be reduced. The anglers who take summer flounder, but were not targeting on them must also be considered. Summer flounder represents a bycatch and therefore is important even if the anglers were targeting on other species.

Since the regulations impose a *de facto* catch and release policy in the fishery, the actual catch rate for participating fishermen will not decrease. In fact, over time, a catch and release policy is expected to increase the catch rate since the same fish can be caught by more than one angler. The only rate that will change is the retention rate. Schaefer (pers. comm.) stated that one rationale for enacting New York's summer flounder minimum size limit (14") was to allow summer flounder to be caught and released in the spring and landed at a larger size in the fall. He felt that the minimum size achieved this objective and also encouraged a longer season for party and charter boats.

A 1980 survey of Virginia anglers fishing from boats (Dawson and Wilkins, 1981) determined that 93% would maintain their participation rate if faced with a minimum size limit. Of the other 7%, 5% said they would decrease their participation and 2% said they would stop fishing. The absence of a more substantial impact is not surprising, since the majority of the summer flounder caught in the recreational fishery are taken by a small number of relatively more highly skilled anglers.

In these analyses it is assumed that each trip is conducted by a different participant. This is somewhat inaccurate and overestimates the number of individual anglers fishing for summer flounder in the EEZ. The 2% of participants who would stop fishing will be reflected by canceling 2% of the directed trips. The 5% decreased participation will be reflected by assuming 2.5% of both directed and non-directed trips being canceled. These assumptions will overestimate the impacts of the regulation to some unknown but small extent. The losses estimated below for foregone landings, catch, and marginal value are for summer flounder only. For trips that are canceled there is an associated marginal value loss for the other fish which would have been caught and landed. These fish will also be available for other anglers to land, thus the loss may be a transfer within the recreational fishery and possibly to the commercial fishery. It is unknown to what extent this will occur. Summer flounder not landed are assigned a marginal value loss of $1.13 for the first summer flounder of a trip and $0.61 for the average summer flounder (Section 8.1.2). Each trip is valued at $42.92 (Table 57).

The marginal value for a caught and released summer flounder has not been explicitly determined but, for the purposes of these analyses, is assumed to be half that for one kept. Therefore, the marginal value loss associated with a minimum size must be halved to reflect the marginal value associated with the catch and release of undersized summer flounder. Note, however, that since many of the states currently have minimum size possession laws greater than 13" the actual number of trips canceled will be less than that estimated below. All EEZ participation and landings will be used to estimate the impacts.

	Trips lost	Flounder not landed	Expenditures redirected	Value lost
Directed				
2% canceled	2,500	14,300	$107,300	$ 8,700
2.5% reduced	3,100	17,800	134,100	10,850
Non-directed				
2.5% reduced	2,000	8,300	84,800	5,100
Released summer flounder	-	261,500	-	79,750
Total	7,600	301,900	$326,200	$104,400

Revenues will be lost to the recreational fishing business sector if fishing trips are canceled or not taken due to changes in catch per unit effort or retention per unit effort. However,the money not spent on cancelled fishing trips will be spent elsewhere in the economy on other goods and services. Executive Order 12291 (46 FR 34263) states that regulatory actions shall consider benefits and costs *to society* (emphasis added).Therefore, while the recreational fishing industry may lose this revenue, society as a whole will not and the redirection cannot be considered a loss, but simply a transfer.

Since the States from Massachusetts through North Carolina already have size limits, the change in the number of trips due to an increase in the size limit is unknown. It is expected that those anglers fishing from States already having a size limit of 13" or greater would not change the number of their trips due to an EEZ size limit of 13". In addition, the actual response of anglers to a size limit may not be a reduction in trips but a redirection of effort. The assumptions made above concerning lost trips were based on Dawson and Wilkins (1981) and are considered to be conservative.

Increases in future catch because of decreased mortality of small fish will stimulate new interest in fishing for summer flounder. It is difficult to determine how many more summer flounder need be taken to actually motivate one more trip, but it is likely that the release of small fish will increase the catch rates for all anglers. This will augment the value of the fishing experience, regardless of whether the fish are retained.

After two years the minimum size regulation will change to a 14" minimum. This will cause different impacts which will be evaluated in this analysis to the catch, landings, and revenues of the 13" minimum size regulation.

The states where anglers would be directly impacted by a 14" minimum size limit in the recreational fishery are New Jersey (13"), Maryland (12"), Virginia (12"), and North Carolina (11") (Section 4.2.2). However, it is again necessary to examine the recreational EEZ fishery on a coast wide basis to analyze the full impacts.

On average, 46% of the EEZ summer flounder landings were less than 14" in length (Table 48). This results in an average of 328,000 summer flounder less than 14" in length being landed from directed EEZ trips and an additional 153,000 summer flounder less than 14" in length landed from the EEZ on non-directed fishing trips. This leads to an increase of 142,000 summer flounder below the minimum size being landed from directed trips and 67,000 being landed from non-directed trips.

The change in trips lost, summer flounder not landed, expenditures redirected, and marginal value lost from the 13" minimum size analysis is:

	Trips lost	Flounder not landed	Expenditures redirected	Value lost
Directed				
2% canceled	-	-	-	-
2.5% reduced	-	-	-	-
Non-directed				
2.5% reduced	-	-	-	-
Released summer flounder	-	178,500	-	$ 54,400
Total	-	178,500	-	$ 54,400

The small amount of change shown above is due to the assumptions made previously concerning redirection of trips, etc. on a coast wide basis based on a minimum size limit. Since the States from Massachusetts through North Carolina already have size limits, the change in the number of trips due to an increase in the size limit is unknown. It is expected that those anglers fishing from States already having a size limit of 14" would not change the number of their trips due to an EEZ size limit of 14". In addition, the actual response of anglers to a size limit may not be a reduction in trips but a redirection of effort. The assumptions made above concerning lost trips were based on Dawson and Wilkins (1981) and are considered to be conservative.

2.10.2.3. Enforcement

Commercial fishery enforcement for these minimum sizes would be totally dockside with increased surveillance of all EEZ landings and finfish otter trawl landings in particular. The requirement for surveillance of commercial landings would not change with the change in minimum sizes. Since sale of EEZ landed smalls would be illegal, the surveillance could occur at the dock or at the processor, thereby centralizing effort. Based on the joint NMFS/Coast Guard enforcement document (USDC, 1985c) and the assumption of 900 vessels affected by the regulation (Section 8.1.1 and Table 33) approximately 2,300 contacts would be necessary per year. This would require approximately 2.6 man-years of enforcement effort at $50,000 per year or $130,000.The Council believes that this measure is designed for dockside enforcement only. In order to cut costs, efforts to include state enforcement officers, many of whom are already inspecting summer flounder for a minimum size, could be utilized.

The joint enforcement document (USDC, 1985c) does not address the enforcement costs of recreational fishing. Therefore, an estimate will be made based on the number of trips involved and the area covered. There were an estimated 427,000 recreational trips in the EEZ that land or direct on summer flounder. This number is misleading, however, since there was an average of 2.8 participants per party (Section 8.1.2). Therefore, an estimated 155,000 vessel trips are involved in the EEZ summer flounder recreational fishery. Even this may be an overestimate since party and charter boats landed 28% of the summer flounder from the EEZ (Table 46). It must be remembered that only approximately 17% of the EEZ landings are in states that have a possession or landing limit less than 13" (Table 46). Therefore, assuming that landing rates are constant along the coast, only 17% of the trips need to be intercepted by federal enforcement efforts. Federal responsibilities would be further reduced if the States of North Carolina and Virginia carry out their intentions to implement a 13" minimum size limit.

This analysis is conducted assuming an arbitrary 5% coverage of the trips and an average of 15 contacts per day. The requirements become 0.6 man years of effort costing $30,000. To the extent that trips are monitored in states already having a 13" minimum size, assistance is given to state agencies, or state regulations change these requirements will vary.

When the regulations change to a 14" minimum size, the state of New Jersey will be added to those states requiring federal enforcement efforts. Again assuming that landing rates are constant along the coast, approximately 63% of the trips need to be intercepted by federal enforcement efforts. This results in additional enforcement efforts directed at 46% of the trips.

This analysis is again conducted assuming an arbitrary 5% coverage of the trips and an average of 15 contacts per day. The additional requirements become 1.6 man years of effort costing an additional $80,000. To the extent that trips are monitored instates already having a minimum size, assistance is given to state agencies, or state regulations change, this requirement will vary.

To the extent that enforcement resources must be drawn from existing assignments the actual cost increases will be zero, and considered as transfers. The internal agency opportunity costs of such transfers would be the cost of the previous assignment. The cost to society would be the difference between the combined enforcement and avoidance costs in the current assignment and those in the summer flounder fishery. Since the societal costs are not quantifiable at this time all enforcement costs will be considered transfers.

2.10.2.4. Future benefits

The summer flounder that are caught and released from the EEZ recreational fishery will provide future benefits in several ways. Some will be caught and/or landed in the recreational fishery at a later date. This will provide additional marginal value benefits and may encourage more fishing trips. Increases in catch will stimulate new interest in fishing for summer flounder. It is difficult to determine how many more summer flounder need be taken to motivate one more trip. Some will be landed in the commercial fishery over time. Some will provide prey to larger sport and commercial fish which will be caught or targeted. Also, more will survive long enough to spawn, thereby increasing the stability of the stock and contributing to future progeny, and thus future fishing.

2.10.2.5. Summary of selected costs and benefits

The estimated costs (X000) and benefits of the regulations are estimated as follows:

	1st & 2nd years	3rd & later
Commercial Lost revenue	$1,300	$2,900
Recreational marginal value	$ 104	$ 159
Total	$1,404	$3,059
Commercial landing loss	3.0 million lbs	6.4 million lbs
Recreational loss	7,600 trips	7,600 trips
Benefits: Reduced mortality	1.9 million	2.1 million

2.10.2.6. Other costs and benefits

Non-quantified benefits and cost are listed below. Based on a subjective analysis of available data, a comparative value of small, medium, or large was assigned to each.

	Cost	Benefit
Commercial fishermen's willingness to pay	Small	
Consumers' willingness to pay	Small	
Deck hands' income	Small	
Employment change	Small	
Net judicial expenses	Small	
Non-quantified direct expenses	Small	
Overall recreational experience	Small	
Redirection of effort	Small	Small
Regional sociological effects	Small	Small
Preventing stock failure	Small	Large
Overall potential costs and benefits	Small	Small-Large

As can be seen, the costs are numerous but of relatively small size each. The benefits are considered to be few and also of mostly small size each. Preventing stock failure has the largest potential benefit and is the reason for the FMP. The only reduction in mortality which will occur in the commercial fishery is due to voluntary redirection of effort or use of different mesh.

2.10.2.7. Commercial, and Recreational Summer Flounder Revenues and Increased Landings Over Time due to Decreased Mortality

Assumptions

- The best estimate of current fishing mortality rate (F) is 0.65.
- The future fishing mortality rate (F) is assumed to be 0.60.
- The best estimate of the natural mortality rate (M) is 0.20.
- The proportion of landings by fishery is assumed to continue and is described by the seven year average of 59% commercial and 41% recreational.
- A commercial discard mortality rate of 60% is used.
- An annual discount rate of 3% is applied.
- The following commercial fishery 1979-1985 average price per pound, coast wide were used to calculate future benefits:

Small	$0.44	S,M,L & J	$0.77
Medium	$0.75	Unclassified	$0.78
Large	$0.94	Overall	$0.78
Jumbo	$1.22		

- All fish of the same age are assumed to be the same weight.
- The marginal values for recreationally caught fish as estimated by Agnello and Anderson (1987) are used.

Increased Landings

Year	Recreational (000 fish)	Recreational (000 lbs)	Commercial (000 lbs)
2	321	480	691
3	461	798	1,148
4	936	1,787	2,571
5	988	1,999	2,876
6	1,011	2,119	3,050
7	1,022	2,188	3,148
8	1,027	2,221	3,197
9	1,027	2,222	3,197
10	1,027	2,222	3,197

Increased Revenues Due to Regulation Change (in 000's of $)

Year	Commercial	Recreational	Total
2	502	190	692
3	884	265	1,150
4	2,131	523	2,654
5	2,402	536	2,937
6	2,516	532	3,048
7	2,544	522	3,066
8	2,519	509	3,028
9	2,446	494	2,940
10	2,375	480	2,856

Note: All values are adjusted to 1985 dollars.

2.10.2.8. Comparisons of Discounted Yearly Costs and Benefits

The costs are listed above. Total yearly costs are determined to be $1,404,000 the first two years and $3,059,000 each year thereafter.

Discounted Benefits and Costs (in millions of $)

Year	Benefits	Costs	Net Benefits
1	0	1.4	- 1.4
2	0.7	1.3	- 0.7
3	2.1	2.8	- 0.7
4	2.7	2.7	- 0.1
5	2.9	2.6	0.3
6	3.0	2.6	0.5
7	3.1	2.5	0.6
8	3.0	2.4	0.6
9	2.9	2.3	0.6
10	2.9	2.3	0.7
Total	23.3	22.9	0.4

Given the assumptions stated above, the net benefit of moving to a size limit of 13", and after two years to 14", for EEZ caught summer flounder amounts to $0.4 million in 1985 dollars for a ten year horizon discounted at 3%. If the commercial discard mortality rate is in fact greater than 60%, a lesser increase in commercial revenue will occur (absent a behavioral or gear change to reduce the take of undersized fish). As a worst case scenario, the above analysis was repeated under the assumption of 100% commercial discard mortality. The results projected a loss of $18.4 million for the same ten year time horizon. To the extent that the true discard mortality rate lies somewhere between 60% and 100%, or changes in commercial fishing practices reduce discarding, the net benefits of the proposed 13"/14" size limit will lie within a range of negative $18.4 million to positive $0.4 million.

It must be noted, however, that the benefits specified above do not include the value of increased reproductive stability of the population which will occur with decreased fishing mortality. Any increase in recruitment resulting from survival of more summer flounder to reproductive maturity will result in more highly valued commercial and recreational fisheries. To be sure, it is chiefly this increase in spawning potential which is the aim of the proposed size limit. Unfortunately, this benefit cannot be quantified given present knowledge of summer flounder recruitment dynamics.

Apart from potential gains in recruitment, an additional benefit will result from survival of more summer flounder to older age classes. The benefit of a balanced age structure is most apparent when one considers the risk associated with compressing the age composition of the catch to where only one or two year classes dominate. Such compression of the age structure increases the risk of a year class failure resulting in collapse of the fishery. The costs of closing the fishery to allow rebuilding of the summer flounder stock are likely to be far greater than costs incurred to maintain a stable and balanced age structure.

2.11. OTHER MANAGEMENT OPTIONS CONSIDERED

During development of the FMP several other management options were considered. These options were modifications to the alternatives presented above. In summary, these options, and the reasons for deleting them, were:

A. Vessels with Federal permits would be required to fish pursuant to Federal rules.

With this option permittees must fish and land their fish under Federal regulations even if State regulations are more stringent. The permittees could end up in States with less restrictive measures than the Plan. The purpose of the FMP is to have the fishermen fish under the more restrictive measure.

B. For the alternatives with a minimum mesh regulation, vessels would be allowed to have only one size mesh on board.

One mesh on board is not appropriate because some boats engage in a mixed fishery and it may be necessary to have different sized meshes for the different species. The inability to have more than one mesh on board may force the mixed trawl fishery to concentrate on fluke, which would put more pressure on the resource. One mesh on deck could be an appropriate alternative.

C. Impose a minimum size limit on all fisheries except the otter trawl fishery while imposing only a minimum mesh regulation on the otter trawl fishery.

There is a strong feeling that it is appropriate to include a minimum length on otter trawl fisheries, even with a mesh size, because not having the size limit would encourage fishermen to take methods that would increase the catch of small fish. If all sizes were landed, it is believed the mortality rate would be higher. The general conclusion of attendees at the Third Stock Assessment Workshop at Woods Hole was that a fish brought on board from an otter trawl under the current fishing conditions would die before it was released, but there was disagreement with that statement. It was felt that there would be no effective regulation of the fishery without a size limit and that the size limit should be on a possession basis.

D. Impose a summer flounder 13" minimum fish length total length north of the water areas 625 through 639 (Figure 15) and a 5.0" minimum mesh size in the water areas 625 through 639.

E. Impose a summer flounder 13" minimum fish length total length north 39° N. latitude and a 5.0" minimum mesh size south of 39° N. latitude.

F. Impose a summer flounder 5.0" minimum mesh size in the Territorial Sea and one mile seaward of the outward boundary of the Territorial Sea.

These options were deleted because of a lack of enforcement to offset the complexity of the regulations. With different size limits, the size limit could not be enforced as a possession limit once the fish left the vessel. Undersized fish could be caught and landed.

The institution of a boundary with a mesh restriction on one side and not the other would require the presence of at sea enforcement vessels year round. These enforcement vessels would be required to stop and check otter trawlers crossing the boundary for summer flounder on board. In addition, an elaborate notification system would be necessary to alert dockside enforcement officers of the vessels checked.

APPENDIX 2. Recommended Summer Flounder FMP Penalty Schedule (penalties in thousands of dollars)

Violation	Offense 1st	2nd	3rd	4th +
SUMMER FLOUNDER SMALLER THAN MINIMUM SIZE	A	B		
Fishing without permit	1-2.5	2.5-5e	5-10e	10 + e
Failure to report change in permit information	.25-1	.75-1.5	1.5-5	5 +
Refuse permission to board a vessel	5	25		
Intimidate or assault an Authorized Officer	5	5-10	10-17.5	18-25
Resist arrest	5	5-10	10-17.5	18-25
Interfere with lawful investigation	1-2.5	2.5-5	7.5-10	10 +
Failure to obey Coast Guard signals in a timely manner	5 .5-1	5-10 1-2.5	10-17.5 2.5-5	18-25 5-10
Failure to provide safety equipment for boarding party	1-2.5	2.5-5	5-10	10 +
Failure to maneuver safely	1-2.5	2.5-5	5-10	10 +
Interference with boarding party	2.5-5	5-10	10-17.5	18-25
Failure to permit inspection of gear	5	25		
Making false statements to an Authorized Officer or the designee of the Regional Director	1-2.5	2.5-5	5-10	10 +

A = $20/undersized fish to a maximum of $5,000.
B = $20/undersided fish to a maximum of $25,000.

a = + forfeiture of illegal catch or value of illegal catch.
b = + forfeiture of entire catch or value of entire catch.
c = + forfeiture of entire catch or value of entire catch & 60-day permit suspension.
d = + forfeiture of entire catch or value of entire catch & revocation of permit and/or vessel seizure up to 6 months.
e = + value of summer flounder. If value undeterminable, $5/individual fish.

ENVIRONMENTAL ASSESSMENT ON SUMMER FLOUNDER FISHERY MANAGEMENT PLAN (FMP)

1. INTRODUCTION

This FMP was based on a management plan drafted by the State/Federal Summer Flounder Management Program pursuant to a contract between the New Jersey Division of Fish, Game, and Wildlife and NMFS. The State/Federal draft was adopted by the Atlantic States Marine Fisheries Commission (ASMFC) at its annual meeting in October 1982.

2. PURPOSE OF AND NEED FOR ACTION

2.1. The Fishing Mortality Rate May Exceed F_{max}

The current best estimates of the instantaneous rate of fishing mortality, F, are on the order of 0.65 to 0.70 (section 5.3.7.) for both sexes combined of summer flounder. The F_{max} level (the rate of fishing mortality for a given method of fishing which maximizes the harvest in weight taken from a single year class of fish over its entire life span) is estimated to occur at an F = 0.26 for females and F = 0.44 for males (section 5.3.8.). Assuming a 1:1 sex ratio in summer flounder for all ages (section 5.3.4.) allows averaging the two F_{max} estimates for a combined estimate of 0.35. Thus, the current instantaneous rate of fishing mortality is nearly double the rate which would produce the maximum yield from a single year class. Without question, long term yield from the fishery can be increased by reducing fishing mortality.

2.2. Yield from the Fishery Can Be Improved

Yield per recruit (per unit weight of recruits) estimates were maximized at F = 0.26 for females and F = 0.44 for males and is at best one half the current levels of fishing mortality occurring in the fishery. However, the $F_{0.1}$ level of fishing (rate of fishing at which the increase in yield per recruit for a small increase in fishing mortality is only one-tenth the increase in yield per recruit for the same increase in fishing mortality from a virgin fishery), which is a somewhat more conservative estimate, is significantly less. While $F_{0.1}$ may be more conservative than trying to always maximize the yield, extensive recent literature advocates a more conservative approach to managing a fish stock that is vulnerable to wide fluctuations in year class strength and does not have a defined stock-recruitment relationship.

The optimal levels (as defined in Gulland and Boerema, 1973) of fishing mortality ($F_{0.1}$) are considerably lower for females than for males. At a minimum size of 14", $F_{0.1}$, or optimal level of fishing, for females equals 0.16. Unquestionably the yield per recruit can be increased significantly by increasing the minimum size of the fish caught.

Spawning stock biomass per recruit declined markedly with increasing fishing mortality on females (Figure 11). The spawning stock biomass per recruit concept allows egg production for the population to be directly linked with fishing mortality. Egg production is highest without any F and can be increased by decreasing or delaying mortality. The spawning stock biomass per recruit consistently increases with increases in the minimum legal size limits at the $F_{0.1}$ level.

2.3. Lack of Uniformity of Management Throughout the Range

The many jurisdictions involved in the summer flounder fishery create other problems. A major portion of both recreational and commercial catch comes from State waters between Massachusetts and North Carolina. Existing State regulations differ significantly (Section 9.3.4.1). Maine, New Hampshire, and Pennsylvania have no specific laws relating to summer flounder (Squires, Dunlop, and Abele, pers. comm.). Massachusetts prohibits catching, landing, and possession of summer flounder less than 14" TL (Pierce, pers. comm.). Rhode Island prohibits harvesting and possession of summer flounder less than 14" TL (Sisson, pers. comm.). Connecticut prohibits possession, sale, and purchase of summer flounder less than 14" TL; recreational fishery minimum length is also 14" (E. Smith, pers. comm.). New York prohibits possession, sale, and transportation of summer flounder less than 14" TL and requires a mesh size equal to or greater than 4" in Long Island Sound (Mason, pers. comm.). New Jersey has a 13" minimum size limit for summer flounder in both the commercial and recreational fisheries; additionally, commercial fishermen engaged in a directed fishery must have a 4.5" stretched mesh codend (Freeman, pers. comm). Delaware prohibits possession (unless legally taken elsewhere) of summer flounder less than 14" TL (Lesser, pers. comm.). Maryland prohibits selling, buying, and possession of summer flounder less than 12" TL with a tolerance of 5% of the vessel load, by number, as indicated by a sample of not less than 200 fish, undersized (Casey, pers. comm.). There is also a 2.5" gill net minimum mesh size. Virginia prohibits taking and possession of any summer flounder less than 12" TL and requires a mesh equal to or greater than 4.5" (Travelstead, pers. comm.). North Carolina prohibits possession of summer flounder less than 11" TL (with a 5% undersized tolerance by weight) and also requires a 4.5" minimum mesh size when the load is 60% or more summer flounder (McCoy, pers. comm.).

In summary, Massachusetts, Rhode Island, Connecticut, New York, and Delaware have 14" minimum size limits. New Jersey has a 13" limit. The Maryland and Virginia limits are 12", while the North Carolina limit is 11". New York (4"), New Jersey (4.5"), Maryland (2.5" gill net), Virginia (4.5"), and North Carolina (4.5") have mesh regulations for some or all of their waters.

The lack of regulations in Maine, New Hampshire, and Pennsylvania does not present a problem because of the small amount of landings in those States. However, the lack of regulations could be significant if vessels land summer flounder in those States to avoid the regulations in other States.

Extensive efforts have been spent to coordinate this FMP with the ASMFC and the ASMFC Summer Flounder Plan (Scarlett, 1981). The ASMFC Plan provided background information and served as a spring board for many aspects of the Council's FMP. In June of 1987 an ASMFC advisory committee (ASMFC Advisory Committee, 1987) was convened to review the objectives of the ASMFC Plan and evaluate the condition of the stock. This committee's first two recommendations were: (1) "It is the feeling of the plan review subcommittee that the summer flounder plan should be updated once the draft summer flounder management plan prepared by the Mid-Atlantic c Management Council is accepted" and (2) "States should be encouraged to implement the recommendations of the original ASMFC Plan".

2.4 Lack of Data

Tremendous advances in the quantity and quality of data have occurred since 1979 when the Marine Recreational Fishery Statistics Survey (MRFSS) was initiated and all States finally began separating summer flounder from other flounders. Also the paper by Morse (1981) clarified much of the uncertainties of the biological characteristics of summer flounder. Thus, most of the catch and biological information necessary for management is currently being collected. Age composition of the commercial catch for recent years and age composition of the recreational catch are two critical biological pieces still needed. However, very little economic data are currently being collected. The key economic item needed is better effort information for the whole fishery. The addition of New York to the weighout system in 1986 will help the description of the commercial fishery, but still nearly one third of the commercial fishery landings will have no associated effort measurement. Expenditures for the recreational fishery are also needed.

2.5. Increase in Fishing Pressure due to Decrease of Other Flatfish Stocks

Unquestionably the continued decline of the New England groundfish fishery will cause more effort to be exerted on the summer flounder stocks. Nearly all the major groundfish stocks in New England (haddock, yellowtail flounder, cod, redfish, etc.) have their stocks severely depleted or have the current catch exceeding the long term potential catch (USDC, 1986d). Summer flounder commercial catch has remained relatively constant over the past several years (Table 1) while the catches of total flounders along the Atlantic coast (Table 60) have been decreasing. Significantly more effort (numbers of vessels) has been directed towards summer flounder during the past seven years (Table 55).

3. MANAGEMENT OBJECTIVES

The objectives of the FMP are to:

1. reduce fishing mortality on immature summer flounder;

2. increase the yield from the fishery;

3. promote compatible management regulations between the Territorial Sea and the EEZ; and

4. minimize regulations to achieve the management objectives recognized above.

4. MANAGEMENT UNIT

The management unit is summer flounder (*Paralichthys dentatus*) in US waters in the western Atlantic Ocean from North Carolina northward.

5. ALTERNATIVES

The adopted management measures are presented in Sections 3 and 9.1 of the FMP. Other alternatives are presented in Appendix 1 to the FMP.

6. ENVIRONMENTAL IMPACTS

The impacts of adopted management measures are presented in Section 9.2 of the FMP. Other alternatives are evaluated in Appendix 1 to the FMP.

7. MANAGEMENT COSTS

7.1. Annual Permit System

7.1.1. Costs

The annual (recurring) costs of instituting an annual permit system for summer flounder are minimal. There will be no start-up costs since the NMFS Northeast Regional Office implemented an annual permit system in 1987 in response to amendments to the Atlantic Mackerel, Squid, and Butterfish FMP (by the Mid-Atlantic Council). The remaining Magnuson Act fisheries (multispecies, lobster, sea scallop, surf clam/ocean quahog were amended to include an annual permit requirement for 1988.

The process and costs of annual maintenance should be straight forward. A renewal application would be sent to each permit holder which contains all the standard information concerning his vessel. The permit holder would simply update the form by writing corrections directly on it (e.g. change in gear, owner's address, etc.) and noting the vessels' catch of summer flounder for the past year. NMFS would process the application upon its return and issue a renewed permit. In 1987 the total cost of issuing a permit was $12.00 (Wang, pers. comm.).

The cost to each respondent would simply be the value of his time in filling out the application/renewal form. The Council estimates that filling out a renewal form should require substantially less time than the 30 minute estimate made for the initial application form, however the more liberal estimate of 30 minutes will be utilized for the purpose of this analysis. This should be considered a maximum estimate however, since it is most likely that fishermen will fill out the form at home on a day experiencing poor weather conditions. Under these circumstances, the opportunity cost approaches zero.

7.1.2. Benefits

Under the Magnuson Fishery Conservation and Management Act (MFCMA), the Secretary of Commerce is authorized to adopt such regulations as may be necessary to carry out the fishery conservation and management objectives of Fishery Management Plans (FMPs). Effective management of the summer flounder fishery requires knowledge of the numbers of vessels as well as the quantity harvested by them. Since this information is currently unavailable to the Council, a request for an annual permit system has been incorporated into the Fishery Management Plan for Summer Flounder.

Prior to the FMP, fishing for summer flounder did not require a permit. It is the intent of the Council that each permit be renewed annually by the applicant, and an estimation of the applicant's previous year's landings of summer flounder be included on the application form.

The benefits of instituting an annual permit system are several. The first and most direct benefit is the value to managers of knowing how many participants are actively engaged in the fishery, as well as, basic information on how it is being executed (gear types, vessel sizes, etc.). Those who are familiar with the current permit system are aware that fishermen can obtain a permit for any permitted fishery (except surf clams) simply and conveniently by checking off boxes on the application form. (This minimizes the imposed costs to the public but also limits the value of the data.) The most common tendency is to check off all the boxes, regardless of whether a real interest exits for participation in any given fishery. This may be simply for the purpose of leaving all options open, or in some cases fishermen fear the prospect of a limited entry program being instituted at some point in the future, and wish to establish a record of having participated. There is no current provision for discovering if a given vessel did indeed exercise its right to fish for any particular species.

A second benefit from the new system is a vastly improved ability to conduct the Regulatory Impact Reviews of management plans which are required of the Councils by E.O. 12291. In order to assess the impacts of management measures on fishermen, it is clearly necessary to be able to identify who these fishermen are.

A third point of importance is that the three tier information collecting system used by NMFS is based on samples. The Permit File, theoretically, is the one data base available which covers 100% of the population in question. Clearly it would be beneficial to fishery managers to be able to utilize its full potential.

Finally, it should be recognized that the Permit Files have the potential for being an invaluable data base on the East Coast fishing fleet as a whole, not simply from the perspective of individual fisheries. If annual permits were required across all fisheries, a comprehensive and continually updated data base would be the resultant product.

7.1.3. OMB Approval

The FMP as a whole is projected to become effective by 1 January 1989, and for this reason supporting documents are being submitted at this time. Therefore, the estimates of burden hours presented below will be applied against the FY 1989 information budget when it is prepared in June of 1988. For the FY 1988 budget, only one burden hour is requested for the purpose of beginning the start up procedures.

The Office of Management and Budget has already approved the use of annual permits as requested on Standard Form 83. The current system allows for a total of 9,400 responses per year across all fisheries in the Northeast. With a mean response rate of 30 minutes per application, a total of 4,700 Public Burden Hours have been approved.

Since the greater part of permit renewal will be simply verifying and correcting information already printed on the renewal form, response time should require less than the approved 30 minutes. With the total number of permits issued for summer flounder fishery currently estimated at about 1000, the limit of 9,400 responses per year presents no increase in burden (1,000 responses x 0.5 hours per response = 500 public burden hours).

The only modification of the permit system proposed by this FMP which may require OMB approval is in providing space on the renewal form itself for the past year's landings of summer flounder. The Council believes that adding this question will not increase public response time by more than a few seconds and certainly not exceeding the approved 30 minutes.

7.2. Reporting costs.

Reporting costs were not calculated since it is unknown whether NMFS will institute a mandatory reporting requirement.

7.3. Administrative, enforcement, and information costs.

Enforcement of this measure for the commercial fishery would be entirely dockside with increased surveillance of all EEZ landings and finfish otter trawl landings in particular. Since sale of EEZ landed smalls would be illegal, the surveillance could occur at the dock or at the processor, thereby centralizing effort.

Based on the joint NMFS/Coast Guard enforcement document (1985) and the assumption of 900 vessels affected by the regulation (Section 8.1.1 and Table 33) approximately 2,300 contacts would be necessary per year (each vessel contacted 2.5 times per year). This would require approximately 2.6 man-years of enforcement effort at $50,000 per year or $130,000. The Council believes that this measure is designed for dockside enforcement only. In order to cut costs, efforts to include state enforcement officers, many of whom are already inspecting summer flounder for a minimum size, could be utilized.

The joint enforcement document (USDC, 1985c) does not address the enforcement costs of recreational fishing. Therefore, an estimate will be made based on the number of trips involved and the area covered. There were an estimated 427,000 recreational trips in the EEZ that land or direct on summer flounder. This number is misleading, however, since there was an average of 2.8 participants per party (Section 8.1.2). Therefore, an estimated 155,000 vessel trips are involved in the EEZ summer flounder recreational fishery. Even this may be an overestimate since party and charter boats landed 28% of the summer flounder from the EEZ (Table 46). It must be remembered that only approximately 17% of the EEZ landings are in states that have a possession or landing limit less than 13" (Table 46). Therefore, assuming that landing rates are constant along the coast, only 17% of the trips need to be intercepted by federal enforcement efforts. Federal responsibilities would be further reduced if the States of North Carolina and Virginia carry out their intentions to implement a 13" minimum size limit.

This analysis is conducted assuming an arbitrary 5% coverage of the trips and an average of 15 contacts per day. There requirements become 0.6 man years of effort costing $30,000. To the extent that trips are monitored in states already having a 13" minimum size, assistance is given to state agencies, or state regulations change, this requirement will vary.

To the extent that enforcement resources must be drawn from existing assignments the actual cost increases will be zero, and considered as transfers. The internal agency opportunity costs of such transfers would be the cost of the previous assignment. The cost to society would be the difference between the combined enforcement and avoidance costs in the current assignment and those in the summer flounder fishery. Since the societal costs are not quantifiable at this time all enforcement costs will be considered transfers.

8. TRADEOFFS BETWEEN THE BENEFICIAL AND ADVERSE IMPACTS OF THE PROPOSED AMENDMENT

The impacts of the adopted management measures are presented in Section 9.2 of the FMP. Other alternatives are evaluated in Appendix 1 to the FMP.

9. EFFECT ON ENDANGERED SPECIES AND ON THE COASTAL ZONE

The adopted management measures, the preferred alternative for purposes of public hearings and review, and the alternatives do not constitute an action that "may affect" endangered or threatened species or their habitat within the meaning of the regulations implementing Section 7 of the Endangered Species Act of 1973. Thus, consultation procedures under Section 7 will not be necessary on the Amendment.

The FMP was reviewed relative to CZM programs of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina. Letters were sent to all of the States listed above. The letters to all of the States except New Hampshire and Pennsylvania stated that the Councils concluded that the FMP would affect the State's coastal zone and was consistent to the maximum extent practicable with the State's CZM program as understood by the Councils. For New Hampshire, the evaluation was that the FMP might affect the coastal zone and was consistent. For Pennsylvania, the evaluation was that the FMP would not affect the coastal zone. The letters were mailed to the States along with a copy of the hearing draft of the FMP on 21 December 1987. As of 9 June 1988 all of the States had concurred with the Council's finding except Maine and Rhode Island, which States did not respond [since Rhode Island has a minimum size (14") larger than provided by the FMP (13") and Maine has no regulations, here are no apparent reasons to believe that those States should dispute the Council consistency findings].

10. EFFECTS ON FLOOD PLAINS OR WETLANDS

The adopted management measures or their alternatives will not adversely affect flood plains or wetlands, and trails and rivers listed or eligible for listing on the National Trails and Nationwide Inventory of Rivers.

11. List of Agencies and Persons Consulted in Formulating the Proposed Action

In preparing the FMP, the Council consulted with NMFS, the New England Fishery Management Council, the South Atlantic Fishery Management Council, the Fish and Wildlife Service, the Department of State, and the States of New York, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia through their membership on the Council. In addition to the States that are members of this Council, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, and North Carolina were also consulted through the Coastal Zone Management Program consistency process. A list of the agencies and persons sent copies of the FMP, including the EA and RIR, and notice of the public hearings is inclued as Exhibit A to the final version of this EA.

12. List of Preparers of Environmental Assessment and Plan Amendment

The FMP was prepared by a team of fishery managers and scientists with special expertise in the summer flounder resource including: the Mid-Atlantic Council Demersal Fisheries Committee (Gordon Colvin, Joseph MacMillan, Harry M. Keene, Axel Carlson, Jr., Ronal Smith, Russell Cookingham, Jack Travelstead, Bruce Freeman, and representatives of ASMFC and US Fish and Wildlife Service) and MAFMC staff John C. Bryson, David R. Keifer, Thomas B. Hoff, Richard L. Tremaine, Christopher W. Rogers, and Clayton E. Heaton.

13. Findings of No Significant Environmental Impact

For the reasons discussed above, it is hereby determined that neither approval and implementation of the proposed action nor the alternatives would affect significantly the quality of the human environment, and that the preparation of an environmental impact statement on the Amendment is not required by Section 102(2)(c) of the National Environmental Policy Act nor its implementing regulations.

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APPENDIX 4. REGULATORY IMPACT REVIEW

1. INTRODUCTION

1.1. Purpose

The purpose of this document is to present an analysis of the proposed regulations for the Summer Flounder Fishery Management Plan (FMP). This document has been prepared in compliance with the procedures of the National Marine Fisheries Service (NMFS) to implement Executive Order (E.O.) 12291. The document also contains an analysis of the impacts of the Plan relative to the Regulatory Flexibility Act and the Paperwork Reduction Act of 1980.

1.2. Description of User Groups

The fishery is described in Sections 7 and 8 of the FMP.

1.3. Problems Addressed by the FMP

The problems to be addressed are discussed in Section 4.2 of the FMP.

1.4. Management Objectives

The objectives of the FMP are:

1. reduce fishing mortality on immature summer flounder;

2. increase the yield from the fishery;

3. promote compatible management regulations between the Territorial Sea and the EEZ; and

4. minimize regulations to achieve the management objectives recognized above.

1.5. Provisions of the FMP

The adopted management measures are presented in Sections 3 and 9.1 of the FMP. Other alternatives are presented in Appendix 1 to the FMP.

2. REGULATORY IMPACT ANALYSIS

The impacts of the adopted management mesures are presented in Section 9.2 of the FMP. Other alternatives are evaluated in Appendix 1 to the FMP.

3. DISCUSSION OF THE BENEFITS AND COSTS OF THE AMENDMENT

E.O. 12291 requires that a benefit-cost analysis of all proposed regulations be performed.

3.1. Costs

Management costs are discussed in section 9.2.

3.2. Benefits

The benefits of the FMP are discussed in section 9.2.

3.3. Benefit - Cost Conclusion

The benefits and costs of the FMP are discussed in section 9.2.

4. Other E.O. 12291 Requirements

E.O. 12291 requires that the following three issues be considered:

1. Will the Plan have an annual effect on the economy of $100 million or more.

2. Will the Plan lead to an increase in the costs or prices for consumers, individual industries, Federal, State, or local government agencies or geographic regions.

3. Will the Plan have significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of US based enterprises to compete with foreign based enterprises in domestic or export markets.

The FMP should not have an annual effect of $100 million or more. The total commercial fishery was valued at $33 million in 1985 (the highest in history) and the EEZ summer flounder recreational fishery expenditures are estimated at $14 to $43 per trip.

The FMP is not expected to lead to an increase in costs or prices to consumers. Recreational anglers are expected to be impacted to a small extent in the early years of the FMP with a redirection of expenditures of around $300,000. Commercial fishery lost revenue in the first year is estimated at about $1.3 million (Section 9.2.2.4). However, over a ten year time horizon the discounted benefits exceed costs by roughly $300,000 (Section 9.2.2.6).

These benefits and costs do not include any value for the increased reproductive stability of the population that will occur with a decreased fishing mortality rate and the concurrent spreading out of various age classes in the catch. These biological benefits are most apparent when one views the risk associated with compressing the age composition of the catch to where only one or two year classes dominate, thereby increasing the risk of year class failure, potentially resulting in fishery wide collapse. It is impossible to value this insurance against stock problems at this time. However, the value is of a magnitude equal to or greater than the monetary costs accounted for. This is discussed in FMP sections 9.2.1.1, 9.2.2.6, and 9.2.2.7.

A redirection of costs within the Coast Guard and NMFS is expected to amount to approximately $$130,000 per year (Section 9.2.2.3). However, these costs are considered to be transfers between competing needs within the agencies since additional funds are not anticipated to be allocated to meet the enforcement needs of this FMP. The net costs to these and other agencies are expected to be negligible.

Cost and benefit data are presented and analyzed in section 9.2.2 of the FMP.

The FMP should not have significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of US based enterprises to compete with foreign based enterprises in domestic or export markets.

5. Impacts of the Plan relative to the Regulatory Flexibility Act and the Paperwork Reduction Act of 1980.

The Regulatory Flexibility Act requires the examination of the impacts on small businesses, small organizations, and small jurisdictions. The impacts of the FMP do not favor large businesses over small businesses.

The Paperwork Reduction Act concerns the collection of information. The intent of the Act is to minimize the Federal paperwork burden for individuals, small business, State and local governments, and other persons as well as to maximize the usefulness of information collected by the Federal government. The annual permit provision is evaluated in section 9.2.2 of the FMP.

APPENDIX 5. SUMMER FLOUNDER FMP PUBLIC HEARING SUMMARIES AND PUBLIC COMMENTS

FAIRHAVEN, MA, JANUARY 11,1988

The Summer Flounder Fishery Management Plan (FMP) public hearing in Fairhaven, MA was called to order at approximately 7:10 p.m. on January 11, 1988. Phil Coates, New England Council member, was the hearing officer. Also present were Kathi Rodrigues (NMFS), Steven Correia, Virginia Fay, Charles Carmor, and Karen Bagly (all Massachusetts Division of Marine Fisheries); and David Keifer and Laura Hinton (Mid-Atlantic Council staff). Five members of the public were present.

Mr. Coates made the opening remarks regarding the Summer Flounder FMP. He stated the objectives of the FMP, as well as the management measures that the Council adopted for purposes of obtaining public comment. Mr. Coates also reviewed the alternatives to the proposed plan.

Mr. Keifer read the summary of the plan and Mr. Coates then restated the objectives of the plan and opened the hearing for any questions or comments from the industry audience. There were no comments from the audience on the objectives.

Mr. Coates went over the management measures one at a time and asked for opinions and/or comments from the industry audience. Mr. John Gonzales stated his objections to management measure 1 which states that it would be illegal to possess summer flounder or parts thereof less than 13" total length. Mr. Gonzales asked why there were no universal size limits coastwide.

Mr. Kenny Daniels from North Carolina stated his objections to the 4.5" minimum net mesh size for trips possessing 500 lbs or more of summer flounder. He stated that 500 lbs was too low and that the limit should be nearer 5,000 lbs. On questioning by Mr. Coates, Mr. Daniels indicated that there would be a problem in the sea bass fishery, where there is a substantial summer flounder bycatch and a net of 2.5" - 3".

Mr. Stephen Morris expressed concern over the ability to enforce the minimum mesh size north of the dividing line.

Mr. John Gonzales stated his objections to management measures 3 and 4 which specify that vessels south of the line would be required to use a 4.5" minimum net mesh size for trips possessing 500 lbs or more of summer flounder and that the 4.5" minimum mesh size south of the line would be increased automatically to 5" two years after plan implementation. He stated that in his opinion the mesh should be much larger. Mr. Gonzales also objected to management measure 5.

Management measures 6-9 received no comments or objectives from the audience.

Mr. Gonzales stated his objections to the implementation of 5.5" mesh in the state waters. Messrs. Santos and Daniels also objected, stating that fishermen could not catch summer flounder at all with a 5.5" mesh net.

Mr. Coates pursued the other public hearing issues to illicit comments from the industry audience.

Messrs. Santos, Morris, and Gonzales all stated their objections to the Council's statement that discard mortality was 100%. All three men agreed that the discard mortality was much lower.

Messrs. Morris and Daniels stated that the 500 lb trigger for which the minimum net size applies was way too low.

Mr. Keifer restated that the deadline for comments was Feb. 19.

Mr. Coates thanked the audience and the hearing adjourned at 8:17 p.m.

GALILEE, RI, JANUARY 12,1988

The Summer Flounder FMP public hearing in Galilee, RI, was called to order at 7:12 p.m. on January 12, 1988. David Borden, Chairman of the New England Fishery Management Council, presided over the hearing. Also present were Robert Smith and Richard Allen (New England Council), Dick Sisson (RI Division of Fish and Wildlife), and David Keifer and Laura Hinton (Mid-Atlantic staff). Five members of the public were present,

Mr. Borden made the opening remarks and introductions. He stated the objectives of the FMP, as well as the management measures the Council adopted for purposes of obtaining public comment. Mr. Borden also reviewed the alternatives to the proposed plan. He asked Mr. Keifer to read the summary of the plan.

Mr. Borden then restated the objectives of the plan and asked for questions or comments from the industry audience. There were no questions on Objective 1. On Objective 2 Mr. Smith stated that the cut off point should be at 14".

Mr. Allen wanted to know what the impact on the landings would be and what would prohibit people north of the line from landing less than 13" fish south of the line.

Mr. Sisson asked if there would be any regulations south of the management line.

In relation to management measure 3, Mr. Allen wondered if the New England selectivity studies would show the surveys of the state regulations on mesh. He stated that one needed to match the legal size to the mesh size.

There were no questions on management measure 4.

There was considerable discussion on management measure 5, which stated that after 500 lbs of summer flounder have been retained, only nets of the legal size would be allowed on deck and in use. Messrs. Allen, Smith and Jim McCauley discussed this measure at length, asking for any exceptions to this rule.

Mr. McCauley, from Pt. Judith, had a question regarding the annually renewable permits for vessels fishing commercially for summer flounder, either directly or as a bycatch in other fisheries. He asked whether these permits were completely separate from the other required state permits.

Mr. Smith opposed management measure 9, which stated: states with minimum sizes and minimum mesh regulations larger than those in the FMP are encouraged to maintain them. He asked if the stock continues to decline would the criteria still remain at 500 lbs?

Messrs. Sisson and McCauley also stated objections to management measure 9 on the basis of differing mesh sizes in different states.

Messrs. Allen, Sisson, Smith, and McCauley all had comments and opinions on management measure 10. Most of the comments centered around the fact that if the stock continues to decline and the Council finds that the adjustment criteria have been met and if the NMFS Northeast Regional Director agrees with the Council, the minimum fish length and a minimum mesh size would be increased to a minimum fish length of 14" TL and a minimum net mesh size of 5.5" and the line specified would be eliminated from the management regime. It was generally agreed that that measure would definitely be needed if the commercial fishermen continually landed south of the line.

Hearing no further questions on the management measures, Mr. Borden addressed the Penalty Schedule. Mr. Keifer highlighted the differences among the Penalty Schedules. Messrs. Smith and Allen asked for clarification on several points of the schedule.

The statement that the analyses of the alternatives are based on the assumption that all fish discarded in the trawl fishery die, and that the discard mortality may, in fact, be less than 100% was discussed. Messrs. Smith, McCauley, Allen, Mike Foley, and Robert Chandlin all agreed that the discard mortality rate was less than 100%. Mr. Allen cited circumstances where he had caught fish from the Tag and Release Study conducted by NMFS.

There was discussion regarding the responsible party on a party/charter boat when a violation would be issued. The discussion centered around the possibility of the owner being issued the violation when, in fact, the individual renting the boat and doing the fishing actually committed the violation.

Mr. Keifer reiterated that the due date for comments was February 19.

Mr. Borden concluded the hearings at 8:32 p.m.

RIVERHEAD, NY, JANUARY 13,1988

The Summer Flounder FMP public hearing in Riverhead, NY, was called to order at approximately 7:30 p.m. on January 13, 1988 by Gordon Colvin, Director of the Division of Marine Resources for the Department of Environmental Conservation and a member of the Mid-Atlantic Council. Also present were Charles Johnson (Mid-Atlantic Council), Jack Terrill (NMFS), John Mason, Raoul Castaneda, Kevin DuBois, and Chester Zawacki (NY Department of Environmental Conservation), and David Keifer and Laura Hinton (Mid-Atlantic staff). Twelve members of the public were present.

Mr. Colvin made the opening remarks. Mr. Keifer then read the summary of the plan and Mr. Colvin opened the hearing for comments on the proposed plan.

Mr. Castaneda asked whether there would be a 10% size tolerance allowed on the size limit and wondered why that was not put into the plan.

Mr. Fritz Cass commented that it might be useful to go on a percentage basis for size limits under 500 lbs.

Mr. Floyd Carrington, President of the Shinnecock Fisherman's Club, had a question regarding management measure 1, which states that it would be illegal to possess summer flounder or parts thereof less than 13" total length. He asked if the filleted parts of the legal size fish also had to be at least 13".

Mr. Richard Miller wanted to know how the plan justifies the 13"-14" recommendations for size limits in the different states. Mr. Colvin stated that the southern states are at 4.5" mesh net right now and the all of the states are different and that the intent of the plan is to promote consistency in size limits among the states. Mr. Miller stated that it sounded like the decision to have different size limits is based on political maneuvering rather than consideration for promoting consistency between the states.

Mr. Jim Gillen was interested in how the plan would affect the recreational fishery. Mr. Keifer stated that the size limit and the EEZ line applied to both commercial and recreational fisheries. Mr. Gillen also addressed the enforcement issue with regard to the plan. He recommended that the person who actually caught the fish (on a recreational party or charter boat) be the person issued the violation and therefore be responsible for the fine. He stated that it was unfair to ticket the owners of the boats when they had little or no ability to enforce the rules on the boats other than posting the law in plain sight.

There was discussion on management measure 5 which stated that after 500 lbs of summer flounder have been retained, only nets of the legal size would be allowed on deck and in use. Mr. Cass asked if the nets had to be out on deck or simply available.

There were several questions from the audience pertaining to definitions used in the plan which Mr. Keifer explained to the industry audience. Mr. Keifer restated to the audience that the deadline for comments for the plan was February 19.

The hearing adjourned at approximately 8:10 p.m.

ROCKVILLE CENTER, NY, JANUARY 14,1988

The Summer Flounder FMP public hearing in Rockville Center, NY was called to order at approximately 7:15 p.m. on January 14, 1988. Charles Johnson, member of the Mid-Atlantic Council presided over the hearings. Also present were John Mason and Raoul Castaneda (NY Department of Environmental Conservation), and David Keifer and Laura Hinton (Mid-Atlantic staff). Nine members of the public were present.

Mr. Johnson made the opening remarks and stated the objectives of the plan, as well as covered the management measures for which the council was seeking public comments. Mr. Keifer read the summary and Mr. Johnson opened the hearing for questions and comments from the industry audience.

Mr. Tony Stustad commented that the summer flounder should have been included in the plans for the multi-species. He also stated that the regulations for these plans should be universal among the different councils.

Messrs. Charles Werst, Gordon Roman and Bruce Larson discussed the differences in the size limits between the south and the north. Mr. Roman, a party boat owner, also wanted to know if an owner needed a permit if he did not fish past the 3 mile limit.

Mr. George Lightfoot commented on management measure 5, which states that after 500 lbs of summer flounder have been retained, only nets of the legal size would be allowed on deck and in use. Mr. Lightfoot commented that it would be quite difficult to maintain the limit without coming back to port constantly. He stated that his normal tows were at least 4,000 lbs. and that 500 lbs. was far too low. Mr. Delanoid, a recreational fisherman, commented on Mr. Lightfoot's example and stated that a one time purchase of a new net would be worth it for the good of the habitat.

Mr. Roman commended the Council for its efforts in trying to establish a management plan. Mr. Roman commented that the bulk of the small fish seem to be in the south. He stated that going to 13" coastwide would ensure a more stable growth pattern coastwide.

Mr. Werst, Chairman of the West End Fishermen's Assoc., commented on the plan analyses of the alternatives based on the assumption that all fish discarded in the trawl fishery die. Mr. Werst stated that in his opinion 100% of discarded fish do not die. He observed that the percentage of fish that die when discarded is variable depending on what type of fishing is being done. He stated that on a "clean tow" a fisherman would have a high percentage of fish that do not die when discarded and on a "dirty tow" fewer fish returned would live, but the discard mortality would still be less than 100%. Mr. Stustad agreed with Mr. Werst stating that the fish are still regulated quite closely and that he has caught quite a few fish that were from the Tag and Release Study done by NMFS.

Mr. Bob Pataffy had some questions regarding the Penalty Schedule. His questions centered around the responsibility of the boat owner when a violation was issued. He recommended that if a boat demonstrated compliance by providing measuring devices and posted size limits (demonstrated obedience to the law) then the individual catching the illegal fish should be the one to be issued the violation. He further stated that the measurement and differentiation of the party/charter boat specifications should be delineated more clearly in the Penalty Schedule. He recommended that the notices be posted and that would be enough to imply compliance with the law.

Mr. Ed Blyskal commented that there was a need for management.

Messrs. Stustad, Ricky Ivans, Werst, Steve Grimwold, Neil Delanoid and Roman all commented and discussed the various reasons for the decline of summer flounder stock. The main reasons cited were overfishing (by both commercial and recreational) and pollution. Mr. Roman stated the fish are not being allowed to reach maturity and are being caught too soon south of the line.

A question was raised regarding the dividing line near Hudson Canyon. Mr. Mason answered the question.

Mr. Keifer stated that the deadline for comments was February 19, 1988.

The hearing was adjourned at approximately 9:00 p.m.

WALL TOWNSHIP FIRE HALL, WALL, NEW JERSEY, JANUARY 28, 1988

The meeting was called to order by Mr. Axel Carlson at 7:20 p.m. Those in attendance were: Axel Carlson (Mid-Atlantic Council member), Bruce Halgren and George Howard (Division of Fish and Game of NJ), and John Bryson and Kathy Collins (Mid-Atlantic Council staff). Thirty nine members of the public attended.

Opening statements were read by Mr. Carlson. Mr. Bryson presented a summary of the Summer Flounder Plan. Following the presentation of the summary, a brief question and answer period was opened. Following the question and answer period Mr. Carlson opened the hearing to comments from the public.

Mr. Nils Stolpe, Executive Director of Commercial Fishermen's Assoc. of NJ, submitted a written report (Attachment A).

Mr. Kevin Bradshaw, stated that the fillet size should not be measured. He stressed that too much of the fish will be cut away so the fish should be measured before you fillet it.

Mr. Steve Wilkes, Commercial Fisherman, stated that the he does not agree with the plan at all.

Mr. Ray Burke, stated that the private mariner's should be watched carefully because they are the ones who probably bring in the most undersized fish. He also stated that the fish should be measured before you fillet it.

Mr. Jim Mathews, stated that the plan would put fisherman out of business.

Mr. Dennis Slouger, agreed that the plan would put fisherman out of business. He also commented on the 500lb. limit. He stated that the fluking may be poor so you decide to go whiting fishing but you cannot because of the limit. You would have to go all the way back to the dock and then back out which is a waste.

Mr. Joe Bogan, stated that he also agrees that the fish should be measured before you fillet it. He also suggested that the racks be brought in with the fillets to be measured.

Mr. Halgren explained what the state of NJ was doing to determine a proper size for a fillet from a 13" fish.

Mr. Joe Galluccio, stated that the fillet length should be abolished because it would hurt the fisherman too much.

Mr. Tom Buban, stated that the 13" size limit should be enforced so you do not have to go to fillet size.

Mr. Gary Clayton, stated that the fluke law is unenforceable.

There being no further comments, Mr. Carlson adjourned the meeting at 8:50 p.m.

CAPE MAY COURTHOUSE, NJ JANUARY 27, 1988

The Summer Flounder FMP public hearing in Cape May Courthouse, NJ was called to order at approximately 7:05 p.m. on January 27, 1988 by Mr. Axel Carlson, a member of the Mid-Atlantic Fishery Management Council. Also present were Ms. Fran Puskas (Mid-Atlantic Council), Dr. Robert Lippson (NMFS), Bruce Halgren (NJ Marine Fisheries), and Stewart Tweed and Gef Flimlin (NJ Sea Grant), and David Keifer and Laura Hinton (Mid-Atlantic Council staff).

Mr. Carlson introduced Mr. Keifer. Mr. Keifer read the summary for the industry audience and Mr. Carlson then opened the hearing for comments and questions.

Mr. George Trotmen, a recreational fisherman from Philadelphia had questions pertaining to the fillet from a 13" fish. He asked if there were any alternatives in the plan to the fillet size regulation. Mr. Carlson answered that, as stated in the Plan, there were no alternatives to the measure which stated that it would be illegal to possess summer flounder or parts thereof less than 13" total length.

Mr. Bob Walters objected to the wording in the Plan of "parts thereof". He suggested that it was impossible to get 13" fillets from a 14" fish. He offered a suggestion that the measure be reworded to say appropriate sized fillets from a 14" fish.

Mr. Joe McTommy, a fisherman from New Jersey wanted to know if there was a size limit on the fillets in the recreational fishery.

Mr. Danny Cohen from Cape May asked if it was legal to fillet the fish before docking. Mr. Carlson answered yes. Mr. Cohen noted that other state's plans contained tolerances and asked if the Summer Flounder Plan contained any tolerance levels. Mr. Keifer indicated that at this point in the plan there were no tolerances.

Mr. Walters recommended that the Summer Flounder Plan include tolerances.

There was discussion among the fishermen regarding management measure 5, which states that after 500 lbs of summer flounder have been retained, only nets of the legal size would be allowed on deck and in use. Mr. Walters recommended that at least 51% of the catch be caught before this measure was implemented.

Mr. Cohen commented that it would be to the benefit of the summer flounder stock if the regulations were universal all along the coastline.

Mr. Nils Stolpe, of the New Jersey Commercial Fisherman's Association, wanted to know if the 13" fillet size limit could be changed to parts (fillets) of legal size fish. Discussion followed by commercial and recreational fishermen as to the probability of getting a 13" fillet from a legal size fish. The consensus among the fishermen was that it was not likely that one could get a fillet that was 13" except from a much larger fish.

Mr. Trotmen wanted to know if there were annually renewable licenses for the recreational fishermen. It was explained that if a fisherman caught more than 100 lbs. of fish he would need a permit but not if he caught below 100 lbs or did not fish beyond the 3 mile limit. There was continued discussion of the 3 mile limit with regard to federal fishing permits and party/charter boats.

Mr. Walters recommended that the New Jersey penalty guidelines for undersize fish should be adopted by the Plan. He suggested that a maximum fine be imposed for violation of the regulations.

The hearing was adjourned at 8:07 p.m.

COLLEGE OF MARINE STUDIES, U OF D, LEWES, DE, JANUARY 15, 1988

The meeting was called to order by Mr. Richard Cole at 7:15 p.m. Those in attendance were: Richard Cole (Mid-Atlantic Council member), Bob Lippson (NMFS), and Council staff John Bryson and Kathy Collins. Nine members of the public attended.

Opening statements were read by Mr. Cole. Mr. Bryson presented a summary of The Summer Flounder Plan. Following the summary, a brief question and answer period was arranged. After the question and answer period, Mr. Cole opened the hearing to comments from the public.

Mr. John Martin, Martin Fish Co., stated that a 4.5" bag will destroy 12" size or less fish, although the 13" size regulation is fine. He said that he would favor the 5" bag because it would eliminate smaller fish. He also stated that he is in favor of conserving fish by preventing them from going through the mesh. He also stated that a larger mesh size will save many fish - not just flounder. Also, it would be better to tighten the fly net to the bottom in order to catch flounder. Strictly, a bigger flounder bag would allow smaller fish to go through. He also stated that the 13" is okay for short tows and shallow water because you do not lose too many fish. Clean tows rarely happen and three hour tows are not uncommon. He also added that using a fly net with a slight modification could be used to bottom fish.

Mr. David Martin, Martin Fish Co., stated that his main concern of the whole thing was the provision that there could not be anything less than 13". He said that there should be a tolerance. He also stated that by being penalized for one fish that was under 13" is too much. He also agreed totally with Mr. John Martin on the bag size.

Mr. Phillip English, Operator of a Charter Boat, stated that he would be in favor of a 13" size limit and a 5" bag.

There being no further comments, Mr. Cole adjourned the meeting at 8:05 p.m.

DEPT OF LEGISLATIVE REFERENCE BLDG. ANNAPOLIS, MARYLAND, JANUARY 14, 1988

The meeting was called to order by Mr. Harry M. Keene at 7:00 p.m. Those in attendance were: Mid-Atlantic Council members Harry M. Keene and Al Goetze, Paul Martensen (NMFS), and Council staff John Bryson, Tom Hoff, Chris Rogers, and Kathy Collins.

Opening statements were read by Mr. Keene.

There being no members present from the public, Mr. Keene closed the meeting at 7:25 p.m.

QUALITY INN, NORFOLK, VIRGINIA, JANUARY 13, 1988

The public hearing was called to order by Mr. Jack Travelstead at 7:10 p.m. Those in attendance were Council Members Jack Travelstead and Jim McHugh, Bob Lippson (NMFS), and Council staff John Bryson and Kathy Collins. Twenty-four members of the public attended.

Opening statements were read by Mr. Travelstead. Mr. Bryson presented a summary of the Summer Flounder Plan. Following the summary presentation, a brief question and answer period was opened. Following the question and answer period, the hearing was opened to comments from the public.

Mr. Gordon Eastlake, from Wachapreague, stated that 25% of catches are throwbacks because major catches range from 12" to 13". This will put us out of business if the size limit is changed. There has not been any enforcements before so why start now?

Mr. Charlie Emory, AD Emory Co., stated that he does not agree with the 13" and 14" law because major catches range from 12" to 13". With this law there would be a lot of wasteful dumping of dead fish. He also felt that a tolerance was needed. He also recommended keeping what is caught, even though it is dead and giving it to a state or county institution to use.

Mr. Herb Gordon, Virginia Federation of Anglers, stated that he fully supports the 13" law even though it may put a temporary hardship on some people.

Mr. Bryson stated that we believe that we are protecting your future and your long term fishery by implementing this law.

Mr. Carl Herring, President of the Virginia Federation of Anglers, stated that they are in support of this particular proposal. He fully supports the plan.

Mr. Eddie Gaskins, stated that he finds it hard to comply with a 12" law, how can they comply with a 13" law.

Mr. Bill Culpepper, Seafood Packers, stated that he totally disagrees with the 13" law because the majority of the fish are smaller.

Mr. Randy Lewis, from Wachapreague, stated that he also does not support the 13" law.

There being no further comments Mr. Travelstead adjourned the hearing at 9:20 p.m.

NORTH CAROLINA AQUARIUM, MANTEO, NORTH CAROLINA, JANUARY 12, 1988

The meeting was called to order by Mr. Spitsbergen at 7:25 p.m. Those in attendance were: Dennis Spitsbergen (South Atlantic Council), Jim McCallum (Congressmen Jones' office), Bob Lippson (NMFS), and Mid-Atlantic Council staff John Bryson and Kathy Collins.

Opening statements were read by Mr. Spitsbergen. Mr. Bryson presented a summary of the Summer Flounder Plan. Following a brief question and answer period, Mr. Spitsbergen opened the hearing to comments.

Dr. William Hogarth, Director of North Carolina Division of Marine Fisheries, read a prepared statement (Attachment B).

Mr. Moon Tillett, stated that he agreed with the statement which Dr. Hogarth read. It should be enforced at the dock and that the 500 lb. limit was too low. It should be more like 5,000 lbs. instead of 500 lbs. because you would have to come back to the dock to unload it before you could go out fishing for something else.

Mr. Spitsbergen clarified to Mr. Tillett that there is a fly net exemption. Even though you have 500 lbs. in the hold, you can take off your flounder net and put your fly net on.

Mr. Tillett continued to state that he opposes the 4.5" - 5" tail bag because they cannot have a bycatch. The bycatch is a lot of times a lot more than a flounder catch for some people.

Mr. Art Smith, read a prepared statement (Attachment C).

Mr. Walter Tate, Commercial Fisherman, stated that no action needs to be taken at this time because more studies are needed.

Mr. Jimmy Fletcher, Commercial Fisherman, stated that a 13" total length and 5" tail bag would be the best alternative. If these are not used you kill more than 50% of the fish less than 13". (See Attachment D)

Mr. Joey Daniels, stated that he supports the 5" mesh net size.

Mr. Willie Etheridge, Etheridge Seafood, stated that he supports the preferred alternative.

Mr. Henry Daniels, stated that he supports the 13" total length size but opposes a restriction on bag size.

Mr. Billy Carl Tillett, stated that he opposes any mesh sizes.

There being no further comments Mr. Spitsbergen adjourned the hearing at 9:32 p.m.

CARTERET COMM. COLLEGE, MOREHEAD CITY, NORTH CAROLINA, JANUARY 11, 1988

The meeting was called to order by Mr. Dennis Spitsbergen at 7:15 p.m. Those in attendance were: South Atlantic Council member Dennis Spitsbergen, Jim McCallum (Congressman Jones' office), David Taylor (NC Division of Marine Fisheries), and Mid-Atlantic Council staff members John Bryson and Kathy Collins. Sixteen members of the public attended.

Opening statements were read by Mr. Spitsbergen. Mr. Bryson presented an overview of the Summer Flounder Plan. Following the summary presentation, Mr. Spitsbergen opened the hearing to comments from the public.

Mr. Billy Smith, Commercial Fisherman, said that the 13 inch minimum length for flounder would hurt the fisherman that are trying to make an honest living. The fishing industry is the last industry that you work for what you get. We're going to stand up and fight for it but it isn't going to do any good but we are going to fight all we can to try to keep what we have got. Honestly, to make a living you've got to work for it.

Mr. Spitsbergen added the comment that getting a Summer Flounder Plan going there was a letter to the South Atlantic Council from one of our U.S. Representatives who said he had been contacted by North Carolina fishermen and said please do something about flounder. Look at getting mesh sizes, look at getting fin fish sizes, look at doing something, our flounder fishery is in trouble.

Mr. Jimmy Gillikin, Gillikin Seafood, stated that in trying to help save the flounders, you always pick on the flounder boat, the big trawlers. Changing the mesh net size would cause us to have to change all of our nets. It's not the net size that should matter, it's the bag size. There are probably more baby flounders caught in shrimp nets than fluke nets. If you have to change all of that gear just to save some flounder you're not going to save them.

Mr. Ed Cross, commercial fisherman, said we asked for help from the industry to have some input in this thing and from what I see from the plan there is a lot of stuff that the industry cannot survive with. Like a 4.5 " mesh net, I doubt the council knew what size our nets were, and this is going to cost a ton of money to throw the nets away we have stored. Nobody is going to be willing to do this. You cannot enforce it to start with whether they do it or not as stated on Appendix 2 which has the fines stated.

Mr. Bryson stated that there has to be a policy for those who are caught violating, and they are going to have to pay a pretty big penalty if we are ever going to hope to do anything with this.

Mr. Cross continued that he agreed with Mr. Bryson, but discarding all the nets we have and convert to a 4.5" mesh, I am sure the industry that makes nets would be interested in making new nets, but we do not need this. He said the fish are going into the bag anyway and we can regulate it with the tail bags and that is where it needs to be done. Once that fish is on deck, and he is dead, and the fish is thrown back overboard, that is a saleable product for the market. Why should that fish go to waste? I say the 13" should not be the limit size. I say put it on the net, what gets in there, bring it home and sell it.

Mr. Gerry Smith, Smith Seafood, said one thing I would like for you to consider, is that we have a short season. We start in November, it usually lasts three months. Out of the three months we might fish two months. With a 4.5" mesh thousands of dollars are going to be destroyed if you do not change this.

Mr. Spitsbergen clarified Mr. Smith's statement by asking him if he did not want a mesh size, if he wanted it at the cod end not just through the net?

Mr. Gerry Smith confirmed Mr. Spitsbergen's statement by saying he just wants the cod end regulated, not throughout the net.

Mr. William Smith, Smith Seafood, said that too many fish are thrown back because of the size limit and that this is a waste. Lets put it on the bag and what stays in there lets sell it and see how it works. The bag size limit is okay. Keep up front mesh and do not go 4.5" throughout the net. He also stated that a lot of 8" fly nets are being used instead of 16".

Mr. Virgil Potter, Potter Seafood, said that he was glad that a lot of fluke had showed up this fishing season. Before the rules are implemented, I would like to know where they come from. If the law goes to 14" it will destroy us. Most fish checked will be under 14".

A prepared statement was read into the record on behalf of Dr. William T. Hogarth (Attachment E)

There being no further comments, Mr. Spitsbergen adjourned the meeting at 9:30 p.m.

SUMMARY OF ATTENDANCE RECORD RESPONSES

Date		Alternative Supported 1	2	3	4	5	6	7	8	9	10	Preferred Alt.	Total
1/11/88	Fairhaven, MA	-	-	-	-	-	-	-	-	-	-	-	-
1/12/88	Galilee, RI	-	-	-	-	-	-	-	-	-	-	-	-
1/13/88	Riverhead, NY	-	-	-	-	-	-	-	-	-	-	-	-
1/14/88	Rockville, NY	-	-	-	-	-	-	-	-	-	-	-	-
1/28/88	Wall, NJ	-	-	-	-	-	-	-	-	-	-	-	-
1/27/88	Cape May, NJ	-	-	-	-	-	-	-	-	-	-	-	-
1/15/88	Lewes, DE	-	-	-	1	-	-	2	1	-	1	-	5
1/14/88	Annapolis, MD	-	-	-	-	-	-	-	-	-	-	-	-
1/13/88	Norfolk, VA	6	-	-	-	-	-	-	-	-	-	3	9
1/12/88	Manteo, NC	9	-	1	-	-	3	1-	-	-	-	-	14
1/11/88	Morehead City, NC	5	-	-	-	-	-	-	-	-	-	1	6
Mail In Responses		6	-	1	4	1	2	4	52	-	-	6	76
TOTAL		**26**	-	**2**	**5**	**1**	**5**	**7**	**53**	-	**1**	**10**	**110**

Preferred Penalty Schedules

	A.	B.	C.	D.
Public Hearing Attendees	1	-	3	-
Mail In Questionnaires	1	-	56*	2

100% Discard Mortality

	YES	NO
Public Hearing Attendees	6	8
Mail In Questionnaires	58*	6

If No, What % survive?

	80%	10-50%	25%	Length of Tow
Public Hearing Attendees	1	4	2	-
Mail In Questionnaires	1	1	2	1

Is 500 lbs a reasonable minimum?

	Yes	No
Public Hearing Attendees	3	4
Mail In Questionnaires	55*	6

* 49 questionnaires were received from Cape May County Party & Charter Boat Assoc., and the Cape May Tuna & Marlin club. All of the questionnaires were identical in their answers.

NEW JERSEY COMMERCIAL FISHERMEN'S ASSOCIATION

ONE CENTENNIAL SQUARE, SUITE 104
HADDONFIELD, NEW JERSEY 08033
(609) 429-5351

ATTACHMENT A

COMMENTS ON:
PROPOSED SUMMER FLOUNDER FISHERY MANAGEMENT PLAN

January 27, 1988

Nils E. Stolpe
Executive Director

The New Jersey Commercial Fishermen's Association is concerned with the following management measures as presented in the Hearings Bulletin dated 12.14.87:

1. The possession of summer flounder parts ~~less than~~ 13" in length. - No matter how proficient one is with a filleting knife, it will be impossible to cut a legal fillet from many summer flounder of above the legal minimum length. It is incumbent upon the Council, in cooperation with the National Marine Fisheries Service and the various involved state agencies, to decide upon criteria that relate characteristics of the fillet to the legality of the summer flounder from which it came. There is no justification for a regulation which places fishermen, (or anyone else, for that matter) in the position of being penalized for possessing fillets from legal fish because fillet length isn't related to total fish length.

5. We oppose the proposed requirement that once a 500 pound summer flounder minimum is reached, only nets of legal size would be allowed on deck and in use. For many vessels this would be unworkable, for all vessels it would be impractical and potentially hazardous. Storage space below decks is not always

available, extra gear changes increase the risk of mishap, and other opportunities could easily, and unnecessarily, be lost.

OTHER ISSUES:

1. As proposed by the South Atlantic Council, we recommend a 10% tolerance in undersized summer flounder in the trawl fishery.

2. In view of the fact that the New Jersey state enforcement agencies are faced with the same or similar enforcement considerations, we recommend a penalty schedule conforming with that in effect in New Jersey presently.

3. Provisions in the plan should insure that penalties for illegal fish are imposed on the proper parties. As brought up at the Cape May hearing, for instance, a dock could be in possession of illegal fish unknowingly, unintentionally, and innocently and yet still be severely penalized.

I am William T. Hogarth, Director of the North Carolina Division of Marine Fisheries. Our agency feels that without question, there is a need for regulatory controls on summer flounder to aid in the protection and release of small fish which have not achieved spawning size. In the past, the Division of Marine Fisheries has gone on record in support of regulations, including size limits and net mesh sizes similar to those recommended in the Atlantic States Marine Fisheries Commission Summer Flounder Management Plan. The Division of Marine Fisheries continues to be concerned about the status of this important interjurisdictional resource. Indications suggest that this fishery may be approaching recruitment over-fishing (catching them more rapidly than they are being replaced) rather than growth over-fishing (catching them too small).

The Division of Marine Fisheries implemented a 4½ inch tailbag mesh size for the directed flounder fishery in the territorial sea, beginning in 1984. We have, however, found this to be extremely difficult to enforce since it requires at-sea enforcement, which means boarding fishing vessels at sea to determine compliance. Gear regulations were utilized because they are the only controls that we can impose based on present regulations.

In past years, the majority of the winter trawl fishery for summer flounder was a directed fishery, taking primarily flounder. In recent years, however, possibly because flounder stocks are down, it has become a more mixed fishery with the by-catch of trout, king fish, scup, sea bass, etc., occasionally equal to the flounder catch.

The Division of Marine Fisheries strongly supports a minimum size limit of 13 inches (to allow for at least one spawn) but has mixed feelings with regard to the tailbag mesh size. Presently, North Carolina fishermen are economically dependent on the retention of by-catch which would be a loss with a tailbag mesh size necessary to release small flounder. We are, however, concerned that the size limit alone (unless strictly enforced and complied with by the fishing industry) may not reduce mortality of the small flounder which this plan is designed to protect.

The position of the Division of Marine Fisheries is to establish a minimum size limit of 13 inches with zero tolerance. If mesh requirements are incorporated in the plan, a liberal exemption should be considered for fly nets and combination nets (nets with large mesh wings and body that catch some flounder).

Most important, we would like to see uniform regulations for this fishery between the individual states and the federal waters.

Prepared 1/8/88

ATTACHMENT C

(919) 473-5026 (919) 473-5027

Fisherman's Seafood, Inc.

P.O.BOX 399 • WANCHESE, N.C. 27981

January 12, 1988

Mid-Atlantic Fishery Management Council
Room 2116, Federal Building
Dover, Delaware 19901-6790

To Council Members:

This letter is in reference to the proposed summer flounder regulation. We are opposed to any regulation that contains gear restrictions. The mesh regulation this proposal contains discriminates against southern states and their fisherman by allowing fisherman north of the N.J./N.Y. border to fish without bag restrictions. This allows northern fisherman to catch squid, bass, scup, and other bycatch to supplement their flounder fishing trips. Also, without excessive federal cost and effort, enforcement cannot be done properly. Without strict enforcement, fisherman will be encouraged to break the law for economic benefit. The fisherman that refuse to break this law will suffer. This mesh regulation will cost fisherman several million dollars in loss of bycatch. To make up for this loss, more effort, not less, will be placed on summer flounder.

In discussing this issue with local fisherman we have found that the majority supports the objectives of the FMP which are to reduce fishing mortality on immature summer flounder and increase summer flounder yields. They believe this can be done with size limit regulations with low catch and no sale tolerance. Minimum size limits will cause fisherman to avoid small fish that have no economic value. They also support compatible management regulations between state and federal waters. Fish size limits not exceeding 13 inches should be adopted in all federal waters and states should be encouraged to adopt identical regulations. They strongly support the objective to minimize regulations to achieve management objectives. A uniform size limit with no mesh regulations would be effective, more enforceable, and something our summer flounder fisherman could live with.

To reduce fishing effort on summer flounder fishery, the MAFMC should encourage the NMFC to reduce or drop present mesh regulations in northern ground fisheries. They should also encourage Congress to place tariffs on imported fish. This would increase bycatch value and spread fishing effort over more species.

We appreciate your consideration in this matter.

Sincerely,

Rex E. Simpson
Rex Simpson

Art Smith
Art Smith

ATTACHMENT D

NET MESH SELECTIVITY IN TRAWL FISHERIES

THE FLUKE; SCIENTIFIC NAME *Paralitchthys dentatus*: GEOGRAPHIC RANGE; NOVA SCOTIA TO NOTHERN FLORIDA, MOST ABUNDANT CAPE COD TO CAPE HATTERAS.

LIFE HISTORY

MAXIMUM SIZE: 25# ALTHOUGH 15#" OR 36 IN. ARE USUAL.
SEXUAL MATURITY: FEMALES 14 TO 17 IN. (3 TO 4 YRS) MALES 13 TO 15 IN. (2 TO 3 YRS.).
LENGTH TO AGE : (1 YR. 8 IN.) (2 YR. 11. IN.) (3 YR. 15 IN.) (4 YR. 17 IN) (5 YR. 19 IN.) (6 YR. 20 IN.

REPRODUCTION

SPANING: OCTOBER IN NOTHERN PORTION OF RANGE TILL JANUARY IN SOUTHERN RANGE. SPANNING TAKES PLACE OFFSHORE, ALONG THE CONTINENTAL SHELF. FEMALES MAY SPAWN MORE THAN ONCE PER. YEAR.

PROBLEM

METHODS TO ALLOW FISH TO ATTAIN SPAWNING SIZE & AGE BEFORE BEING KILLED BY SPORT OR CONNERCIAL INTREST.

THE SPORT SIDE OF THE PROBLEM SHOULD BE REASONABLE SIMPLE A (14 TO 16 IN.) SIZE LIMIT ON THE FISH TAKEN FROM ALL WATERS STATE AND FEDERAL.

THE COMMERCIAL SIDE IS FAR MORE COMPLEX FOR IT MUST TAKE INTO ACCOUNT GILL, POUND, FIKE, AND MOST IMPORTANT TRAWL NETS.

IN 1972 MYSELF AND OTHER CONCERNED WATERMEN PETITIONED THE NORTH COROLINA DEPT. OF MARINE FISHERIES FOR A 5 IN. TAIL BAG LAW. THE REASON FOR THIS ACTION, THE HIGH MORTALITY OF SMALL NON SALEABLE FLUKE THAT WERE BEING SHOVELED OVERBORD BY THE INDUSTRY. ACTUAL COUNT ON DECK VARIED FROM FIVE NONSALABLE FISH TO EACH SALABLE AS A LOW TO THIRTY TO FIFTY NONSALABLE TO ONE SALABLE AS A HIGH. IT IS REGRETTED NO RECORD OF BY CATCH WAS RECORDED.

FROM 1972 TILL 1980'S N.C. FISHERIES SIDE LINED THE REQUEST BY STUDYING THE PROBLEM. "IN RECENT YEARS THERE HAS BEEN GROWING CONCERN OVER THE INCREASING NUMBERS OF SMALL SUMMER FLOUNDER <300 MM BEING LANDED IN THE FISHERY. AGE-GROWTH DATA HAS SHOWN THAT THESE ARE 1+TO 2 YEAR OLD FISH (POWELL 1974, SMITH AND DAIBER 1977) SINCE THERE APPEARS TO BE NO DECLINE IN RECRUIMENT , THIS AGE COMPOSITION MAY INDICATE THAT "GROWTH OVERFISHING " MAY BE OCCURRING BECAUSE FISHING MORTALITY MAY HAVE EXCEEDED THE POINT OF MAXIMUM YIELD PER RECRUIT (CUSHING 1977). PAST EXPREIMENTS HAVE SHOWN THAT FOR MOST SPECIES, ESCAPEMENT OCCURS THROUGH THE COD-END (MARGETTS 1963) (GULLAND 1969) HAD CONDUCTED STUDIES . "SINCE ITS MODEST BEGINNINGS IN THE EARLY 1920S (PEARSON 1932),THE WINTER (OCTOBER- APRIL) TRAWL FISHERY OFF THE COAST OF N.C. AND VIRGINIA HAS CONTRIBUTED GREATLY TO N.C. COMMERCIAL FISHERIES.

THE ABOVE SHOWS THAT STUDIES WERE CONDUCTED PRIOR TO R/V DAN MOORE STUDIES OF 1979-80. SIXteen YEARS HAD PASSED FROM THE COMMERCIAL WATERMEN SEEING A PROBLEM AND ACTION BY THE N.C. MARINE FISHERIES.

THE CONCLUSIONS OF THE R/V DAN MOORE (DATA FROM THE PRESENT STUDY INDICATES THAT THE COD-END MESH SIZE NOW BEING USED IN THE WINTER TRAWL FISHERIES (3 OR 4 IN STRETCHED MESH) ARE VIRTUALLY NON-SELECTIVE OVER THE ENTIRE SIZE RANGE OF SUMMER FLOUNDER AVAILABLE TO THE FISHERY. THE DATA INDICATES THAT THE BEST COD-END MESH SIZE TO ALLOW AT LEAST 50% OF THE SMALL (<300MM) SUMMER FLOUNDER TO ESCAPE IS 126 MM (5.0 IN.)

THERE ARE OTHER ALTERNATIVES : ONE HANG THE COD END ON THE SQUARE, THIS HAS WORKED IN OTHER COUNTRIES BUT HAS NOT BEEN EXPERMINATED WITH IN THE FLOUNDER FISHERIES.
THE SECOND AND NEWER TECHNOLOGY IS THE DOUBLE COD END. IT IS A UNKNOWN IF ROUND FISH WOULD RAISE INTO THE UPPER COD-END WHILE THE FLUKE WOULD BE TRAPPED IN THE LOWER, THIS WOULD ALLOW THE 5 IN. BAG TO BE USED WITHOUT LOSING THE BY CATCH OF ROUND FISH.

WHAT IS CERTAIN IS THAT BY CATCH IS A PROBLEM, ONE GROUP FEELS THAT IF SMALL FLUKE LESS THAN 14 IN. CAN'T BE SOLD THEN FISHERMEN WILL NOT WORK WHERE SMALL FISH ARE. THIS IS MISTAKEN FOR AS LONG AS THE SALEABLE PART OF THE CATCH IS GRATER THAN THE COST OF THE HAUL (FISHERMEN) WILL WORK THE AREA. TWENTY BASKETS KILLED TO GET 8 BASKETS OF SALABLE FISH, (FISHERMEN) WILL WORK THE AREA. THE 5 IN. COD-END ALLOWS THE AREA TO BE WORKED FOR THE 8 BASKETS BUT THE TWENTY BESKETS ARE NOT KILLED.

A SECOND AND MORE CONSERVATIVE GROUP FEELS THAT THE BY CATCH WILL GROW TO A SIZE THAT WILL BE CAUGHT IN (5 IN) THE EXCEPTION ARE SPOT, BUTTERFISH, SEA MULLETT,AND SQUID. THESE FISH ARE CAUGHT BY OTHER METHODS AT DIFFERENT TIMES OF THE SEASON.

WINTER TRAWL LANDINGS FOR OCTOBER 1978 TO APRIL 1979 DO NOT DIFFERENTIATE BETWEEN FISH CAUGHT IN FLY NETS OR FLAT NETS.

FIGURES 14,151,200# FLOUNDER AT A $ VALUE OF $7,574,990 LEADS THE LIST. WEKEFISH AT 10,184,998 # $ VALUE OF $2,131,031

ATLANTIC CROAKER	9,709,350 #	$ VALUE OF $2,035,871
BLUEFISH	1,921,496 #	$ VALUE OF $ 354,749
PORGY	1,293,654 #	$ VALUE OF $ 439,702
SEA BASS	743,185 #	$ VALUE OF $ 450,670
SQUID	450,148 #	$ VALUE OF $ 153,824

ALL OTHER SPECIES WHETHER BY FLY NET OR FLAT NET MAKE UP LESS THAN HALF THE TOTAL $ LANDED. IT SHOULD THERE FOR BE IMPERATIVE THAT THE (5 IN) BE INSTALLED WHILE OTHER METHODS ARE EXPLORED.

THE PRESENT DIRECTOR OF MARINE FISHERIES HELD A IN WANCHESE N.C. DEC. 28 1987 A MEETING WITHOUT NOTIFYING ANYONE IN FAVOR OF THE (5 IN.) COD-END BEING NOTIFIED.

IS THIS A CASE OF A SMALL GROUP UTILIZING A RESOURCE OR BROAD LONG RANGE PLANNING WHERE THE RESOURCE IS MANAGED FOR THE BENEFIT OF THE RESOURCE AND PUBLIC?

THE $ LANDINGS SHOWS THAT ACTION MUST BE TAKEN TO ALLOW SMALL FLUKE TO REACH A AGE THAT THEY SPAWN AT LEAST ONE TIME.

LINERS IN THE COD ENDS MUST BE RECKONED WITH, STIFF ENFORCEMENT ON THE PART OF BOTH STATE AND FEDERAL MUST BE A REALITY. CONSIDERATION SHOULD BE GIVEN TO CONFISCATION OF GEAR (FOR THOSE WHO USE LINERS.) THE SAME SHOULD APPLY TO STATE AND FEDERAL WATERS. THE STATE SHOULD ADOPT (5 IN.) FOR POUND NETS, FIKE NETS AND MOST IMPORTANT GILL NETS.

(5 IN.) SHOULD ONLY APPLY TO FLAT TRAWL NETS, THE FLY NETS MUST BE ALLOWED TO USE A SMALLER COD END, THIS SHOULD ALSO BE REGULATED TO STOP THE SLAUGHTER OF SMALL FISH AS IS NOW THE CASE.

ACTION SHOULD BE TAKEN TO ADDRESS THE SLAUGHTER OF SMALL FOOD FISH. THE USE OF SMALL FOOD FISH FOR FISH MEAL AND CRAB BAIT MUST BE PHASED OUT. THE MENHADEN, HERREN, HICKORY SHAD AND LIKE FISH IN THE FUTURE SHOULD BE THE ONLY BAIT FISH.

THE RESOURCE SHOULD BE MANAGED IN ORDER THAT ALL WATERMEN BENEFIT, THE FIVE INCH COD END IS DISCRIMINATORY IF IT IS NOT THE FIRST PART OF A TOTAL MANAGEMENT PLAN.

Summitted By
James Fletcher
PO Box 111.
Nags Head NC 27959

	weakfish	bluefish	croaker	butfish	seabass	fluke
1934	7729400	1766500	7682800	44000	754000	987500
1940	3628500	447900	4310400	44000	306200	498200
1945	4736800	627000	4214600	30000	190600	1203600
1950	1567400	1272200	2095800	39000	75600	1839700
1955	1356000	435000	993000	321000	19000	1126000
1960	2240000	615000	2093000	209000	126000	1236000
1965	1959000	704000	1754000	367000	1090000	4721000
1970	2441000	496000	807000	123000	1178395	3163000
1975	6725000	1975000	105255000	127278	1147761	11510000
1980	20343952	5443558	21146798	148617	1530986	16881890
1984	12990726	3559997	9170775	172374	990089	15086489
1985	9825498	3604445	8714432	158581	1218762	10964585

THESE FIGURES ACCOMPANIED BY THE PHOTO-COPIED GRAPHS SHOW THAT FLUKE MAKE UP THE LARGEST $ PART OF TRAWL FISH. NET MESH SELECITIVITY IN NORTH CAROLINA'S WINTER TRAWL FISHERY A STATE FUNDED STUDY CONCLUDES:

DATA FROM THE PRESENT STUDY INDICATES THAT THE COD-END MESH SIZE NOW BEING USED (3 OR 4 IN STRETCHED MESH) ARE VIRTUALLY NON-SELECTIVE OVER THE ENTIRE SIZE RANGE OF SUMMER FLOUNDER AVAILABLE TO THE FISHERY. THE DATA INDICATES THAT THE BEST COD-END MESH SIZE TO ALLOW AT LEAST 50% OF THE SMALL (< 300MM) SUMMER FLOUNDER TO ESCAPE IS 126 MM (5.0 IN).

TO PLACE A 4.5 IN. COD-END LAW AND 13 FISH WILL DO NOTHING TO HELP THE FISH OR THE INDUSTRY. IT IS HOPED THAT THE FIVE IN. LAW WILL BE APPLIED TO ALL TYPES OF FLOUNDER NETS, TRAWL, POUND NETS GILL NETS AND PIKE NETS.

TS19202,57.134, [illegible] SEPT85-TEMP [illegible]

SPECIES	YR	LONG HAUL	POUND NET	FISH TRAWL	GILL NET	STATE TOTAL
CROAKER	34	3109000	804100	0	2261500	7682800
CROAKER	[illegible]	[illegible]	[illegible]	172000	[illegible]	[illegible]
CROAKER	37	54227[illegible]	[illegible]	3200	2[illegible]	99[illegible]
CROAKER	38	2628[illegible]	1847900	2000	1366801	6475100
CROAKER	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CROAKER	40	1878100	459700	0	572000	4310400
CROAKER	45	1704500	399200	314800	273800	4214600
CROAKER	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CROAKER	51	1159300	28100	780000	95400	2102100
CROAKER	52	632000	22400	620900	54000	1346300
CROAKER	53	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CROAKER	54	211400	17700	773500	10600	1016000
CROAKER	55	217000	58100	707200	2700	993000
CROAKER	[illegible]	[illegible]	[illegible]	4124800	[illegible]	4825000
CROAKER	57	594400	77000	2198300	18400	2916000
CROAKER	58	1029200	132800	5693900	23300	6921000
CROAKER	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CROAKER	60	381800	111600	1537500	14100	2093000
CROAKER	61	330000	131200	1227100	46900	1754000
CROAKER	[illegible]	[illegible]	146500	1151600	[illegible]	[illegible]
CROAKER	63	466700	155900	1547800	53300	2276000
CROAKER	64	309500	55000	1234600	36000	1867000
CROAKER	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CROAKER	66	137400	3700	1029500	74200	1267000
CROAKER	67	273900	3300	913700	5000	1283000
CROAKER	[illegible]	[illegible]	[illegible]	521800	[illegible]	1201000
CROAKER	69	126300	6900	1174300	26500	1269000
CROAKER	70	133000	14400	595700	37100	807000
CROAKER	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CROAKER	72	677300	46400	3126500	171700	4109000
CROAKER	73	2450700	59500	1278300	355800	4324000
CROAKER	[illegible]	[illegible]	[illegible]	1827100	[illegible]	[illegible]
CROAKER	75	6470000	174400	3116900	131800	10525000
CROAKER	76	4404800	311[illegible]	3227500	122700	15038000
CROAKER	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CROAKER	78	6719600	469500	10898000	1206700	19945600
CROAKER	79	9103500	602900	6073800	1986300	20557800
CROAKER	[illegible]	[illegible]	[illegible]	5532481	[illegible]	21144793
CROAKER	81	5423[illegible]	1907093	1971624	1327646	11205342
CROAKER	82	4795516	2044961	1834171	1239044	10824953
CROAKER	83	[illegible]	752470	[illegible]	[illegible]	[illegible]
CROAKER	84	3269790	987557	2273291	2483707	9170775
CROAKER	85	2455832	1357118	2193824	2371674	8714432
SPOT	[illegible]	[illegible]	[illegible]	0	110000	[illegible]
SPOT	36	1004600	134700	0	160000	7443200
SPOT	37	1066400	47400	0	0	5269700
SPOT	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]
SPOT	39	1356900	170900	5100	33000	4469700
SPOT	40	1238100	322400	0	25500	4801300
SPOT	[illegible]	[illegible]	[illegible]	4100	0	[illegible]
SPOT	50	4734000	9200	27700	47600	5178300
SPOT	51	4307100	300	19900	27100	4614300
SPOT	[illegible]	[illegible]	1500	[illegible]	[illegible]	[illegible]
SPOT	53	2554800	14400	43900	29900	2815000
SPOT	54	2121300	11200	101900	26000	2390000
SPOT	55	[illegible]	4500	42400	28300	1858000
SPOT	56	2294500	14700	76500	41600	2875000
SPOT	57	1269500	15000	107400	37500	2153000

SPOT	59	[illegible]	10000	156500	55000	[illegible]
~~SPOT~~	~~60~~	~~[illegible]~~	~~12900?~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
SPOT	61	1511500	7800	366300	95400	2056000
SPOT	62	885600	12700	212000	63000	1218000
~~SPOT~~	~~63~~	~~[illegible]~~	~~0~~	~~[illegible]~~	~~22400?~~	~~[illegible]~~
SPOT	64	523500	10000	92400	82000	1271000
SPOT	65	358000	7000	70800	48500	913000
~~SPOT~~	~~66~~	~~[illegible]~~	~~6500~~	~~27200?~~	~~100500?~~	~~[illegible]~~
SPOT	67	1501300	45300	300800	76600	3048000
SPOT	68	988800	10300	180800	77100	1575000
~~SPOT~~	~~69~~	~~[illegible]~~	~~400~~	~~228500~~	~~80800~~	~~[illegible]~~
SPOT	70	1098200	12100	2900	224500	1529000
SPOT	71	808400	18700	400	94500	1190000
~~SPOT~~	~~72~~	~~2130500?~~	~~5800~~	~~224400~~	~~535800~~	~~[illegible]~~
SPOT	73	3653200	44000	875900	252900	5398000
SPOT	74	4032500	32700	368200	325700	5607000
~~SPOT~~	~~75~~	~~4717500?~~	~~42500~~	~~247500~~	~~246800~~	~~8200000~~
SPOT	76	1868000	54100	146800	99600	2674000
SPOT	77	2672300	37700	564800	151700	3805126
~~SPOT~~	~~78~~	~~[illegible]~~	~~147200?~~	~~1529600?~~	~~[illegible]~~	~~[illegible]~~
SPOT	79	4832800	152900	849200	809000	7303405
SPOT	80	4378312	227985	639353	1040498	7100053
~~SPOT~~	~~81~~	~~[illegible]~~	~~202122?~~	~~95666?~~	~~488058~~	~~2511574?~~
SPOT	82	3526385	370806	80101	365153	4918763
SPOT	83	1940259	90412	75193	458705	2952295
~~SPOT~~	~~84~~	~~[illegible]~~	~~175302?~~	~~[illegible]~~	~~758661?~~	~~[illegible]~~
SPOT	85	2481930	147462	166027	804003	4043843
BLUEFIS	34	365000	231700	0	112500	1766500
~~BLUEFIS~~	~~36~~	~~[illegible]~~	~~146900?~~	~~0~~	~~0~~	~~2037800?~~
BLUEFIS	37	331500	45500	0	34500	1657000
BLUEFIS	38	724100	38500	0	23100	1849000
~~BLUEFIS~~	~~39~~	~~155500?~~	~~7100~~	~~2000?~~	~~25500?~~	~~[illegible]~~
BLUEFIS	40	72200	4800	0	10000	447900
BLUEFIS	45	45500	5300	0	20000	627000
~~BLUEFIS~~	~~50~~	~~[illegible]~~	~~7100~~	~~200~~	~~29400~~	~~[illegible]~~
BLUEFIS	51	574500	4000	0	1400	925800
BLUEFIS	52	439400	3500	0	1100	736500
~~BLUEFIS~~	~~53~~	~~274500?~~	~~2800~~	~~0~~	~~700~~	~~[illegible]~~
BLUEFIS	54	173000	8800	0	0	232000
BLUEFIS	55	242400	26400	7500	8900	435000
~~BLUEFIS~~	~~56~~	~~294600~~	~~21200~~	~~8500~~	~~14000~~	~~433000?~~
BLUEFIS	57	557500	18500	7700	22500	816000
BLUEFIS	58	308700	370	5000	11600	437000
~~BLUEFIS~~	~~59~~	~~536000?~~	~~12400~~	~~10000~~	~~20000~~	~~740000~~
BLUEFIS	60	440700	10600	8000	35000	615000
BLUEFIS	61	514900	7300	15000	84100	752000
~~BLUEFIS~~	~~62~~	~~618200~~	~~43000~~	~~5000~~	~~126200~~	~~555000~~
BLUEFIS	63	527400	40000	4000	112200	813000
BLUEFIS	64	144500	3300	2500	63400	515000
~~BLUEFIS~~	~~65~~	~~186600?~~	~~10000~~	~~2000~~	~~115400?~~	~~[illegible]~~
BLUEFIS	66	281400	1600	18400	129800	821000
BLUEFIS	67	314300	6200	11500	9200	698000
~~BLUEFIS~~	~~68~~	~~596200?~~	~~2700~~	~~10600~~	~~65000~~	~~[illegible]~~
BLUEFIS	69	333800	1300	16100	187200	871000
BLUEFIS	70	245400	3800	22600	71800	496000
~~BLUEFIS~~	~~71~~	~~215500?~~	~~2500~~	~~45000?~~	~~72000?~~	~~[illegible]~~
BLUEFIS	72	403600	2900	319500	180600	1168000
BLUEFIS	73	443200	22600	1061600	66300	2008000
~~BLUEFIS~~	~~74~~	~~[illegible]~~	~~24800~~	~~[illegible]~~	~~182500~~	~~[illegible]~~
BLUEFIS	75	847300	37400	548600	212300	1575000

BLUEFIS	78	269700	56400	1078000	226900	1948400
BLUEFIS	79	[illegible]	71400	[illegible]	[illegible]	[illegible]
BLUEFIS	80	475269	325127	2983076	1214567	5443558
BLUEFIS	81	419079	142157	4337594	1390259	6610459
BLUEFIS	82	435511	224447	1594174	1482225	4290809
BLUEFIS	83	339400	67236	3717456	2298939	6746936
BLUEFIS	84	263155	93263	1088543	1880270	3559997
BLUEFIS	85	[illegible]	134611	557314	1552271	[illegible]
WEAKFIS	34	1634000	3479400	0	1263000	7729400
WEAKFIS	36	1887400	4220400	32500	2394500	8969100
WEAKFIS	37	1525400	2872400	8000	2055200	7525100
WEAKFIS	35	1553300	2199800	0	529800	5094900
WEAKFIS	37	739200	982900	4000	529500	2839600
WEAKFIS	40	1136300	567000	0	748500	3628500
WEAKFIS	45	1350600	1261500	146100	280900	4736800
WEAKFIS	50	756600	225200	394400	147300	1567400
WEAKFIS	51	503300	288300	396400	42500	1242800
WEAKFIS	52	515300	234800	908500	50800	1625600
WEAKFIS	53	426500	147900	1222000	26000	1897000
WEAKFIS	54	721000	403100	1115600	[illegible]	2281000
WEAKFIS	55	427900	157500	703500	43000	1356000
WEAKFIS	56	390400.	94200	1249600	45400	1842000
WEAKFIS	57	421600	21500	1424400	74200	2210000
WEAKFIS	58	670000	106000	2827500	75900	3810000
WEAKFIS	59	441400	60600	2147600	76400	2913000
WEAKFIS	60	242200	36400	1744400	22700	2240000
WEAKFIS	61	204200	67400	1829600	87800	2308000
WEAKFIS	62	163500	65000	1765000	73000	2160000
WEAKFIS	63	145700	40000	1411200	57500	1761000
WEAKFIS	64	97300	44100	1552800	68600	1966000
WEAKFIS	65	103000	311700	1526900	79800	1939000
WEAKFIS	66	120200	88000	[illegible]	[illegible]	[illegible]
WEAKFIS	67	269800	32800	1323400	48400	1769000
WEAKFIS	68	154400	68100	1963000	38900	2286000
WEAKFIS	69	184200	35600	1151200	48700	1528000
WEAKFIS	70	187700	54300	2030000	66900	2441000
WEAKFIS	71	162400	45600	3214400	131100	3645300
WEAKFIS	72	255200	54200	6562500	410500	7373000
WEAKFIS	73	611500	117600	5029700	370300	6222000
WEAKFIS	74	546500	142000	4941500	214600	6056000
WEAKFIS	75	1301600	214200	4935400	118100	6725000
WEAKFIS	76	1298400	423900	6786900	97600	2714000
WEAKFIS	77	2070700	903600	5562100	61200	8671210
WEAKFIS	78	1807800	776500	7387900	437700	10843400
WEAKFIS	79	2155600	417200	10830300	788000	14759197
WEAKFIS	80	2482066	1898223	13550382	1740324	20343952
WEAKFIS	81	1934758	429743	11705479	3135396	16893546
WEAKFIS	82	1724880	389046	7942412	1394997	12052238
WEAKFIS	83	1597040	259458	5675334	2270565	10233738
WEAKFIS	84	1751354	531213	6392698	4299017	12290724
WEAKFIS	85	1115197	475522	3967991	3596008	9825498
FLUKE	34	136000	567900	6000	0	987500
FLUKE	36	19000	135700	623200	1100	1175200
FLUKE	37	18400	133900	80300	0	403800
FLUKE	38	29700	78200	152300	0	501400
FLUKE	39	71900	273000	302100	0	[illegible]
FLUKE	40	17400	202900	117800	0	498200
FLUKE	45	2600	687600	249900	2000	1203600
FLUKE	50	58200	374000	1221500	3600	1839700
FLUKE	51	22600	255000	1015500	17100	1078800
FLUKE	52	43200	920600	1654200	13100	2136000

SCUP/PO 48	0	100	0	0	200
SCUP/PO 49	0	[illegible]	[illegible]	[illegible]	[illegible]
SCUP/PO 50	9300	20200	29900	0	59400
SCUP/PO 51	6700	19100	127000	0	152800
SCUP/PO 52	[illegible]	22000	[illegible]	[illegible]	[illegible]
SCUP/PO 53	0	0	44500	0	44500
SCUP/PO 54	0	0	41100	0	41100
SCUP/PO 55	0	0	[illegible]	[illegible]	[illegible]
SCUP/PO 56	0	0	95000	0	97674
SCUP/PO 57	0	0	15400	0	23742
SCUP/PO 58	0	0	30000	0	[illegible]
SCUP/PO 59	0	0	25000	0	34018
SCUP/PO 60	0	0	135100	0	135627
SCUP/PO 61	0	0	234000	0	[illegible]
SCUP/PO 62	0	0	270700	0	292642
SCUP/PO 63	0	0	179400	0	191755
SCUP/PO 64	0	0	[illegible]	0	[illegible]
SCUP/PO 65	0	0	975200	0	982236
SCUP/PO 66	500	100	1922900	300	1925763
SCUP/PO 67	600	0	[illegible]	[illegible]	[illegible]
SCUP/PO 68	0	0	170600	0	176288
SCUP/PO 69	0	0	251900	0	252416
SCUP/PO 70	0	0	[illegible]	0	212101
SCUP/PO 71	0	0	202900	0	206530
SCUP/PO 72	0	0	36800	0	39185
SCUP/PO 73	0	0	[illegible]	0	[illegible]
SCUP/PO 74	0	0	33200	0	65653
SCUP/PO 75	0	0	111700	0	149498
SCUP/PO 76	0	0	[illegible]	0	[illegible]
SCUP/PO 77	0	0	117900	0	136392
SCUP/PO 78	100	0	1054411	0	1212132
SCUP/PO 79	[illegible]	0	[illegible]	0	[illegible]
SCUP/PO 80	0	0	1321541	0	1751763
SCUP/PO 81	0	0	1502257	25	2178151
SCUP/PO 82	0	0	[illegible]	0	[illegible]
SCUP/PO 83	0	0	665735	11	1473107
SCUP/PO 84	0	0	1054387	0	1561644
SCUP/PO 85	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SEABASS 34	0	0	0	10000	75400
SEABASS 36	0	0	0	0	107000
SEABASS 37	0	0	0	0	117700
SEABASS 38	200	0	0	0	66400
SEABASS 39	0	0	1100	0	107200
SEABASS 40	0	0	0	0	[illegible]
SEABASS 45	0	0	6800	0	190600
SEABASS 50	0	0	10000	700	75600
SEABASS 51	400	0	52900	0	84000
SEABASS 52	800	0	35100	0	109800
SEABASS 53	0	0	37000	0	82600
SEABASS 54	0	0	[illegible]	0	41000
SEABASS 55	0	0	5300	0	19000
SEABASS 56	0	0	43400	0	80000
SEABASS 57	0	0	7000	0	26000
SEABASS 58	0	0	9500	0	27000
SEABASS 59	0	0	21400	0	41000
SEABASS 60	0	0	[illegible]	0	[illegible]
SEABASS 61	0	0	297400	0	635000
SEABASS 62	0	0	971200	0	1287000
SEABASS 63	0	0	[illegible]	0	[illegible]
SEABASS 64	0	0	613400	0	906000
SEABASS 65	0	0	628500	0	1090000
SEABASS 66	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

FLUKE	54	31800	93000	1311300	33500	1645000
FLUKE	55	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FLUKE	56	82900	51300	787600	3200	1002000
FLUKE	57	223400	78800	784200	21700	1236000
FLUKE	58	160200	41500	518200	8500	842000
FLUKE	59	187800	66100	1156400	2100	1529000
FLUKE	60	188000	43200	908600	8500	1236000
FLUKE	61	202400	45400	1534700	2500	1897000
FLUKE	62	153900	48600	1550000	1600	1876000
FLUKE	63	194600	66800	2276800	10300	2674000
FLUKE	64	161200	57100	1861000	8000	2450000
FLUKE	65	286400	137200	3666700	15000	4721000
FLUKE	66	67400	0	3415700	36300	4017000
FLUKE	67	29000	273200	3770600	14000	4281000
FLUKE	68	50900	277700	1838200	82000	2602000
FLUKE	69	6900	423600	2043800	12500	2766000
FLUKE	70	4600	347200	2578000	48700	3143000
FLUKE	71	2100	178300	3572600	56400	4011000
FLUKE	72	13600	471000	3761200	153000	4655000
FLUKE	73	13700	714900	6213600	85400	7345000
FLUKE	74	20200	1166600	10028200	130000	11812000
FLUKE	75	56800	1314800	9538600	121200	11510000
FLUKE	76	22200	1221000	9424900	67200	11452000
FLUKE	77	16500	468100	10336000	51300	11137094
FLUKE	78	109300	501600	10819500	401600	12299300
FLUKE	79	56500	1040500	16084100	455500	13420961
FLUKE	80	85857	1179307	13645623	392689	16881890
FLUKE	81	57783	1059708	7459155	371848	9766248
FLUKE	82	62509	742076	6215102	216904	8429990
FLUKE	83	84221	932146	7057449	432016	9812796
FLUKE	84	64317	1113123	12509761	485705	15086489
FLUKE	85	65249	554188	5657027	522755	10764555
BUTFISH	34	0	12500	0	3000	44000
BUTFISH	36	0	350600	0	0	358000
BUTFISH	37	0	5200	0	0	12000
BUTFISH	38	1100	7200	0	0	15000
BUTFISH	39	7600	12100	4600	0	47000
BUTFISH	40	35200	8000	0	0	44000
BUTFISH	45	30000	0	0	0	30000
BUTFISH	50	36800	1500	1600	0	39000
BUTFISH	51	500	23200	1200	0	25000
BUTFISH	52	52000	33800	38000	300	124000
BUTFISH	53	0	11500	0	0	11000
BUTFISH	54	0	15700	0	0	16000
BUTFISH	55	0	0	0	0	0
BUTFISH	56	56500	20000	30300	800	109000
BUTFISH	57	80000	39700	80000	1700	204000
BUTFISH	58	123900	39100	67600	2500	237000
BUTFISH	59	176400	55800	188400	4500	431000
BUTFISH	60	52000	43600	107200	0	203000
BUTFISH	61	110700	45800	192600	0	349000
BUTFISH	62	57900	37700	63500	0	159000
BUTFISH	63	75000	16000	110800	0	202000
BUTFISH	64	34000	28000	60900	0	130000
BUTFISH	65	82200	67000	204000	0	367000
BUTFISH	66	23500	79000	384000	2500	502000
BUTFISH	67	10800	6000	361700	1600	383000
BUTFISH	68	19900	22000	60900	3800	107000
BUTFISH	69	2800	13800	111600	800	130000
BUTFISH	70	300	0	132100	200	132000
BUTFISH	71	500	1900	49300	200	58000

BUTFISH 73	7200	1300	26900	2000	40000
BUTFISH 74	[illegible]	4400	[illegible]	[illegible]	[illegible]
BUTFISH 75	2300	2500	88300	2200	127278
BUTFISH 76	800	600	48300	0	53933
BUTFISH 77	0	4400	31000	200	47410
BUTFISH 78	13386	1642	76302	17073	110750
BUTFISH 79	111c9	50978	111031	3759	180549
BUTFISH 80	5520	26027	98456	2059	147617
BUTFISH 81	8914	106488	160862	2372	281294
BUTFISH 82	8181	24464	142999	71741	263662
BUTFISH 83	8006	2401	73497	15425	107531
BUTFISH 84	6366	21311	121007	19278	172374
BUTFISH 85	464	938	113364	37480	158581
HARVEST 34	12000	757000	0	0	820000
HARVEST 36	39300	819600	0	0	893100
HARVEST 37	27400	511100	0	0	640900
HARVEST 38	15400	334500	0	0	428700
HARVEST 39	91600	642900	0	0	891300
HARVEST 40	51300	339500	0	0	434500
HARVEST 49	164400	447200	42400	5000	811700
HARVEST 50	173300	186600	102600	2800	468300
HARVEST 51	197200	214700	140000	1500	555700
HARVEST 52	105400	154500	116200	800	398200
HARVEST 53	129600	228000	249600	0	607200
HARVEST 54	171700	439100	122500	0	733300
HARVEST 55	76000	226600	58400	0	381000
HARVEST 56	135000	215900	64800	0	415772
HARVEST 57	101900	102400	0	0	224290
HARVEST 58	74400	24400	2900	0	101926
HARVEST 59	57800	36400	10400	0	105892
HARVEST 60	19100	25000	8900	0	51965
HARVEST 61	12200	22000	6700	0	41117
HARVEST 62	7400	8700	1000	0	17140
HARVEST 63	14200	6200	0	0	20349
HARVEST 64	12500	2500	0	0	14937
HARVEST 65	42300	42300	40600	0	125196
HARVEST 66	22900	41100	7700	0	71541
HARVEST 67	54800	72400	1900	3300	145643
HARVEST 68	6900	60500	1900	1000	70395
HARVEST 69	13700	9100	1100	1000	24884
HARVEST 70	9200	15500	0	2400	26972
HARVEST 71	23700	21800	0	600	48165
HARVEST 72	24100	19100	0	1700	50382
HARVEST 73	45400	14900	0	1700	64401
HARVEST 74	14400	2500	0	100	17032
HARVEST 75	20300	20300	0	200	40883
HARVEST 76	18000	6500	0	0	24679
HARVEST 77	15000	33000	0	0	47919
HARVEST 78	38903	25187	7633	10994	94514
HARVEST 79	7651	9176	0	3022	31471
HARVEST 80	80549	90815	15978	46400	275300
HARVEST 81	67172	21919	14994	25609	149685
HARVEST 82	96253	122283	106245	88965	456233
HARVEST 83	48117	105300	26771	32701	243855
HARVEST 84	48385	152613	6362	14686	222587
HARVEST 85	91065	202977	24477	39031	349209
SCUP/FO 34	0	0	0	0	0
SCUP/FO 35	0	0	0	0	0
SCUP/FO 36	0	0	0	0	0

SEABASS 67	600	0	634200	0	1994000
SEABASS 68	0	0	626500	0	1153000
SEABASS 69	0	0	477600	0	1046921
SEABASS 70	0	0	424400	0	1178395
SEABASS 71	0	0	254400	0	747544
SEABASS 72	0	67500	0	3200	635210
SEABASS 73	0	2500	106000	0	683702
SEABASS 74	0	0	125600	0	1316746
SEABASS 75	0	0	480900	0	1147761
SEABASS 76	0	0	294200	0	573338
SEABASS 77	0	0	1188900	0	1444442
SEABASS 78	0	0	183	0	1149444
SEABASS 77	0	0	506417	0	1374662
SEABASS 80	0	0	759739	0	1530986
SEABASS 81	0	0	647139	0	1197431
SEABASS 82	0	0	426492	750	810302
SEABASS 83	0	0	157544	7	532500
SEABASS 84	0	0	594045	30	990089
SEABASS 85	592	0	816578	934	1218762

I am William T. Hogarth, Director of the North Carolina Division of Marine Fisheries. Our agency feels that without question, there is a need for regulatory controls on summer flounder to aid in the protection and release of small fish which have not achieved spawning size. In the past, the Division of Marine Fisheries has gone on record in support of regulations, including size limits and net mesh sizes similar to those recommended in the Atlantic States Marine Fisheries Commission Summer Flounder Management Plan. The Division of Marine Fisheries continues to be concerned about the status of this important interjurisdictional resource. Indications suggest that this fishery may be approaching recruitment over-fishing (catching them more rapidly than they are being replaced) rather than growth over-fishing (catching them too small).

The Division of Marine Fisheries implemented a 4½ inch tailbag mesh size for the directed flounder fishery in the territorial sea, beginning in 1984. We have, however, found this to be extremely difficult to enforce since it requires at-sea enforcement, which means boarding fishing vessels at sea to determine compliance. Gear regulations were utilized because they are the only controls that we can impose based on present regulations.

In past years, the majority of the winter trawl fishery for summer flounder was a directed fishery, taking primarily flounder. In recent years, however, possibly because flounder stocks are down, it has become a more mixed fishery with the by-catch of trout, king fish, scup, sea bass, etc., occasionally equal to the flounder catch.

The Division of Marine Fisheries strongly supports a minimum size limit of 13 inches (to allow for at least one spawn) but has mixed feelings with regard to the tailbag mesh size. Presently, North Carolina fishermen are economically dependent on the retention of by-catch which would be a loss with a tailbag mesh size necessary to release small flounder. We are, however, concerned that the size limit alone (unless strictly enforced and complied with by the fishing industry) may not reduce mortality of the small flounder which this plan is designed to protect.

The position of the Division of Marine Fisheries is to establish a minimum size limit of 13 inches with zero tolerance. If mesh requirements are incorporated in the plan, a liberal exemption should be considered for fly nets and combination nets (nets with large mesh wings and body that catch some flounder).

Most important, we would like to see uniform regulations for this fishery between the individual states and the federal waters.

Prepared 1/8/88

ATTACHMENT F

CLARKS LANDING MARINA
847 ARNOLD AVENUE / POINT PLEASANT, NEW JERSEY 08742 / 201-899-5559

RECEIVED

MID ATLANTIC COUNCIL

February 9, 1988

Mr. John Bryson, Executive Director
Mid Atlantic Council
Room 2115 Federal Building
Dover, DE 19901

Dear Mr. Bryson,

I am in full support of the 13" minimum limit for Fluke.

As a marina owner and operator I do see a problem with creating any law that would prohibit the filleting of fish while at sea. We have presently received complaints when our customers fillet their fish in this marina and throw the carcasses in the river.

The New Jersey Board of Health said this is considered pollution and the customer can be fined. At the present, the removal of fish carcasses is a big problem. They smell when left in the dumpsters and also use up valuable space.

Please do whatever is possible to allow fish to be cleaned while at sea.

Sincerely,
CLARKS LANDING MARINA

George Truesdale
President

GT/lf

cc: Charlie Malta

JACK FEINBERG (1915-1967)
VINCENT T. DEE (1928-1976)
WILLIAM M. FEINBERG
RICHARD J. FEINBERG
RICHARD MEOLA

FEINBERG, DEE & FEINBERG
COUNSELLORS AT LAW
554 BROADWAY
BAYONNE, N.J. 07002

AREA CODE 201
FEDERAL 9 { 5500 5501 5502

January 27, 1988

Mid-Atlantic Fishery Management Council
Room 2115
Federal Building
300 South New Street
Dover, Delaware 19901-6790

RECEIVED
JAN ...
MID ATLANTIC COUNCIL

Attention: John C. Bryson, P.E.
Executive Director

Re: Summer Flounder FMP

Dear John:

I have had an opportunity to review the Summer Flounder FMP. Actually, I would have preferred expressing my sentiments in person at the public hearing scheduled to be heard in my area on January 28. Unfortunately, a conflict in my schedule does not permit my being at the hearing and thus this letter.

I am pleased that a Summer Flounder FMP has at long last been prepared. I am aware that it has taken a great deal of work and involves a substantial range. The plan is much needed in part to protect the stocks as they exist at the present time and in part to prevent a problem from occurring in regard to this species which, in my opinion, would come about without proper regulation. As for the mechanics of the plan itself, they seem most appropriate and appear to coordinate the states' efforts in regard to the inshore fishery for summer flounder with the Council's efforts in the fishery conservation zone. I believe that the size limits, the mesh limits and other measures adopted will prove to be entirely appropriate. Obviously, if future conditions necessitate, adjustments can always be made. I am also pleased to see that foreign fishing for summer flounder is not permitted under the plan. In short, the plan certainly has my endorsement and the endorsement of a number of other sport fishermen with whom I have spoken about it.

Please extend my best regards to the staff and to all of my old friends.

Sincerely yours,

Bill Feinberg

WILLIAM M. FEINBERG

WMF:dk

RECEIVED

[illegible] 8 1988

MID ATLANTIC COUNCIL

February 2, 1988

Mid Atlantic Council
Room 2115
Federal Building
Dover, Deleware 19901

Att'n: Mr. John Bryson
Executive Director

Re: Fluke Restrictions

Dear Mr. Bryson,

I am a licensed charter boat captain operating out of Manasquan Inlet in New Jersey. I am also the Recording Secretary of The Greater Point Pleasant Charter Boat Association and would like to relay not only my opinion but the opinions of our entire membership pertaining to the size limitations of fluke in our state. We agree, firmly support and will enforce the 13" size limitations imposed by the Council. Our recent catches indicate that the rule was long overdue. On the other hand we strongly oppose the filleting restrictions you are now considering.

Very truley yours,

Peter Grimbilas
3 Oakwood Court
Towaco, N.J. 07082

Shinnecock Marlin & Tuna Club, Inc.
P.O. BOX 9
HAMPTON BAYS, NEW YORK 11946

RECEIVED
JAN 28 1988
MID ATLANTIC COUNCIL

January 27 ,1988

Mr. John C. Bryson
Executive Director
Mid-Atlantic Fishery Management Council
Room 2115 Federal Building
300 New South Street
Dover, Delaware 19901

Dear Mr. Bryson:

We would like to make the following comments on the proposed Summer Flounder Fishery Management Plan.

The plan documents the need for the line and the mesh size below it. However we recommend that it should be illegal to possess summer flounder or parts thereof less than 14" total length both north and south of the line.

In the past we have had a problem with southern boats catching short fluke (under 14" total length) in the FCZ near and the waters of New York State and landing the fish in the south. By having a 13" total length possession north of the line it will not help this situation.

We feel a 14" total length for the whole coast and a mesh size south of the line would better achieve plan objectives of reducing fishing mortality on immature summer flounder and increasing the yield from the fishery.

Lastly we hope the fifteen recommendations in section 6.5 are implemented and not just sitting on a computer disk waiting to be used in the next plan.

Yours truly,

Floyd Carrington

Floyd Carrington
President

cc Mr. Kevin J. Cross

Box 383
Wanchese, N.C. 27981
Feb. 1, 1983

Mr. John C. Bryson
Executive Director
Mid-Atlantic Fishery Management Council
300 S. New Street
Dover, De. 19901

Gentlemen,

I want to express my concern regarding the management plan for Summer Flounder. I and many others in this area strongly oppose any gear restrictions to be imposed on us. Knowing that something needs to be done to help the stocks of flounder. I feel that any gear restrictions, especially four and a half or five inch mesh nets would cause serious loss of by-catch which makes up from 30 to 50%, sometimes more of our stock on many trips. When we are fishing inshore from November through December, the by-catch consist of mainly trout, croakers, bluefish, and squid. The by-catch offshore January through April consist of sea bass, scup, bluefish, whiting, and squid. Many times, fishing off on the edge in 20F out to 70-80 F, large amounts of sea bass, scup, and squid are caught while fluking. Many times, the by-catch is greater than the fluke catch. This also applys to inshore fishing as well. Most of us use nets that are combination nets to fluke with in order to get by. Many trips fluke can be scarce and the by-catch is what makes your trip along with the fluke.

During the winter months, we lose countless days of fishing due to bad weather, therefore the fishing grounds are left vacant for sometimes a week or more. It is not the same as summer time when boats are out constantly dragging the same bottom over and over seven days a week. Maybe this is something, you people don't realize. I am all for imposing a 13" size limit on the fish and strongly enforcing it at the dock and in the fish houses. There should be only a small tolerance for the boat, maybe as little as 1%, but no(%) tolerance for sale. I feel that if this is enforced strongly, the long term effect will prove far more successful than mesh size, because mesh size can't be enforced properly at sea. If the fisherman knows that he can't sell fish under 13", and will lose his trip and be fined if caught, he will not bring them in and will move around while fishing to look for bigger fish, therefore staying away from the smaller fish as much as possible. One more curcumstance that we have in our area is that we catch a lot of trash while fluking, mainly skates, king crabs, and a lot of sharks which makes mesh sizes that much more ineffective. It doesn't let the small fish escape as much as many people think that it does. You can't use a mesh big enough to let this kind of trash out. If you did, you wouldn't catch anything, not even jumbo fluke.

We have quite a different situation down in this area, than there is up North. The main reasonf for it being so different is because of the fact that Fluke along with other fish don't stay in the hot water, 70 degrees approximately. When these fish get near the hot water, they stop and bunch up just ahead of it, and this causes several different species along with the Fluke to be in the same area. This is why a lot of N.C. fishermen depend on what we call combination fishing.

I would also like to ask you to consider changing the 16" as the dividing line between legal Fluke gear and Fly-net to 8", because of the number of boats who still use 8" Fly-nets to fish with. These nets aren't Fluke nets, and sometimes catch round fish better than 16-64" mesh, because of different conditions. Eight-inch nets could be modified and used for combination fishing (Fluke and Round Fish), and would catch less small Fluke, because they would escape throOgh the wings. If you impose mesh size, you are going to put more pressure on Fluking, because we are going to have to put in more time dragging to get a trip. The loss of by-catch and the loss of small fluke both contribute to this.

Thank you for your concern. Please listen to we fishermen,who have to make a living out there , where you people are trying to put laws on us that you can't enforce fairly.

Sincerely yours,

Capt. Billy Carl Tillett

Capt. Billy Carl Tillett
F/V Linda Gayle
Wanchese, N.C.

Moon Tillett Fish Co.

February 5 '88

RECEIVED

FEB 8 ...

MID ATLANTIC COUNCIL

Mid-Atlantic Council
Federal Building
Dover, Delaware

Attention: Mr John Bryson
Executive Director

Re: Fluke Regulations & Fillet Proposal.

Dear Mr Bryson

I am a licensed captain and operate a charter business out of Point Pleasant, N.J. In addition, I am also an active member of both the Point Pleasant Charter Association and Jersey Shore Captains Association and would like to relay not only my opinion but also the opinions of both memberships. We all firmly agree and support the 13" regulation regarding overall minimum size for Fluke. However, we all strongly oppose the "Filleting" proposal that you are now considering. We request that the Council support the present state regulation and monitor its progress for one to two years before reacting so drastically.

Thankyou —

Capt. Charlie Malta - c/o Blue Fin Sport Fishing
9 Salem Lane, Jackson, N.J. 08527

Alt 1 - Take no action

?.

Wm Hines
1018 W. 3rd. ST.,
Florence, N.J.
08518

John C. Bryson - exec. director
Mid-Atlantic Fishery Man. Council

Dear John -

I just finished reading an article on Fluke Filleting. Part of the meeting at South Wall Twsp., where your council proposed a size minimum of fillets, the Skippers of Head & Charter boats were against it. Well, I'm against and all of my buddies are with me in Filleting of any Kind!.

While fishing off Long Branch the last two seasons, I've taken my boat near one "sport" who fillets his Fluke. I'll swear he filleted 7" to 9" Fluke. The fish over 13" he never touched, he just put them in his cooler. This past year I've seen more fish filleted than in the past 50 or more years I've been fishing. We all know there will be many "short" fish taken if a minimum isn't in force.

Here in Florence, theres quite a few fishermen. We've been talking about fluke for years. Every one I've talked to are against filleting of fish. If your "bleed" your fish ~~they~~ the meat will stay as good as filleting. We're also for 13" or larger if nessesary, to keep our fluke fishery.

"No filleting" & "Larger Size if Needed".

P.S. I'm the youngest "66" on my 20' boat. My buddies are J. [redacted] Hamilton "75" - McDonagh "76" John Parhan "86" & we'll obey the laws.

Good Fishing

Wm Hines

RECEIVED
FEB 16 19??
MID ATLANTIC COUNCIL

THE CANYON RUNNER. 2-6-88

RE[illegible]VED

[illegible]

MID ATL[illegible] COUNCIL

Dear John Bryson:

We are delighted with the idea of 13" fluke rule. This past year most people have seen larger fish than in the past few years. We do believe in this conservation measure, but are opposed to the new 13" fillet reg. With the new regulation we would have to catch a fluke 22" to 24" in length. A fish 13" in length on provides a fillet 7½" to 8¼".

OVER

Please try to give the
state law a chance.

Thank you.
Capt. Joseph F. [illegible]
62 Ivy Hill Rd.
Red Bank NJ.
07701

Personalized • Private • Sports Fishing

On The **LIL' - MIA IV**

Capt. Pete Del Rossi

RECEIVED

FEB 1? 19??

MID ATLANTIC COUNCIL

2-5-88

Robert Martin
Chairman
MID Atlantic Fishery

Mr. Martin:

Please find enclosed my request for info on various items that come under the jurisdiction of your council.
If available would you forward to me asap whatever is available on "SUMMER FLOUNDER FISHERY". I have heard some disturbing information on such a plan but will reserve comment in my columns which does appear in quite a number of fishing journals. And as the director of the Charter Boat Association in Fortescue, N.J. we are directly affected by such a plan, and its implementation. It seems the sore spot is the 13" filet question this I am sure bears some explanation, because in the context it is now written it is impossible to adhere to. Thanking you in advance for my request, I remain

Sincerely
Capt. Peter L. DelRossi

MEMBER PENNSYLVANIA OUTDOOR WRITERS ASSOCIATION

7049 RUTLAND STREET
PHILADELPHIA, PA 19149
(215) 745-1965

P.O. BOX 600
FORTESCUE, N.J. 08321
(609) 447-3341

RECEIVED

FEB [illegible]

MID ATLANTIC COUNCIL

February 5, 1988

Sir:

First I would like to say that I have been a fluke fisherman for fifty years.

I agree with the 13" limit and would not object to a 14" limit.

One problem I have is that sometimes a fluke will hook itself deep in its throat and by the time the hook is removed the fish is dead or most certainly will die. It make no sense to throw such a fish back it could at least be used for bait.

The only solution I can see to making sure the 13" rule is adhered to is to stop filleting of fish on the boat until the boat is docked.

Sincerely

Mr Adrian R Dazin

2-11-88

To the S.O.B.'s that are complaining about fluke regulations, and you softies that are prolonging putting fluke on the endangered list.

In a way the fluke Industry reminds me of a gold rush. The fluke will go as did the gold.

Ask a real deer hunter if he'd like to see year round hunting.

It seems to me that people in the fishing Industry insist on cutting off the hand that feeds them.

The commercial guys are dragging the ocean clean. Have you been on a party boat lately. They go 2 to 3 miles off with 35 to 50 people, stay for four hours and come in with 30 to 40 pounds of fish. Thats considered a good day, with a write up in the fishing section

Its as plain as day that the commercial draggers are loading up before these fish get a chance to come inshore.

About a month ago I read an article about the cost + catch ratio for fluke, I think the figures were put out by your council.

I also read about the decline of Tens of Millions of pounds per year, year after year.

So forget about a 13" min.

500 lb permit

Net size fillet size etc.

Make a Season on fluke!

Ask any real fishermen.

RECEIVED

FEB 1[illegible]

MID ATLANTIC COUNCIL

Ken Bartos

Kenneth A. Bartos
22 Bayway Dr.
Brick [redacted]. NJ 08723
[redacted]

APPENDIX 6 - REGULATIONS - PART 625 - SUMMER FLOUNDER FISHERY

Subpart A - General Provisions

Subpart B - Management Measures

Authority: 16 U.S.C. 1801 *et seq*.

Subpart A - General Provisions

§625.1 Purpose and Scope.

The regulations in this Part implement the Fishery Management Plan for the Summer Flounder Fishery (FMP), which was prepared and adopted by the Mid-Atlantic Fishery Management Council in cooperation with the New England and South Atlantic Fishery Management Councils and approved by the Under Secretary for Oceans and Atmosphere, NOAA.

§625.2 Definitions. In addition to the definitions in the Magnuson Act and in §620.2 of this chapter, the terms used in this part have the following meanings:

Charter or *party boat* means any vessel which carries passengers for hire to engage in fishing.

Fishery Management Plan (FMP) means the Fishery Management Plan for the Summer Flounder Fishery and any amendments thereto.

Fishing Trip means a period of time during which fishing is conducted, beginning when the vessel leaves port and ending when the vessel returns to port.

NEFC means the Northeast fisheries Center, NMFS, Water Street, Woods Hole, MA 02543.

Person who receives summer flounder for commercial purposes means any person (excluding governments and governmental entities) engaged in commerce who is the first purchaser of summer flounder. The term includes, but is not limited to, dealers, brokers, processors, cooperatives, or fish exchanges. It does not include a person who only transports summer flounder between a fishing vessel and a first purchaser.

Regional Director means the Regional Director, Northeast Region, NMFS, Federal Building, 14 Elm Street, Gloucester, Massachusetts 01930-3799, telephone 508-281-3600, or a designee.

Regulated fishery means any fishery of the United States which is regulated under the Magnuson Act.

Summer flounder means *Paralichthys dentatus.*

Total length (TL) means the distance from the tip of the head to the tip of the tail (caudal fin) while the fish is lying on its side normally extended.

Vessel length means that length specified on State registration or U.S. Coast Guard documentation.

§625.3 Relation to other laws.

(a) The relation of this part to other laws is set forth in §620.3 of this chapter and paragraph (b) of this section.

(b) Additional regulations governing fishing for summer flounder by foreign vessels in the EEZ are set forth in 50 CFR Part 611, Subparts A and C.

§625.4 Vessel permits and fees.

(a) *General.* (1) Any vessel of United States fishing for summer flounder in the EEZ must have a permit required by this part aboard the vessel. A vessel with a permit issued under these regulations is required to fish and land under these regulations unless the vessels lands in a State having larger minimum summer flounder size limits than those provided in these regulations; in that case the landings must meet the State limits. A recreational vessel is exempt from the permitting requirement if it catches no more than 100 pounds of summer flounder per trip.

(2) Vessel owners or operators who apply for a fishing vessel permit under this section must agree as a condition of the permit that the vessel's fishing and catch (without regard to whether such fishing occurs in the EEZ or landward of the EEZ, and without regard to where such fish are possessed, taken, or landed), will be subject to all the requirements of this part.

(b) *Eligibility.* (Reserved)

(c) *Application.*

(1) An application for a permit under this Part must be submitted and signed by the owner or operator of the vessel on an appropriate form obtained from the Regional Director at least 30 days prior to the date on which the applicant desires to have the permit made effective.

(2) An Applicants must provide all the following information:

(i) The name, mailing address including Zip code, and telephone number of the owner and master of the vessel;

(ii) The name of the vessel;

(iii) The vessel's US Coast Guard documentation number or the vessel's State registration number for a vessels not required to be documented under Title 46 of the US Code;

(iv) Home port and principal port of landing, gross tonnage, radio call sign, and length of the vessel;

(v) Engine horsepower of the vessel and the year the vessel was built;

(vi) Type of construction, type of propulsion, navigational aids (e.g., Loran C), type of on-board computer, and type of echo sounder of the vessel;

(vii) Permit number of any current or previous Federal fishery permit issued to the vessel;

(viii) Approximate fish hold capacity of the vessel (to the nearest 100 lbs);

(ix) Type and quantity of fishing gear used by the vessel;

(x) Average size of the crew, including the captain, which may be stated in terms of a normal range;

(xi) Directed fishery or fisheries;

(xii) Quantity of summer flounder landed during the calendar year prior to the one for which the permit is being applied.

(xiii) Number of passengers the vessel is licensed to carry (party and charter boats); and

(xiv) Any other information concerning vessel characteristics requested by the Regional Director.

(3) Any change in the information specified in paragraph (c)(2) of this section must be submitted by the applicant in writing to the Regional Director within 15 days of the change.

(d) *Fees.* No fee is required for any permit issued under this Part.

(e) *Issuance.* The Regional Director will issue a permit to the applicant no later than 30 days from the receipt of a completed application.

(f) *Expiration.* A permit will expire upon any change in vessel ownership, registration, name, length, gross tonnage, fish hold capacity, home port, or the regulated fisheries in which the vessel is engaged.

(g) *Duration.* A permit will continue in effect until December 31 of each year unless it is revoked, suspended, or modified under 15 CFR Part 904.

(h) *Alteration.* No person may alter, erase, or mutilate any permit. Any permit which has been intentionally altered, erased, or mutilated is invalid.

(i) *Replacement.* Replacement permits may be issued by the Regional Director when requested in writing by the owner or operator, stating the need for replacement, the name of the vessel, and the fishing permit number assigned. An application for a replacement permit will not be considered a new application.

(j) *Transfer.* Permits issued under this Part are not transferable or assignable. A permit will be valid only for the fishing vessel and owner for which it is issued.

(k) *Display.* The permit is subject to inspection by an authorized officer.

(l) *Suspension and revocation.* Subpart D of 15 CFR Part 904 (Civil Procedures) governs the imposition of sanctions against a permit issued under this part.

§625.5 Recordkeeping and reporting ~~requirements~~. (reserved)

§625.6 Vessel identification.

(a) *Vessel name.* Each fishing vessel subject to this Part and over 25 feet in length must display its name on the port and starboard sides of the bow and, as possible, on its stern.

(b) *Official number.* Each fishing vessel subject to this Part and over 25 feet in length shall display its official number on the port and starboard sides of the deckhouse or hull, and on an appropriate weather deck so as to be clearly visible from enforcement vessels and aircraft.

(c) *Numerals.* Except as provided in paragraph (e) of this section, the official number must be displayed in block arabic numerals in contrasting color at least 18 inches in height for fishing vessels over 65 feet in length, and at least 10 inches in height for all other vessels over 25 feet in length. The length of a vessel, for purposes of this section, is that length set forth in US Coast Guard or State records.

(d) *Duties of owner or operator.* The owner or operator of each vessel subject to this part will:

(1) Keep the vessel's name and official number clearly legible and in good repair, and

(2) Ensure that no part of the vessel, its rigging, its fishing gear, or any other object obstructs the view of the official number from any enforcement vessel or aircraft.

(e) *Non-permanent marking.* Vessels carrying recreational fishing parties on a per capita basis or by charter must use markings that meet the above requirements, except for the requirement that they be affixed permanently to the vessel. The non-permanent markings must be displayed in conformity with the above requirements when the vessel is fishing for summer flounder.

§625.7 Prohibitions.

(a) In addition to the general prohibitions specified in §620.7 of this chapter, it is unlawful for any person owning or operating a vessel issued a permit under §625.4 to do any of the following:

(1) Land or possess at sea any summer flounder, or parts thereof, which fail to meet the minimum fish size specified in §625.23; and

(2) Fail to affix and maintain markings as required by §625.6.

(b) It is unlawful for any person to do any of the following:

(1) Use any vessel of the United States (except for recreational fishing vessels catching no more than 100 pounds per trip) for the taking, catching, harvesting, or landing of any summer flounder taken from the EEZ unless the vessel has a valid permit issued under this part and the permit is aboard the vessel;

(2) Possess, have custody or control of, ship, transport, offer for sale, sell, purchase, land, or export any summer flounder taken, retained, possessed, or landed in violation of the Magnuson Act, this part, or any other regulation under the Magnuson Act.

(3) Make any false statement, oral or written, to an authorized officer, concerning the taking, catching, harvesting, landing, purchase, sale, possession, or transfer of any summer flounder;

(4) Interfere with, obstruct, delay, or prevent by any means the lawful investigation or search in the process of enforcing this part; or

(5) Fail to report to the Regional Director within 15 days any change in the information contained in the permit application for a vessel;.

(c) It is unlawful to violate any other provision of this part, the Magnuson Act, or any regulations or permit issued under the Magnuson Act.

§625.8 Facilitation of enforcement

See §620.8 of this chapter.

§625.9 Penalties.

See §620.9 of this chapter.

Subpart B - Management Measures

§625.20 Fishing year. (Reserved)

§625.21 Allowable levels of harvest. (Reserved)

§625.22 Closure of fishery. (Reserved)

§625.23 Size restrictions.

(a) The minimum size for summer flounder, including parts thereof, is 13 inches TL.

(b) *Increase in the minimum fish size.*

(1) The Secretary must, based upon a recommendation of the Council, increase the minimum size for summer flounder to 14 inches beginning 3 years after the date of implementation of these regulations, or upon annual reassessment thereafter, if the Regional Director determines that the trend in fishing mortality of age-2 summer flounder has increased from the baseline established by the NEFC using survey and catch-at-age data from 1976-1988.

(2) In making this determination, the Regional Director must consider:

(i) Fishing mortality estimated from the NEFC's spring survey;

(ii) Fishing mortality estimated from a virtual population analysis based on commercial and recreational catch per unit of effort; and

(iii) Any other relevant information.

(3) Any increase in the minimum size must be published as a notice in the **Federal Register** with the basis for such increase.

§625.24 Gear restrictions. (Reserved)

§625.25 Time restrictions. (Reserved)

APPENDIX 7. ABBREVIATIONS AND DEFINITIONS OF TERMS

Act (MFCMA) - the Magnuson Fishery Conservation and Management Act of 1976, as amended, 16 USC 1801 et seq.

adjusted dollars - dollars standardized to a base year based on the Consumer Price Index.

Allowable Biological Catch (ABC) - the maximum allowable catch for a particular fishing year developed by reducing the maximum OY as necessary based on stock assessments.

Annual Fishing Level - a foreign fishing allocation set pursuant to Section 201(d)(3) of the Act.

ASMFC - Atlantic States Marine Fisheries Committion.

CFR - Code of Federal Regulations.

Council (MAFMC) - the Mid-Atlantic Fishery Management Council.

CPI - Consumer Price Index; a comparitive ratio of a certain group of goods across time.

CPUE - catch per unit of effort.

Domestic Annual Harvest (DAH) - the capacity of US fishermen, both commercial and recreational, to harvest and their intent to use that capacity.

Domestic Annual Processing (DAP) - the capacity of US processors to process, including freezing, and their intent to use that capacity.

Exclusive Economic Zone (EEZ) - the zone contiguous to the territorial sea of the US, the inner boundary of which is a line coterminous with the seaward boundary of each of the coastal States and the outer boundary of which is a line drawn in such a manner that each point on it is 200 nautical miles from the baseline from which the territorial sea is measured.

F - instantaneous rate of fishing mortality (The proportion of the population caught in a small period of time.). This mortality occurs in the presence of mortality from other causes and is usually given as averages for a year.

$F_{0.1}$ - the rate of fishing mortality for a given method of fishing at which the increase in yield per recruit for a small increase in fishing mortality results in only 10% increase in yield per recruit for the same increase in fishing mortality from a virgin fishery.

F_{max} - the rate of fishing mortality for a given method of fishing which maximizes the harvest in weight taken from a single year class of fish over its entire life span.

FMP - fishery management plan.

FR - Federal Register.

GIFA - Governing International Fishery Agreement.

GRT - gross registered ton.

ICNAF - International Commission for the Northwest Atlantic Fisheries (replaced by NAFO).

ICES gauge - International Council for the Exploration of the Seas (ICES) longitudinal mesh gauge set a 4 kg presure; as used in mesh selectivity studies.

internal waters - marine waters landward of the territorial sea.

L_{50} - length at which 50% of the fish are mature.

M - natural mortality; instantaneous rate of death attributable to all causes except fishing.

MSY - maximum sustainable yield. The largest average catch of yield that can continuously be taken from a stock under existing environmental conditions, while maintaining the stock size.

MRFSS - Marine Recreational Fishery Statistics Surveys, 1979 - 1985.

NAFO - Northwest Atlantic Fisheries Organization.

natural mortality - deaths from all causes except fishing, including predation, senility, epidemics, pollution, etc.

NEFC - the Northeast Fisheries Center of the NMFS.

NMFS - the National Marine Fisheries Service of NOAA.

NOAA - the National Oceanic and Atmospheric Administration of the US Dept. of Commerce.

OY - Optimum Yield.

Regional Director (RD) - the Regional Director, Northeast Region, NMFS.

recruitment - the addition of fish to the fishable population due to migration or to growth. Recruits are usually fish from one year class that have just grown large enough to be retained by the fishing gear.

SA - Subarea or Statistical Area.

SSC - the Scientific and Statistical Committee of the Council.

Secretary - the Secretary of Commerce, or his designee.

serial spawners - species which have egg batches that are continuously matured and shed during a protracted spawning season.

state waters - internal waters and the Territorial Sea.

stock assessment - the NMFS yearly biological assessment of the status of the resources. This analysis provides the official estimates of stock size, spawning stock size, fishing mortalities, recruitment, and other parameters used in this Plan. The data from these assessments shall constitute the "best scientific information currently available" as required by the Act.

Territorial Sea - marine waters from the shoreline to 3 miles seaward.

TL - total length.

Total Allowable Level of Foreign Fishing (TALFF) - that portion of the Optimum Yield made available for foreign fishing.

USDC - US Department of Commerce.

year-class - the fish spawned or hatched in a given year.

yield per recruit (YPR) - the expected yield in weight from a single recruit.

Z - instantaneous rate of total mortality; the ratio of numbers of deaths per unit of time to population abundance during that time.