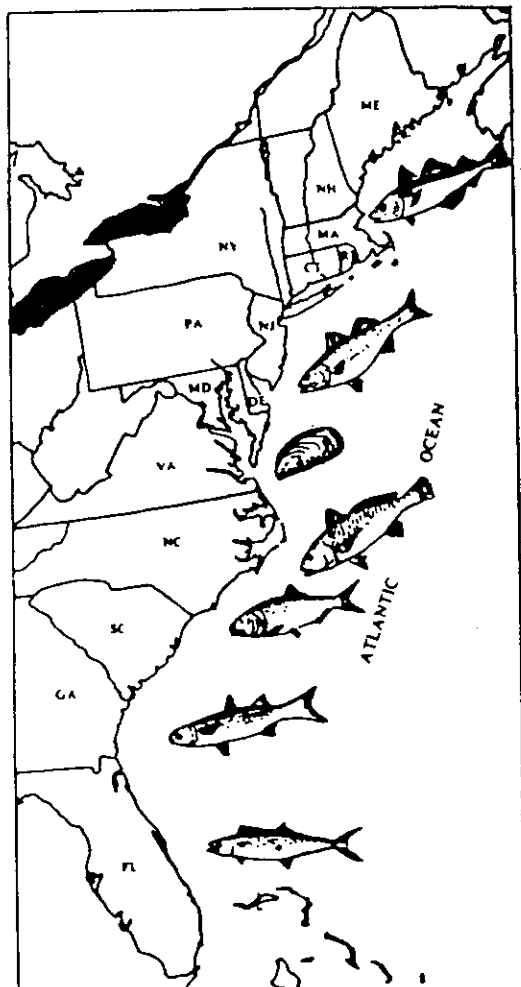


*Special Report No. 11*  
*of the*  
**ATLANTIC STATES MARINE  
FISHERIES COMMISSION**



**FISHERIES MANAGEMENT PLAN REVIEWS  
FOR  
AMERICAN LOBSTER  
ATLANTIC MENHADEN  
NORTHERN SHRIMP  
RED DRUM  
SHAD AND RIVER HERRINGS  
SPOTTED SEATRUT  
SUMMER FLOUNDER  
WEAKFISH**

**April 1988**



**ATLANTIC STATES MARINE FISHERIES COMMISSION**

**FISHERIES MANAGEMENT PLAN REVIEWS**

**FOR**

**AMERICAN LOBSTER**

**ATLANTIC MENHADEN**

**NORTHERN SHRIMP**

**RED DRUM**

**SHAD AND RIVER HERRINGS**

**SPOTTED SEATRUT**

**SUMMER FLOUNDER**

**WEAKFISH**

**Prepared by the Atlantic States Marine Fisheries Commission's Advisory  
Committee, April 1988.**

**Editorial Committee**

**Mike Street, NC  
Eric Smith, CT  
Joseph McGurrin, ASMFC  
Paul Perra, ASMFC**

**Special Report No. 11 of the Atlantic States Marine Fisheries Commission**



ATLANTIC STATES MARINE FISHERIES COMMISSION  
FISHERIES MANAGEMENT PLAN REVIEWS

PREFACE

This report summarizes a yearlong (1987) effort of the Atlantic States Marine Fisheries Commission's Advisory Committee to review the implementation status of fishery management plans developed under the auspices of the Commission's Interstate Fisheries Management Program and its predecessor, the NMFS State/Federal Fisheries Management Program. Plans were reviewed for American lobster, northern shrimp, summer flounder, spotted seatrout, weakfish, menhaden, shad and river herring, and Atlantic Coast red drum. A review of the striped bass plan was not considered because of ongoing efforts to revise that plan.

Plan reviews were completed by teams consisting of Advisory Committee members, past members of the Scientific & Statistical Committees responsible for development of the original plans, and other participants judged to have knowledge or current responsibility for management of a particular species. The reviews include a short summary with recommendations followed by a more detailed evaluation of the status of the plan, fish stocks, research and monitoring, management measures, and recommendations.



## TABLE OF CONTENTS

|                                                                                                 | <u>Page</u> |
|-------------------------------------------------------------------------------------------------|-------------|
| Preface . . . . .                                                                               | i           |
| American Lobster . . . . .                                                                      | 1           |
| Atlantic Menhaden . . . . .                                                                     | 9           |
| Northern Shrimp . . . . .                                                                       | 17          |
| Red Drum . . . . .                                                                              | 27          |
| Shad and River Herrings . . . . .                                                               | 37          |
| Spotted Seatrout . . . . .                                                                      | 43          |
| Summer Flounder . . . . .                                                                       | 53          |
| Weakfish . . . . .                                                                              | 69          |
| Lists of ASMFC Advisory Committee and Atlantic Menhaden<br>Advisory Committee Members . . . . . | 79          |



REVIEW OF THE  
INTERSTATE FISHERY MANAGEMENT PROGRAM  
FISHERY MANAGEMENT PLAN  
FOR  
AMERICAN LOBSTER

Prepared By:

Eric M. Smith, CT  
Bruce A. Halgren, NJ  
Thomas D. Morrissey, NMFS



## SUMMARY

### 1978 AMERICAN LOBSTER FISHERY MANAGEMENT PLAN REVIEW

The goals of the 1978 American Lobster Fishery Management Plan were to: 1) develop a structure of institutional arrangements for effective regionalized management of lobster stocks that occur within two or more political jurisdictions; 2) coordinate the collection and analysis of statistical and scientific data for the fishery resource; 3) promote efficiency in harvesting and utilization of the resource; 4) develop and maintain a healthy commercial fishery; and 5) maintain opportunities for participation in recreational lobster fishing.

Objectives included: 1) adjust the minimum size limitations on the basis of the best scientific information available; 2) develop regional programs to control lobster fishing effort and regulate lobster fishing mortality rates; 3) implement uniform collection, analysis, and dissemination of biological and economic data; 4) increase brood stock abundance to minimize the risk of stock depletion and recruitment failure; 5) minimize lobster injury and mortality associated with fishing; 6) develop standard gear-making procedures to the extent practical; and 7) maintain existing social and cultural features of the industry whenever possible.

Since 1978, all states have attained a uniform minimum length of 3-3/16" carapace length, but none have dealt effectively with fishing mortality. All are cooperating in the development of a coordinated fishery statistics program, and to a variable extent most have dealt in some fashion with wastage, and with gear conflict. The two most necessary objectives -- increasing spawning stock size and decreasing fishing mortality rates -- have not been accomplished. Stock conditions are relatively unchanged from the late 1970's, with very high fishing mortality rates, and particularly in more northern areas, a relatively low proportion of mature females in the size class of lobsters recruited to the fishery each year. Nonetheless, recruitment and the magnitude of landings have remained relatively constant.

In 1986, Maine and the New England Fishery Management Council undertook an initiative to accomplish 1) a gradual increase in the minimum legal length (from 3-3/16" to 3-5/16" carapace length over a 5-year period); and 2) protection of female brood stocks. The Council Plan amendment is being reviewed by the Secretary of Commerce, with legislation in both Maine and Massachusetts and a regulation in Rhode Island (which would accomplish the same increase), all pending.

#### Recommendations:

The Advisory Committee recommends development of an ASMFC plan addendum intended to summarize conditions that have changed in the fisheries since 1978 (i.e. with respect to lobster management), and to provide an analysis of the advantages and disadvantages of current and alternative management measures for American lobsters. It is intended that this effort be sponsored by an ASMFC-coordinated, Interjurisdictional Fisheries Act-funded planning exercise.

## FISHERY MANAGEMENT PLAN REVIEW - AMERICAN LOBSTER

### I. STATUS OF THE FISHERY MANAGEMENT PLAN

The 1978 American Lobster Fishery Management Plan (the State/Federal Plan) was the first to address regional fishery management issues across interjurisdictional boundaries. It was a precursor to the plans developed more recently by regional Fishery Management Councils. One of those plans, adopted in 1983 by the New England Fishery Management Council (the Council Plan), provides for the management of the American lobster in the Exclusive Economic Zone (EEZ). While the State/Federal Plan has never been amended, the Council adopted an amendment to its plan in mid-1987 which would accomplish two objectives: 1) to increase the minimum length of lobsters, over a five-year schedule, to 3-5/16" carapace length; and 2) to prohibit the landing of V-notched lobsters. This amendment was approved by the Secretary of Commerce in October 1987.

The State/Federal Plan recommended a variety of management measures, one of which was largely a socio-political statement of intent (e.g. maintain existing social and cultural features of the industry whenever possible). The active plan objectives included: 1) adjusting the minimum legal length (e.g. initially, to achieve a uniform 3-3/16" carapace length, and potentially, to attain larger sizes in the future); 2) controlling lobster fishing mortality rates; 3) implementing uniform data collecting and management measures; 4) increasing spawning stock size; 5) minimizing wastage and fishery-related injuries to lobsters; and 6) developing strategies to resolve gear conflicts.

### II. STATUS OF THE STOCK

The status of lobster stocks can be summarized on the basis of conditions prevailing in three geographic regions: 1) the inshore Gulf of Maine; 2) inshore southern New England; and 3) offshore waters.

Fishing mortality rates in the northern Gulf of Maine have remained stable and high during the last ten years ( $F=2.5+$ ) but appear to have increased in the southern area (from 2.0 to 2.6). Abundance (cpue) in the northern area appears to be relatively stable but is declining in the southern Gulf of Maine. Catch rates have fluctuated, with peak landing occurrences in 1982.

Fishing mortality rates in inshore southern New England have remained similar to the inshore Gulf of Maine ( $F=2.4+$ ) but have been lower along the south shore of Long Island ( $F=0.65$ ). Abundance indices for Long Island Sound and Buzzard's Bay peaked in 1983 and, for Block Island Sound, in 1982. In the inshore southern Long Island area, abundance appears to have peaked in 1985. Catches in Long Island Sound increased during the late 1970's and early 1980's, peaked in 1984 and declined thereafter in Connecticut, while in New York, catches have continued to increase from 1981 through 1986; on the south shore of Long Island, catches declined in 1985-86. In New Jersey, the trend in catches has been increasing since 1976, notwithstanding implementation of minimum length increases during the 1980's.

Fishing mortality rates in offshore areas have remained lower than in inshore areas ( $F<1.0$ ). Relative abundance, while highly variable, was considerably lower in the mid-1980's compared to the mid-1970's; the highest point in the mid-Atlantic was observed in 1980, and the lowest in 1985. Landings of offshore

catches in the mid-1970's to early 1980's were about 46 percent lower than during the early 1970's but, in 1984-85, they almost doubled to record levels.

In summary, inshore catches were stable during the period 1960-1975, approximating 22-26 million pounds; from 1975-1983 they increased 50 percent (to 39 million pounds) staying relatively high in 1984 at 36 million pounds (Figure 1). Offshore catches peaked in the early 1970's at nine million pounds and subsequently declined about 50 percent by 1980 before doubling to a level equal to the highest level on record. However, since offshore landings have never comprised more than 20 percent of the total, these changes have had a relatively minor impact on overall landings.

### III. STATUS OF RESEARCH & MONITORING

Most states as well as the National Marine Fisheries Service (NMFS) maintain some provision for catch reporting, or the collection of landings and some form of effort statistics. Most evaluate catch per unit of fishing effort annually based on these data. Statistics systems range from mailed-in, annual summary catch reports to personal interviews with vessel operations.

Maine, Massachusetts, Connecticut, and New York routinely sample commercial catches for biological measurements; Massachusetts also derives abundance estimates from a commercial sea sampling survey. While both Massachusetts and Connecticut can derive abundance indices from inshore trawl surveys, this is not the most reliable estimator in use. Maine and Connecticut conduct juvenile surveys, Maine and Massachusetts are investigating fecundity and reproductive potential, Connecticut conducts larval surveys, and Maine, Connecticut, New York and New Jersey have each recently analyzed lobsters for the presence of selected contaminants. NMFS is conducting studies of the effects of pollutants in Long Island Sound on lobster growth and reproduction. Maine and Massachusetts have each researched time degradable fasteners for lobster pot escapement openings.

### IV. STATUS OF MANAGEMENT MEASURES

Effective January 1, 1987, all states have implemented the 3-3/16" minimum carapace length which was the initial target of the 1978 Plan. This length is also in effect in the EEZ; however, the recently-adopted Council plan amendment would implement a 1/8" total increase in the length limit, attained in four 1/32" increments over a five-year period ending in 1992. Three states (Maine, Massachusetts, and Rhode Island) have similar increases pending; Maine's legislation also depends on protection of V-notched lobsters in the EEZ. Based on these actions, other states have expressed a willingness to consider implementation of the length limit.

All states save New York have implemented escape vents. Three states -- Maine, New Hampshire, and Connecticut (wire pots only) -- will implement degradable panels (for escapement from "ghost" pots) at varying dates in 1988-89.

Maine has an experimental trap limit plan in the Swan's Island region and Massachusetts has a form of restrained entry to the fishery. While not necessarily effort limitation, Maine prohibits the landing of lobsters by trawlers, and Massachusetts prohibits the landing of more than 100 lobsters if the trawler has fished that day in waters of the Commonwealth. Connecticut and New York both limit trawlers fishing in Long Island Sound to a possession limit of 100 lobsters per day.

Most states recommended investigating ways of increasing spawning stock size; while the spawning stock-recruitment relationship is poorly understood for lobsters, an increase was considered a desirable hedge against the possibility of recruitment overfishing. One respondent observed that effective management would require an understanding of the extent of recruitment to inshore fisheries from offshore stocks. Another felt the impact of the recent increase in minimum length should be investigated prior to continuing the increases.

Most states suggested "quality measures," that is, ways of reducing the number of culls, or the losses associated with lost lobster traps. Examples include degradable panels or panel fasteners, and other gear modifications. It was observed that the incidence of culls can often be attributed to handling and other fishing practices, suggesting that behavior modification may be required to resolve this question.

Individual comments ranged from evaluating ways to reduce fishing mortality (without creating a crisis in the fishery), increasing yield per recruit, and generating more precision in fecundity estimates.

## **V. RECOMMENDATIONS**

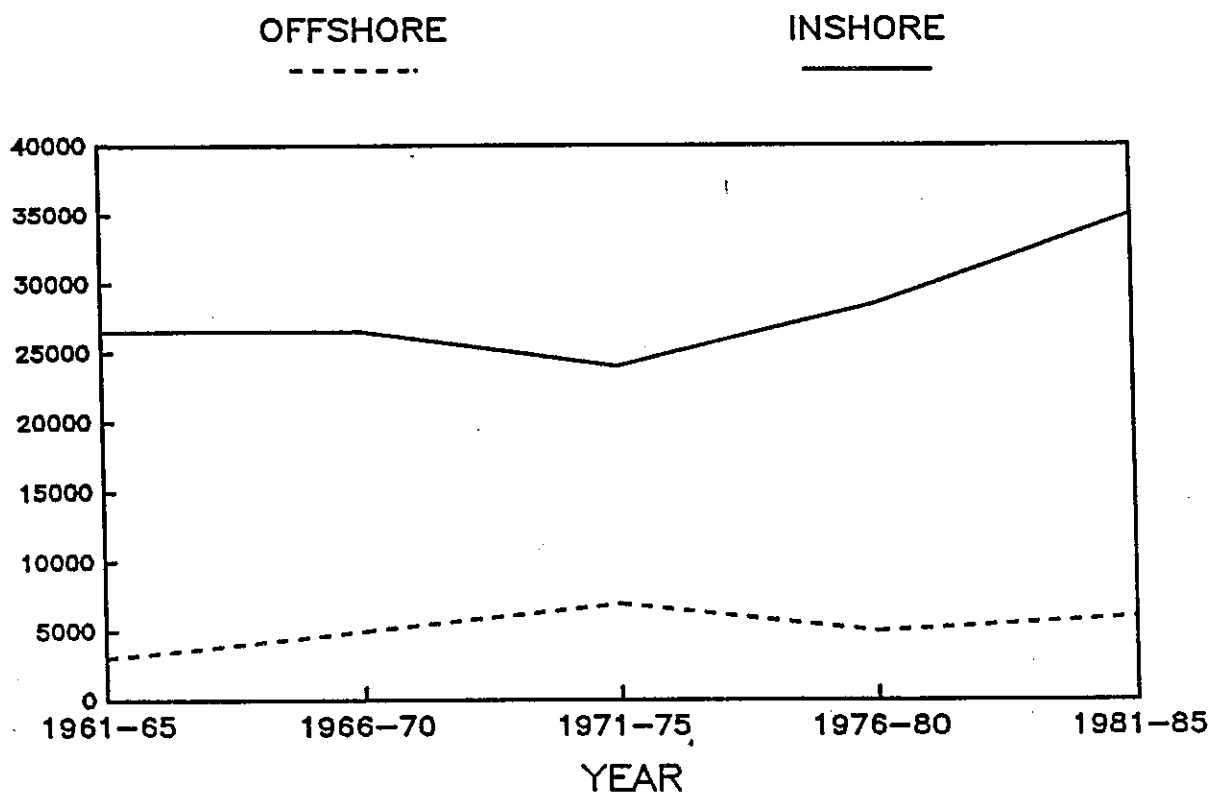
The 1978 plan served a useful purpose and there are elements of it which would benefit from a plan revision. The question is whether lobster management would benefit from the effort that would be necessary to rewrite the plan.

There has been relatively little change in stock conditions over the past ten years; in fact, given the concerns of participants in the state/federal lobster management program in the mid-1970's, the most remarkable attribute of the intervening years is that stocks have not collapsed. This does not in any way suggest that they won't in the future.

Given the fact that there is little change apparent in stock condition, and little "new science" available that might justify development of a new plan, the recommendation of the Advisory Committee is that a plan addendum be prepared that summarizes new information available to date, the status of management in light of the revised measures now being discussed for the EEZ and the Gulf of Maine, and the desirability of implementing complementary measures in state waters.

This recommendation is strengthened by the observation that the recent New England Council plan amendment has summarized the extent of the problem and the opportunities facing the lobster producing states. In fact, many states are considering implementation of measures compatible to Maine's and the Council's and thus obviating the need for the lengthy and costly revision of the plan. A plan addendum, on the other hand, will serve to focus state agency attention on current issues without delaying progress towards long-range improvements in management measures which will benefit the resource throughout its range.

Figure 1. Five-Year Mean U. S. Lobster Landings  
(x 1,000 pounds), 1961-1985.





REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION  
FISHERY MANAGEMENT PLAN  
FOR  
ATLANTIC MENHADEN

Prepared By:

Atlantic States Marine Fisheries Commission's  
Advisory Committee  
with input from the  
Atlantic Menhaden Advisory Committee



## SUMMARY

### 1981 ATLANTIC MENHADEN FISHERY MANAGEMENT PLAN REVIEW

The goal of the plan is "to prepare a program for utilization of Atlantic menhaden that is biologically, economically, and sociologically sound and which protects the resource and its users." A detailed review of the status of the Atlantic menhaden stock was conducted in 1986 and included updates to many of the tables and figures in the Atlantic Menhaden FMP. The review indicated that due to successful recruitment and reduced effort, stock size and age composition are much improved relative to the 1970s. In contrast, the industry is under great stress due to economic and social problems. The current NMFS program for resource monitoring via fishery-dependent information (nominal effort, size, and age) provides adequate coverage of the reduction fishery. Biological and statistical data for landings by other fisheries and gear are needed. The FMP Supplement discussed effects of management actions on the fishery in light of the objective to eliminate unneeded restrictions. Further, menhaden are dependent on maintenance of a healthy estuarine environment.

#### Recommendations:

- 1) The FMP is adequate and should be maintained and the database updated at 3-5 year intervals.
- 2) The NMFS monitoring and research program is essential for long-term management of the fishery and must be maintained, and analytical capabilities should be strengthened.
- 3) State agencies should improve monitoring of menhaden size and age from fisheries other than purse seine reduction, as well as other forms of mortality, and provide data to NMFS to aid in assessment of the total stock.
- 4) State fishery management agencies should submit rule changes to the ISFMP Policy Board for evaluation prior to enactment, and existing regulations and statutes affecting the menhaden fishery should be examined and deletions considered for those measures conflicting with the FMP.
- 5) The Atlantic Menhaden Advisory Committee (AMAC) should be maintained with state, federal and industry membership to serve the ASMFC Advisory Committee by providing annual reviews of status of plan, stock, fishery, and research.
- 6) State and federal habitat protection and water quality programs must be maintained and strengthened.
- 7) Adequate funding should be provided in North Carolina and Virginia to properly address ulcerative mycosis and its effects on menhaden and other estuarine fishes.

## FISHERY MANAGEMENT PLAN REVIEW - ATLANTIC MENHADEN

### I. STATUS OF THE FISHERY MANAGEMENT PLAN

The goal of the plan is "to prepare a program for utilization of Atlantic menhaden that is biologically, economically, and sociologically sound and which protects the resource and its users" (AMMB 1981:111). The plan's long-term objective contains two parts: to achieve the greatest continuing yield for each area by determining the optimal harvest age, and to eliminate restrictions (statutes and regulations) which do not contribute to the goal. The trend in recent years to close areas to fishing, often for political and social rather than conservation reasons, is counter to the FMP. Closures, such as those in New Jersey, Delaware, North Carolina (in part) New York, and New Hampshire reduce the areas available for fishing regardless of stock conditions, and continued loss of fishing grounds threatens the existence of the industry. Proposals of legislative closures in Virginia and North Carolina, even without implementation, may create an unfavorable business climate for the industry. The very recent closure by statute of all South Carolina waters to purse seine fishing is specifically contrary to the FMP.

The FMP should be maintained with its existing goal and objectives because: 1) the Atlantic menhaden resource is of national importance; 2) the stock is shared by all the Atlantic coastal states; 3) the FMP provides a guide for coherent management throughout the range of the resource; and 4) the FMP provides a framework for communications among industry, the public, and governmental fishery managers.

### II. STATUS OF THE STOCK AND FISHERY

A detailed review of the status of the Atlantic menhaden stock was conducted in 1986 (AMMB 1986) and included updates to many of the tables and figures in the Atlantic menhaden FMP (AMMB 1981). The tables in AMMB (1986) include a historical record through 1985 for landings (Table 1.1), number of vessels (Table 1.2), fishing effort (Table 1.3), catch in numbers at age (Table 1.4), estimated spawners and recruits (Table 1.5), and yield per recruit (Tables 1.6 and 1.7).

High landings were attained during the late 1950's and early 1960's, followed by a rapid decline in landings during the late 1960's due to excessive fishing and poor recruitment. Improved recruitment during the 1970's resulted in increasing landings and spawning stock size.

Five reduction plants have closed in recent years: two in the North Atlantic (South Portland, ME, in 1984; and Gloucester, MA, in 1985), one in the Middle Atlantic (Port Monmouth, NJ, in 1982), and two in the South Atlantic (Southport, NC, in 1984; and Beaufort, NC, in 1985) (See Figure 1). One large plant in Reedville, VA, was closed in 1986, but resumed operation in 1987.

With the plant closures and concomitant reduction in fishing effort, landings have fallen off from the recent season high in 1983. Landings are about half (238 kmt) of the potential yield from recent levels of recruitment (450-490 kmt). Partly because of the proportional shift of operating plants from the north to the south, the fleet is fishing on generally younger and smaller fish. Atlantic

menhaden tend to grow slower when more abundant (Ahrenholz et al., in press), and recent recruitment has been good. The current structure of the fishery suggests that potential yields of 450-490 kmt are not likely to be attained even if stock condition continues to improve.

### **III. STATUS OF RESEARCH AND MONITORING**

The current NMFS program for resource monitoring via fisheries-dependent information on landings, nominal effort, size, and age provide adequate coverage of the reduction fishery. Biological and statistical data for landings of Atlantic menhaden by other fisheries and gear are needed. The data require improved sampling by the states. Coordination of that effort with the NMFS Beaufort program is essential.

The Captain's Daily Fishing Report (CDFR) needs to be continued. Editing and summaries of current computer data files for CDFRs (1981-85) are scheduled. More recent data are not computerized. The juvenile tagging program for migration and mortality of Atlantic menhaden is being maintained, and juvenile abundance and tagging data are being evaluated. Recent stock assessments and data summaries by the menhaden program have been prepared (Ahrenholz et al., in press, Smith et al., in press, Vaughan et al., 1986, and Vaughan and Smith 1986).

Data on other sources of mortality such as fish kills, entrainment/impingement at power plants, disease, and others, must now be lumped with natural mortality in assessments. Data collection/reporting of these mortalities by the states are inadequate to allow partitioning mortality among these sources when conducting stock assessments.

Research projects are underway at private and government laboratories to examine the use of menhaden in the production of surimi and menhaden oil for pharmaceutical and food ingredients. An RFP for a socio-economic study has been prepared (AMMB 1986), but awaits funding. The continuing occurrence of ulcerative mycosis (UM) in menhaden and other estuarine fish species is of great concern because of potential impacts on fishery yields, as well as public perception of seafood, human health risks, and environmental quality. The Florida legislature is funding a research program on fish health and disease centered on the St. John's River. North Carolina has provided state funds for research on UM during 1987-88. Virginia has provided a low-level program for studying UM.

### **IV. STATUS OF MANAGEMENT MEASURES**

The FMP Supplement (AMMB 1986) discussed effects of management actions on the fishery in light of the objective to eliminate unneeded restrictions. State actions, especially area closures which restrict fishing, combined with very difficult economic conditions, have contributed to plant closures and fleet reductions during a period of expansion of the stock. The sole regulatory measure recommended by the FMP menhaden program is the variable fishing season (Option 7). The recommended seasons have been implemented by New Hampshire, Rhode Island, Connecticut, New York, New Jersey and Virginia. North Carolina's fishing season and most states' area closures do not comply with the spirit or letter of the FMP.

Menhaden are dependent on maintenance of a healthy estuarine environment. State and federal habitat protection programs have generally improved throughout the 1970's and 1980's. Increased development activity in most coastal areas is

putting additional pressure on permit review agencies to relax standards. Any retreat from strong commitments for habitat quality will have negative effects on the stock.

## V. RECOMMENDATIONS

- A. The FMP is adequate and should be maintained.
- B. The database should be updated at three to five year intervals.
- C. The NMFS monitoring and research program is essential for long-term management of the fishery, and it must be maintained. Analytical capabilities of the program should be strengthened.
- D. State fishery management agencies should examine their existing regulations and statutes affecting the menhaden fishery and consider deletion of those measures which conflict with the FMP.
- E. State agencies should improve their monitoring of menhaden size and age from fisheries other than the purse seine reduction fishery, as well as from other forms of mortality. The data should be provided to NMFS to aid in assessment of the total stock.
- F. A menhaden industry advisory committee should be formed to advise the ISFMP Policy Board on questions of menhaden management.
- G. The Atlantic Menhaden Advisory Committee should be maintained to serve the ASMFC Advisory Committee by providing an annual review of plan status, stock status, fishery status, and research status.
- H. State and federal habitat protection and water quality programs must be maintained and strengthened.
- I. Adequate funding should be provided in affected states to properly address ulcerative mycosis and its effects on menhaden and other estuarine fishes.

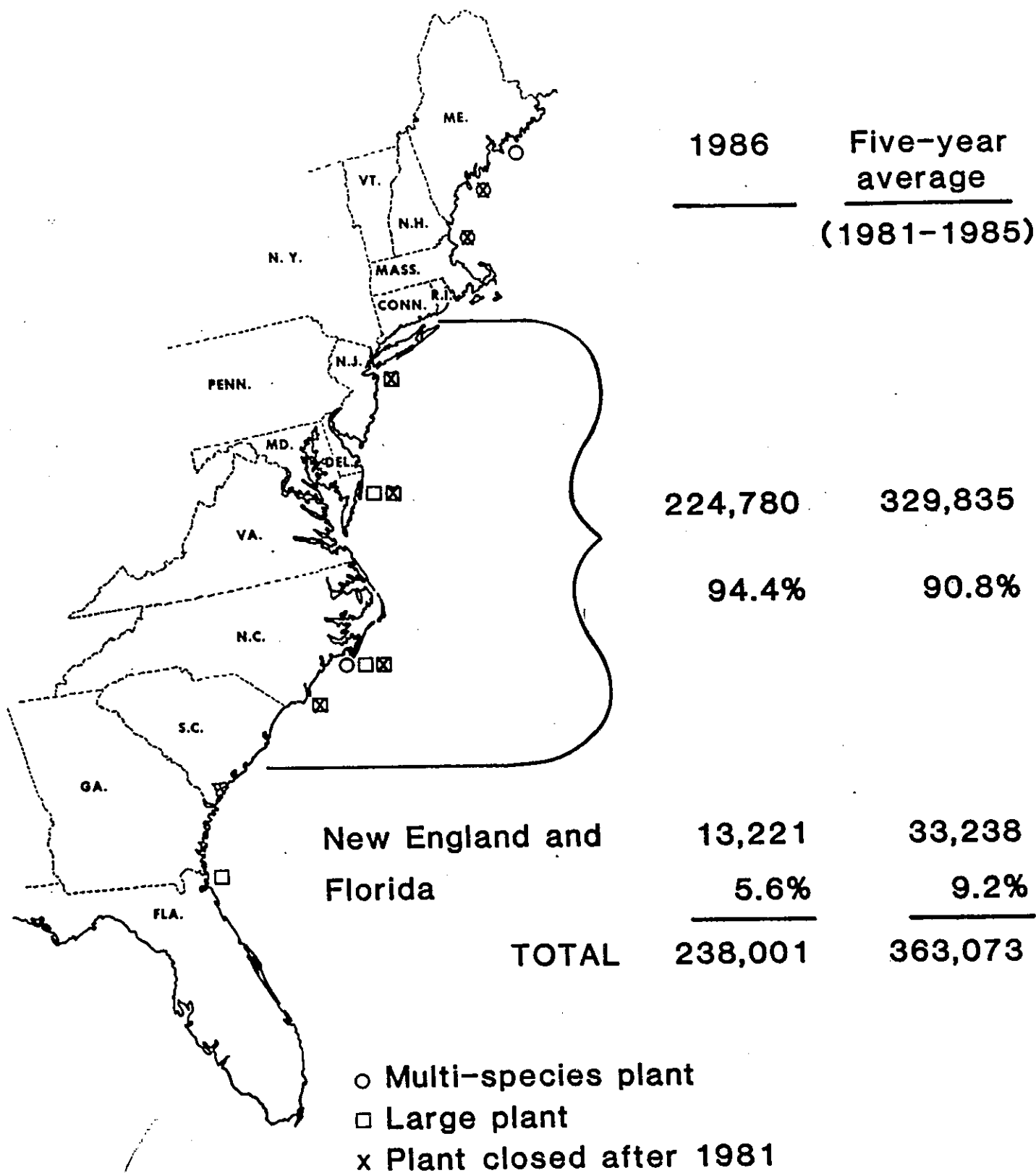


Figure 1. Locations and purse-seine landings for the 1986 fishing year and five-year average (1981-1985). The bulk of the fishery is currently centered in Virginia and North Carolina. Six plants ceased operation during the period 1982 through 1986. Note one plant in Reedville, VA, did not operate during the 1986 fishing year, but did resume operation in 1987.

## REFERENCES

- Ahrenholz, D. W., W. R. Nelson, and S. P. Epperly. 1987. Population and fishery characteristics of Atlantic menhaden, Brevoortia tyrannus. Fishery Bulletin, U.S. 85(4): In press.
- Atlantic Menhaden Management Board. 1981. Fishery management plan for Atlantic menhaden Brevoortia tyrannus (Latrobe). Fishery Management Report 2, Atlantic States Marine Fisheries Commission, Washington, D.C.
- Atlantic Menhaden Management Board. 1986. 1986 supplement to Atlantic menhaden fishery management plan. Fisheries Management Report No. 8, Atlantic States Marine Fisheries Commission, Washington, D.C., 61 p.
- Smith, J. W., W. R. Nicholson, D. S. Vaughan, D. L. Dudley, and E. A. Hall. 1987. The Atlantic menhaden, Brevoortia tyrannus, purse-seine fishery, 1972-1984, with a brief discussion of the age and size composition of the landings. NOAA Technical Report NMFS (In press).
- Vaughan, D. S., J. V. Merriner, D. W. Ahrenholz, and R. B. Chapoton. 1986. Stock assessment of menhaden and coastal herrings. NOAA Technical Memorandum NMFS-SEFC-178, 46 p.
- Vaughan, D. S., and J. W. Smith. 1986. A stock assessment of the Atlantic menhaden (Brevoortia tyrannus) fishery. National Marine Fisheries Service, Southeast Fisheries Center, Beaufort, North Carolina.

REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION'S  
FISHERY MANAGEMENT PLAN  
FOR NORTHERN SHRIMP

Prepared by  
Paul J. Diodati



## SUMMARY

### 1986 NORTHERN SHRIMP FISHERY MANAGEMENT PLAN REVIEW

This plan presents a management approach for the Gulf of Maine northern shrimp (*Pandalus borealis*) stock which is intended to generate the greatest possible economic and social benefits from its harvest over time. Information in regard to the condition of the resource and commercial landings is contemporary. The northern shrimp summer survey is the most valuable source of data for assessing stock status; continuation of this survey will provide a sound basis for long-term management of the fishery. Interactions of the shrimp fishery with other fisheries are of concern to scientists and managers. Monitoring and research efforts, including sea-sampling and development of separator trawls, are needed to address these concerns and are encouraged by this plan.

#### Recommendations:

1. This review finds no need to further update the 1986 Northern Shrimp FMP.
2. The stated research needs should be addressed in a timely fashion.
3. All current research and monitoring activities are essential for long-term management of the fishery and should be maintained; giving priority consideration to the northern shrimp summer survey.
4. Since distribution of northern shrimp in the western Gulf of Maine and the seasonal nature of the fishery can result in considerable fishery interactions, it is imperative that northern shrimp management be viewed in the context of overall management of the Gulf of Maine resource.

## FISHERY MANAGEMENT PLAN REVIEW - NORTHERN SHRIMP

### I. STATUS OF THE FISHERY MANAGEMENT PLAN

The FMP for northern shrimp was rewritten in 1986 from the Draft Northern Shrimp Management Plan and Environmental Impact Statement, and accepted by the Northern Shrimp Management Board of the Atlantic States Marine Fisheries Commission (ASMFC) in October 1979. The plan has been reviewed in recent months by the ASMFC Northern Shrimp Technical Committee, Northern Shrimp Section, and industry representatives; the review indicates that no revisions are necessary to either stated objectives or the general sections. The plan presents a management approach for the Gulf of Maine northern shrimp (*Pandalus borealis*) stock which is intended to generate the greatest possible economic and social benefits from its harvest over time. The plan recommends regulatory measures designed to maintain and eventually rebuild the stock and to perpetuate a viable fishery, recognizing that natural fluctuations in abundance will occur.

In addition, the following management objectives have been identified:

1. Offer adequate protection to the stock to enhance egg production and future recruitment.
2. Reduce the adverse impacts the shrimp fishery may have on other fishery resources.
3. Optimize the yield and reproductive capabilities of strong year classes.
4. Maintain a high product standard by eliminating the harvest of low quality shrimp during those periods when quality is known to be poor.
5. Minimize the adverse impacts of regulations, including increased costs to the shrimp industry and the associated coastal community.

The ASMFC Northern Shrimp Section agrees that, despite natural fluctuations in stock abundance, the northern shrimp fishery can be effectively managed. The Section will therefore provide a continuing management program for this fishery referring to the biological and socioeconomic information outlined in this plan as a basis for effective management.

### II. STATUS OF THE STOCK

The Northern Shrimp Technical Committee, consisting of scientists from the marine resource agencies of Maine, New Hampshire, Massachusetts, and the National Marine Fisheries Service (NMFS), has provided annual stock assessment reports and related information to the ASMFC Northern Shrimp Section. Analyses have been based on: (1) commercial landings data collected by NMFS port agents; (2) biological data obtained during sampling of the commercial catch by personnel from participating states and the NMFS; and (3) research vessel survey data collected by the Committee during the summer and by the NMFS during spring and fall.

**Commercial Fishery Trends:** Annual landings of Gulf of Maine northern shrimp declined from an average of 11,400 metric tons (t) during 1969-1972 to about 400t in the late 1970's, but have since increased to over 4,600t in 1986; the projected total for the 1987 season is about 5,000t (Table 1, Figure 1).

The fishery has been conducted primarily in inshore waters during winter and spring. Maine vessels, fishing for the most part between Portland and Pemaquid Point, have accounted for most of the catch, although since 1969 landings by Massachusetts vessels have been significant. Landings by New Hampshire vessels have also increased since the late 1970's. During 1987, approximately 70, 27, and 3 percent of the harvest was landed by Maine, Massachusetts, and New Hampshire vessels, respectively.

**Effort and CPUE:** Effort has increased rapidly in recent years. This increase has been driven by several factors which include, the occurrence of the strong 1982 year class, record ex-vessel shrimp prices, and reduced abundance of groundfish. Commercial effort in terms of number of trips has increased from 400 or so in 1979 to nearly 11,000 trips during the 1987 season; approximately 340 vessels are known to have participated in the 1987 fishery.

Commercial catch-per-unit effort (CPUE) indices have been developed from trip data for which 50 percent or more of the total catch consisted of shrimp. Both annual and winter (February-March) indices have been calculated; the latter appear more reliable from a historical perspective due to shifts in exploitation patterns by area and season that can occur at other times of year.

Both indices declined to minimal levels in the late 1970's but have since fluctuated without a definite trend in spite of ancillary evidence from the commercial fishery and research vessel surveys indicating a pronounced increase in abundance in recent years. It is unclear whether this inconsistency is related to computational methods or to local population differences.

**Research Vessel Survey Data:** Survey efforts for this stock were substantially expanded in 1983 by implementation of a stratified random survey directed specifically towards northern shrimp. Survey results for 1983-1985 indicate a continued increase in abundance and biomass associated with recruitment and growth of the 1982 year class. Data suggests that this year class is the strongest to appear since the early 1970's. Total mortality rates derived from stratified mean catch per tow at length data and comparisons of recent harvest levels with minimum biomass estimates developed from swept area calculations, suggest that exploitation rates have been relatively low in recent years. Indices of abundance and biomass based on information collected in 1986 were comparable to 1985 values; subsequent year classes, 1983 and 1984, certainly appear weaker (Table 2) and a marked decrease in these values is expected in 1987. It is likely that the continued increase in commercial landings in 1987 is primarily due to increased effort in the fishery.

Members of the 1982 year class dominated commercial landings during 1985 and 1986 and were well represented in 1987 landings. The weakness observed in subsequent year class strength combined with decreases in the growth rate and increases in the natural mortality rate associated with the 1982 year class, are the most likely factors attributable to the static index values observed in 1986. Given these circumstances, prospects for the 1988 and 1989 fishing seasons appear to be more problematical and regulatory adjustments for the next fishing season may be necessary.

### III. STATUS OF RESEARCH AND MONITORING

Biologists from the participating states and the NMFS, collectively comprising the Northern Shrimp Technical Committee, continue to cooperate in conducting annual stock assessment work. The Committee enhanced its predictive and monitoring capabilities in 1983 with the development of a stratified random survey designed specifically for northern shrimp. The survey has been conducted in July and August each year since, aboard the Northeast Fisheries Center's (NEFC) research vessel, GLORIA MICHELLE, with the assistance of the NEFC Fisheries Engineering Group. Data obtained from this survey is now recognized as being the most reliable for northern shrimp stock assessment work.

Maine Department of Marine Resource (MDMR) researchers have undertaken studies of shrimp larval development, including, metabolic requirement, growth rates, and chemical composition. Currently, researchers are trying to correlate their findings with field data on food availability and temperature fluctuations in the Gulf of Maine. Much work has also been done in recent years on the development of a separator trawl by the MDMR Fisheries Technology Service. This type of trawl has shown promise on a trial basis and on initial demonstrations to the industry; however, further evaluation is necessary.

The Massachusetts Institute of Technology (MIT) Sea Grant Program has also had an on-going study to examine the efficiency and selectivity on various types of trawl design. University of New Hampshire researchers are examining commercial trawl discards in both the shrimp and groundfish fisheries to determine what factors contribute to the discard rate.

The NEFC is engaged in several research projects involving the Gulf of Maine northern shrimp population. By-catch analysis is underway and progress has been made in development of commercial and survey abundance indices. Estimates of population parameters including growth, mortality and population age structure, estimation of population size and time series modeling to evaluate the relative impacts of environmental factors, and exploitation on historical trends in abundance, are also being examined.

The Northern Shrimp Technical Committee, in the current plan, has outlined several topics which require further research in such areas as socioeconomics, community dynamics, and gear selectivity.

### IV. STATUS OF MANAGEMENT MEASURES

The current plan endorses the Statement of Policy developed and adopted by the Northern Shrimp Section in 1981 and amended in October 1986. The Policy includes the following measures considered appropriate for regulating the harvest of northern shrimp in the Gulf of Maine:

1. Gear limitations - A minimum uniform mesh size will be incorporated as an integral part of the plan and will be consistent with the stated recommendations of the Northern Shrimp Gear Evaluation Study (1974).
2. Seasonal limitations - An open season, not to exceed 183 days, will be set on an annual basis. The fishery shall not begin sooner than December 1, nor end later than May 31, for any one year. The Section shall determine the exact length of the season after considering recommendations from the Technical

Committee and other information provided by industry or the general public; Committee recommendations are designed to achieve the plan's stated objectives and are relative to the condition of the stock at that point in time.

3. Possession limitations - The count per pound for all shrimp landed and subsequently possessed by all fishermen and dealers/processors, shall be consistent with the selectivity of the minimum uniform mesh size specified by the stated gear limitations.
4. Information collection provisions - There shall be a method of determining participants in the fishery, e.g., licensing of vessels. All primary dealer/processors shall report periodically their transactions involving northern shrimp. The information reported shall be that which is determined necessary, by the Section, to manage the fishery.
5. Dockside and sea-sampling of the commercial shrimp catch shall be conducted.
6. The Section will periodically re-examine the allowed mesh size and the possible by-catch of northern shrimp in other directed fisheries as management programs for other small mesh net fisheries are developed and implemented.

#### V. RECOMMENDATIONS

This review finds no need to further update the 1986 version of the northern shrimp plan. It is recommended that the stated research needs be addressed in a timely fashion and that all current research and monitoring activities be maintained; giving priority consideration to the northern shrimp summer research survey.

The plan stresses that management must continue to acknowledge fisheries interactions that may impact on the northern shrimp stock and, perhaps more importantly, the impact of northern shrimp fishery may have on local finfish stocks. The distribution of northern shrimp in the western Gulf of Maine and the seasonal nature of the fishery, make it imperative that northern shrimp management be viewed in the context of overall management of the Gulf of Maine resource.

Table 1. Commercial landings (metric tons) of northern shrimp in the western Gulf of Maine, 1958-1987.

| Year | Maine           | NH            | Mass            | Total           |
|------|-----------------|---------------|-----------------|-----------------|
| 1958 | 2.3             | 0             | 0               | 2.3             |
| 1959 | 5.4             | 0             | 2.3             | 7.7             |
| 1960 | 40.4            | 0             | 0.5             | 40.9            |
| 1961 | 30.4            | 0             | 0.5             | 30.9            |
| 1962 | 159.7           | 0             | 16.3            | 176             |
| 1963 | 244             | 0             | 10.4            | 254.4           |
| 1964 | 419.4           | 0             | 3.1             | 422.5           |
| 1965 | 947             | 0             | 8               | 955             |
| 1966 | 1737.8          | 18.1          | 10.5            | 1766.4          |
| 1967 | 3141.1          | 20            | 10              | 3171.1          |
| 1968 | 6515            | 43.1          | 51.9            | 6610            |
| 1969 | 10992.9         | 58.1          | 1772.9          | 12823.          |
| 1970 | 7712.8          | 54.4          | 2902.1          | 10669.          |
| 1971 | 8354.7          | 50.8          | 2723.8          | 11129.          |
| 1972 | 7515.6          | 74.8          | 3504.5          | 11094.          |
| 1973 | 5476.7          | 59.9          | 3868.2          | 9404.8          |
| 1974 | 4430.7          | 36.7          | 3477.3          | 7944.7          |
| 1975 | 3177            | 29.5          | 2080.2          | 5286.7          |
| 1976 | 617.2           | 7.3           | 397.8           | 1022.3          |
| 1977 | 148             | 2.3           | 236.9           | 387.2           |
| 1978 | 0               | 0             | 0               | 0               |
| 1979 | 32.9            | 2.3           | 451.3           | 486.5           |
| 1980 | 69.5            | 5.4           | 256.9           | 331.8           |
| 1981 | 528.6           | 4.5           | 538.1           | 1071.2          |
| 1982 | 883.2 (853.3)   | 32.8 (22.3)   | 658.5 (655.3)   | 1574.5 (1530.3) |
| 1983 | 1022 (892.5)    | 36.5 (46.2)   | 508 (460.1)     | 1566.5 (1398.8) |
| 1984 | 2564.7 (2394.9) | 96.8 (30.7)   | 565.3 (525.1)   | 3226.8 (2950.7) |
| 1985 | 2956.9 (2946.3) | 207.4 (216.2) | 1030.6 (967.2)  | 4194.9 (4129.7) |
| 1986 | 3407.3 (3268.2) | 191.1 (231.5) | 1085.6 (1136.2) | 4684.0 (4635.9) |
| 1987 | (3615.2)        | (157.4)       | (1475.3)        | (5247.9)        |

Numbers in parenthesis are computed on a seasonal basis, e.g.  
1983 includes December 1982 but does not include December 1983.

Preliminary.

Figure 1. Northern Shrimp Landings  
Gulf of Maine

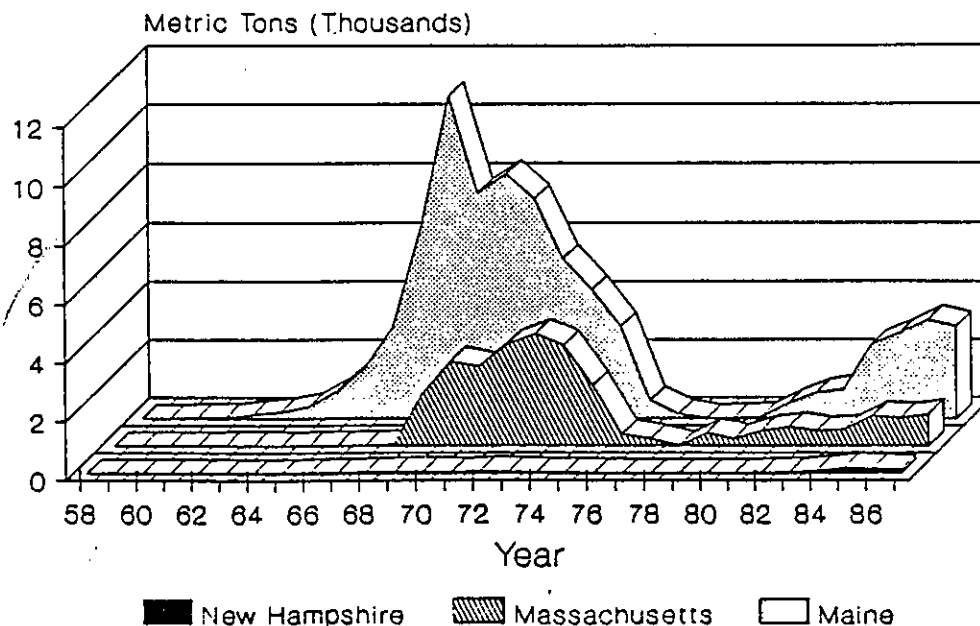


Table 2. Research vessel survey abundance indices for Gulf of Maine northern shrimp, 1968-1986.

| Year | Mean Catch/Tow (kg)<br>Maine Summer Survey <sup>1</sup> | Stratified Mean Catch/Tow (kg)                |              |                                |                    |
|------|---------------------------------------------------------|-----------------------------------------------|--------------|--------------------------------|--------------------|
|      |                                                         | Gloria Michelle<br>Summer Survey <sup>2</sup> |              | NEFC Bottom Trawl <sup>3</sup> |                    |
|      |                                                         | No's.<br>(000's)                              | Wt.<br>(kg.) | Spring                         | Summer      Autumn |
| 1968 | 45.8                                                    |                                               |              | 10.57                          | 3.16               |
| 1969 | 31.2                                                    |                                               |              | 4.46                           | 2.69               |
| 1970 | 40.8                                                    |                                               |              | 2.09                           | 3.66               |
| 1971 | 9.4                                                     |                                               |              | 1.86                           | 2.95               |
| 1972 | 7.0                                                     |                                               |              | 1.44                           | 3.33               |
| 1973 | 7.8                                                     |                                               |              | 1.31                           | 1.89               |
| 1974 | 4.9                                                     |                                               |              | 2.18                           | 0.75               |
| 1975 | 6.7                                                     |                                               |              | 5.40                           | 0.93               |
| 1976 | 4.8                                                     |                                               |              | 0.67                           | 0.58               |
| 1977 | 1.6                                                     |                                               |              | 0.90                           | 0.30      0.15     |
| 1978 | 3.2                                                     |                                               |              | 0.27                           | 0.38      0.41     |
| 1979 | 4.4                                                     |                                               |              | 1.00                           | 0.70      0.51     |
| 1980 | 2.7                                                     |                                               |              | 0.82                           | 0.68      0.53     |
| 1981 | 3.0                                                     |                                               |              | 2.61                           | 1.48               |
| 1982 | 2.0                                                     |                                               |              | 1.10                           | 0.30               |
| 1983 | 4.2                                                     |                                               |              | 1.28                           | 1.02               |
| 1984 |                                                         | 3.00                                          | 22.6         | 1.86                           | 1.89               |
| 1985 |                                                         | 3.53                                          | 29.4         | 0.52                           | 1.60               |
| 1986 |                                                         | 3.36                                          | 30.1         | 0.71                           |                    |

<sup>1</sup>Mean catch per 30 minute tow (daytime)

<sup>2</sup>Stratified mean catch per 15 minute tow (daytime)

<sup>3</sup>Stratified mean catch per 30 minute tow (day/night tows)

## REFERENCES

- Atlantic States Marine Fisheries Commission.  
1986. Fishery management plan for northern shrimp: FMP report No. 9, October 1986. 77 p.
- Blott, A. J., P. J. Diodati, S. H. Clark, D. B. Sampson, and D. F. Shick  
1983. Development of a new research trawl for northern shrimp, Pandalus borealis, in the western Gulf of Maine. ICES C. M. 1983/B;21, 6 p.
- National Marine Fisheries Service  
1986. Report of third NEFC stock assessment workshop (Third SAW). Woods Hole Lab. Ref. Doc. No. 86-14. October 1986. Woods Hole, MA. 98 p.
- Northern Shrimp Scientific Committee  
1974. Final Report: Northern shrimp gear evaluation study. Grant-in-Aid award 04-3043-59, June 1, 1973 - May 31, 1974. 35 p.
- Northern Shrimp Technical Committee  
MS 1986. Gulf of Maine northern shrimp stock status -- 1986. Unpublished report. Salem, Massachusetts. 12 p.
- MS 1986. Cruise results Gulf of Maine northern shrimp survey -- 1986. Unpublished report. Woods Hole, Massachusetts. 26 p.

REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION'S  
FISHERY MANAGEMENT PLAN FOR THE RED DRUM

Prepared by:

Charles M. Frisbie, MD  
Linda Mercer, NC  
Michael D. Murphy, FL  
James E. Weaver, USFWS



## SUMMARY

### 1985 RED DRUM FISHERY MANAGEMENT PLAN REVIEW

The goal of the plan is "to perpetuate the red drum resource in fishable abundance throughout its range and generate the greatest possible economic and social benefits from its harvest and utilization over time". Increased market demand for "blackened redfish" in restaurants and continued fluctuations in landings, particularly in the northern part of the species' range, calls for continued promotion of the red drum plan's goal and objectives.

Knowledge of stock status is fragmentary but preliminary analyses of mortality and yield per recruit have been made in Florida. Recreational catches of adult red drum have declined substantially in the last decade in Maryland and Virginia.

Life history and migration studies are underway from North Carolina through Florida. Specific programs to expand knowledge of red drum in Maryland and Virginia are lacking. Recreational statistics collection projects need more attention in some states.

Most states have complied with the FMP's recommended minimum size and possession limits. South Carolina has declared the red drum a gamefish and prohibited their taking by most commercial gear. Florida has an 18" minimum size on the east coast, a 3 month open season, and daily angler and commercial limits of 1 and 5 fish, respectively.

#### Recommendations:

1. Current size and possession limits should be continued as a minimum. However, achieving maximum yield per recruit while maintaining adequate spawning stock will require a minimum size limit over 14" combined with reduced fishing mortality.
2. States are encouraged to beef up research efforts, especially monitoring of adult spawning stock, determining offshore migrations and fishing mortality rates.
3. More emphasis should be given to improve catch and effort data, particularly in states having substantial populations.
4. Red drum project leaders should meet annually to coordinate efforts and standardize sampling methodology.
5. The plan's recommended management measures should be extended north to DE, PA, NJ and NY.

## FISHERY MANAGEMENT PLAN REVIEW - RED DRUM

### I. STATUS OF THE FISHERY MANAGEMENT PLAN

The goal of the management plan is to perpetuate the red drum resource in fishable abundance throughout its range and generate the greatest possible economic and social benefits from its harvest and utilization over time. Six management objectives adopted to achieve the stated goal are:

1. Attain over time optimum yield.
2. Maintain a spawning stock sufficient to minimize the possibility of recruitment failure.
3. Promote the cooperative interstate collection of economic, social, and biological data required to effectively monitor and assess management efforts relative to the overall goal.
4. Promote cooperative interstate research that improves understanding of the biology and fisheries of red drum.
5. Promote harmonious use of the resource among various components of the fishery through the coordination of management efforts among the various political entities having jurisdiction over the red drum resource.
6. Promote determination and adoption of the highest possible standards of environmental quality and habitat protection necessary for the natural production of red drum.

The goal and objectives continue to be sound and necessary to address the need of coastal stocks of red drum. Emphasis on and modification of certain specific management measures, however, are suggested and are discussed under the recommendations section.

Since the adoption of the red drum plan in 1984, there has been a greatly increased market demand for adult red drum because of the "blackened redfish" promotion by restaurants. Because of this increased demand and the fluctuating nature of red drum landings, it is necessary to continue to promote the goal and objectives of the plan.

### II. STATUS OF THE STOCK

There are presently no YOY indices for red drum along the Atlantic Coast. Only Florida has developed mortality estimates. Mortality rates have been estimated for red drum populations in the Mosquito Lagoon/Indian River area of Florida. A mean estimate of instantaneous total mortality rate for ages II-VI was 1.1 with 95 percent confidence intervals ranging from 0.6 to 1.5 (Footnote 3 of plan). CPUE indices are being developed from a commercial marine fisheries trip ticket system recently instituted in Florida.

Preliminary yield per recruit analyses for red drum in the Mosquito Lagoon/Indian River, Florida, showed that maximum yield occurred when fish enter the fishery at between 27 and 32"FL or when fishing mortality was significantly

reduced from the current (1981-83) 60 percent year-1 to about 30 percent year-1 (Footnote 1 in plan). However, natural mortality rates, subadult emigration from the study area to offshore adult stocks, and the accuracy of age determination methods are not well understood and could profoundly affect these results.

Although limited, recreational catch information indicates a continued decline in abundance of adult red drum in both Maryland and Virginia. Catches of citation sized fish (over 40 lbs) have declined sharply in number since the mid 70's in both states. Spring and Fall runs of fish along the coast have apparently diminished with only minor pulses of 3 to 8 pound fish occurring. Updated recreational statistics are given in Appendix 1. Coastwide commercial landings over the last three years have been highly variable and are given in Appendix 2.

### III. STATUS OF RESEARCH AND MONITORING

As part of the Chesapeake Bay Stock Assessment program, the Maryland Tidewater Administration and the Virginia Institute of Marine Sciences are implementing a comprehensive Chesapeake bay trawl study. This study, building on more limited juvenile sampling programs in both states, should determine whether or not any appreciable recruitment of red drum occurs in Maryland and Virginia waters. No specific programs are currently being planned to expand knowledge of the species in either Maryland or Virginia.

The North Carolina Division of Marine Fisheries initiated a migration study of red drum in 1986 and expanded it to include life history and population dynamics in 1987. Objectives of this study, based on recommendations in the FMP, are to determine migration patterns and utilization of tagged red drum by the various fisheries, locate red drum nursery areas and develop a juvenile index of abundance, develop and validate an ageing technique, determine age at maturity, spawning period and fecundity, estimate mortality, and conduct yield modeling.

The South Carolina Wildlife and Marine Resources Department is conducting a tagging and life history study of red drum. A graduate student is studying early life history, including recruitment and abundance of juveniles from spawning until they emigrate from nursery areas, food habits, growth, daily growth, and age validation. In addition, red drum are being tagged and released for migration study, and life history work is being conducted, including length, weight, sex, age and growth, and food habits of juveniles and adults. The Waddell Mariculture Center is spawning red drum, conducting grow-out studies and has tagged and released a limited number of fish.

Georgia Department of Natural Resources has performed fishery-independent monitoring of finfish abundance in Northern, Central, and Southern sectors of coastal waters since 1984. Red drum captured during this program have been used for tag/recapture studies, age and growth analyses, ultrasonic tagging experiments, and an internal anchor tag retention study.

Validity of red drum ages determined by thin-sectioned otoliths, tag/recapture studies to evaluate subadult emigration rates, fecundity estimation, and evaluation of stocking for population enhancement are currently under study by Florida Department of Natural Resources. Fishery-independent monitoring of juvenile abundance will begin in the Spring of 1988 in Tampa Bay and monitoring of adult Gulf Coast populations will begin in the Fall of 1987. The U.S. Fish and Wildlife Service is studying movement and abundance of finfish in the Merritt

Island Wildlife Refuge on Florida's Atlantic coast.

Commercial landings data are routinely collected on a monthly basis by all Atlantic coastal states. Recreational catch statistics are collected under the NMF Marine Recreational Fishery Statistics Survey. Additionally, Virginia, North Carolina, and South Carolina have taken over, plan to take over, or have augmented the intercept portion of the survey, increasing the number of intercepts using Wallop-Breaux funds.

#### IV. STATUS OF MANAGEMENT MEASURES

Most Atlantic coastal states have complied with the plan's recommendations of a 14" TL minimum size limit and a daily possession limit of not more than two fish over 32" TL.

Effective September 1, 1987, in North Carolina red drum management came under the authority of the Director of the Division of Marine Fisheries who can implement controls by proclamation on seasons, sizes, quantities taken, and fishing areas.

South Carolina has adopted the recommended 14" TL minimum size but only during June 1 to September 1 of each year. However, they have imposed a daily bag limit of 20 fish with only 1 fish greater than 32" TL permitted and have declared the red drum a gamefish which may only be caught by rod and reel and by gigging except during January and February. In addition, the use of trammel, pound, fyke, stop nets, purse seines, and gill nets (except gill nets <100' with a minimum mesh size of 3" stretched mesh used in the Atlantic Ocean or designated areas of bays and sounds) are prohibited in state waters.

In mid-September 1985, the Florida red drum minimum size limit was increased from 12" FL to 18" TL except on the Gulf coast west of Steinhatchee, Florida where it was increased to 16" TL. The fishery there was closed except for a short 3-week opening in February 1987. Regulations have been adopted providing for a special opening of the fishery during October 1 to December 31, 1987, with an 18" TL minimum size limit, 27" TL maximum size limit, recreational bag limit of 1 fish per angler, and commercial bag limit of 5 fish per person. Use of treble hooks while fishing with natural baits is prohibited, red drum must be landed whole, and snatch hooking is prohibited. Red drum are designated a "restricted species" for this period, requiring commercial fisherman harvesting red drum above the recreational bag limit to have a special endorsement on their saltwater products license. At the end of this special season, all harvest of red drum will again be prohibited.

Although not a specific recommendation of the plan, the Chesapeake Bay Restoration Program includes numerous initiatives which should, over time, improve water quality and protect the shallow, nearshore habitat favored as nursery/feeding areas for red drum.

The South Atlantic Fishery Management Council is in the initial states of developing a FMP for red drum.

## V. RECOMMENDATIONS

1. The current size limit and possession limits on red drum should be continued as a minimum. The specific management measure in the FMP calling for a 14" TL minimum size limit may not be enough to meet plan objective 11.1 (2) if fishing mortality is even moderately high. However, to evaluate this a spawner-recruit relation would need to be developed along with data on YOY and adult abundance. The size at 50 percent maturity is 874 MM TL (age IV or V for females along the Florida Atlantic coast; therefore, fish protected only until 14" TL (age I) would still be vulnerable to the fishery for 3 or 4 years before they reached sexual maturity. To achieve the maximum yield per recruit while maintaining adequate spawning stock, some combination of a minimum size limit over 14" TL and reduced fishing mortality would be needed.
2. The states are encouraged to undertake, continue or accelerate the research listed in Section 11.2 (6a - 6g) of the plan. An additional effort should be initiated to access and monitor adult spawning stock(s) in offshore waters and develop detailed tag-recapture programs to estimate age-specific emigration rates offshore and fishing mortality rates in all areas.
3. Increased emphasis should be given to improving catch and effort data from the commercial and recreational fisheries (Section 11.2-4 of the plan), particularly in the states having substantial populations.
4. Project leaders of red drum studies should meet annually to discuss results and coordination as well as standardization of collection techniques.
5. The plan's recommended management measures should be extended north to DE, PA, NJ and NY.

Appendix 1.

Table 7-3. Estimated Number and Weight of Red Drum Caught by Marine Recreational Fishermen by State, 1979 - 1986.

| State               | 1979 |         | 1980 |         | 1981 |         | 1982 |         | 1983 |         | 1984 |         | 1985 |         | 1986 |         |
|---------------------|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|
|                     | No.  | Wgt(Kg) | No.  | Wgt(kg) | No.  | Wgt(kg) | No.  | Wgt(kg) | No.  | Wgt(kg) | No.  | Wgt(kg) | No.  | Wgt(kg) | No.  | Wgt(kg) |
| -----THOUSANDS----- |      |         |      |         |      |         |      |         |      |         |      |         |      |         |      |         |
| New Jersey          | -    | -       | -    | -       | *    | *       | -    | -       | +    | +       | +    | +       | +    | +       | +    | +       |
| Maryland            | -    | -       | -    | -       | *    | *       | -    | -       | +    | +       | +    | +       | +    | +       | +    | +       |
| Virginia            | -    | -       | -    | -       | 90   | 216     | 51   | +       | +    | +       | +    | +       | +    | +       | +    | +       |
| North Carolina      | 28   | 30      | 56   | 74      | *    | *       | 18   | 14      | +    | +       | +    | +       | +    | +       | +    | +       |
| South Carolina      | 66   | 71      | 207  | 269     | 47   | 33      | 128  | 102     | +    | +       | +    | +       | +    | +       | +    | +       |
| Georgia             | 62   | 67      | 30   | 39      | *    | *       | 32   | 26      | 54   | 46      | 220  | 207     | 273  | 220     | 134  | 157     |
| Florida, E. Coast   | 720  | 774     | 124  | 165     | 91   | 64      | 338  | 270     | 429  | 367     | 671  | 631     | 541  | 436     | 211  | 248     |
| TOTAL               | 876  | 942     | 419  | 545     | 258  | 337     | 567  | +       |      |         |      |         |      |         |      |         |

\* 30,000

none reported

+ Not estimated

Appendix 2. Red Drum Commercial Landings Update (kg)

|      | MD | VA    | NC      | SC    | GA | FL East  | FL West |
|------|----|-------|---------|-------|----|----------|---------|
| 1984 | -- | 1,074 | 128,375 | 1,791 | *  | 59,369   | 388,931 |
| 1985 | -- | 530   | 69,253  | 1,723 | *  | 40,338** | 244,303 |
| 1986 | -- | 2,400 | 112,979 | 3,569 | *  |          |         |

\*All years less than 1,000 kg.

\*\*Commercial landings data should be interpreted keeping in mind the management actions implemented by the states during 1985-1986.



REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION'S  
INTERSTATE FISHERY MANAGEMENT PLAN  
FOR SHAD AND RIVER HERRING

Prepared By:

Lewis Flagg, ME  
Harrel Johnson, NC  
Victor Crecco, CT  
Richard St. Pierre  
Harry Mears, NMFS



## SUMMARY

### 1985 SHAD & RIVER HERRING FISHERY MANAGEMENT PLAN REVIEW

The goal of the plan is to promote, in a coordinated coastwide manner, the protection and enhancement (including restoration) of shad and river herring stocks occurring on the Atlantic seaboard. The plan's objectives focus on the need to control harvest, improve habitat accessibility and quality, restore and enhance extant and depleted alosid stocks respectively, and recommend/support research programs to provide data for management purposes. A number of individual states' studies are ongoing to acquire those data necessary to achieve plan objectives. A major contribution of this plan is that the Board and S&S Committee serve as a focal point to address problems of common interest, such as the impact of the mackerel foreign fishery allocation on alosid stocks of the Mid-Atlantic states. Additionally, the plan provides a vehicle for coordination of research and management of alosid stocks, particularly as it relates to coastal intercept fisheries. The plan is adequate and relevant to the current problems and needs of alosid populations and fisheries.

#### Recommendations:

1. Investigate the feasibility of expanding cooperative river basin studies and programs in the southeast to address habitat and resource needs of southeastern alosid stocks.
2. Continue program coordination through annual meetings of the Board and S&S Committees.
3. Provide funding support to expand the coastal shad tagging programs in North and South Carolina to determine origin of stocks in these fisheries.
4. Sponsor and support a stock assessment workshop on shad and river herring.
5. Carry out a state-by-state review of water quality standards and provide a current status report on habitat and water quality.
6. Add to research needs the following item: studies to determine the age at first maturity for American shad.
7. Determine the existence and extent of intercept fisheries for shad and river herring in the lower Chesapeake Bay.
8. Encourage studies of life history of hickory shad by individual states, universities, or private research groups.
9. Increase effort to collect recreational catch data on American shad, hickory shad, and river herring.
10. Initiate studies concerning the impacts of anadromous alosid programs on water quality and resident inland species.

## FISHERY MANAGEMENT PLAN REVIEW - SHAD AND RIVER HERRING

### I. STATUS OF THE FISHERY MANAGEMENT PLAN

The goal of the FMP is to promote, in a coordinated coast-wide manner, the protection and enhancement (including restoration) of shad and river herring stocks occurring on the Atlantic seaboard. The four (4) management objectives of the plan are as follows:

1. Regulate exploitation to achieve fishing mortality rates sufficiently low to ensure survival and enhancement of depressed stocks and the continued well-being of those stocks exhibiting no perceived decline. A corollary to this objective is minimization of exploitation of a given state's stocks by other states or nations.
2. Improve habitat accessibility and quality in a manner consistent with appropriate management actions for non-anadromous fisheries.
3. Initiate programs to introduce alosid stocks into waters which historically supported, but do not presently support, natural spawning migrations; expand existing stock restoration programs; and initiate new programs to enhance depressed stocks.
4. Recommend and support research programs which will produce data needed for the development of scientifically rigorous management recommendations relating to sustainable and acceptable yields, the preservation of acceptable stock levels, and optimal utilization of those stocks.

The plan objectives are sound, achievable, and relevant to the current problems and needs of the alosid populations addressed within the FMP. The plan is necessary and essential to assure coast-wide coordination of research and management of these species. The inclusion of four (4) species (American shad, hickory shad, alewife, blueback herring) in a single plan has tended to focus attention on the more economically important species, such as American shad, at the expense of the other species, in particular, hickory shad.

### II. STATUS OF THE STOCKS

#### American Shad

New England (Maine through Connecticut): In recent years, there has been no substantial directed ocean fishery, although from 1980 to the present the individual state ocean landings have ranged from 23,000 to 68,000 pounds annually. Stocks are currently down in the Connecticut (CT) and Pawcatuck (RI) Rivers while the Merrimack River run is expanding.

Mid-Atlantic (New York through Virginia): Since 1980, ocean fisheries for shad have shown stable or moderate to sharp increases in landings. Sharp increases in landings were most notable in New York (Eastern Long Island) and Virginia (Rudee Inlet area). The Hudson and Delaware Rivers in 1986 showed the best YOY indices ever recorded. While Maryland's stocks still remain at historic lows, the Upper Chesapeake Bay and Susquehanna River showed an increased run of 27,000 adult fish, up from 11,000 fish the previous year. Virginia stocks are reported to be relatively stable in recent years.

Southeast Atlantic (North Carolina through Florida): The 1986 South Carolina ocean fishery contributed 48 percent of state-wide landings and the North Carolina ocean fishery for shad around Cape Fear has increased substantially.

### **River Herring**

New England: Since 1976, Maine has been the major contributor to New England river herring landings. Landings throughout the region have shown a major downward trend since the early 1970's and in the past four (4) years, Maine landings have declined dramatically in those rivers which traditionally contributed the majority of the catch.

Mid-Atlantic: Landings have declined dramatically since the mid-1960's, and have remained very low in recent years, particularly in Maryland and Virginia which were traditionally the major producers in the mid-Atlantic area.

Southeast Atlantic: Landings reached a low in the early 1980's and have begun to recover since that time. North Carolina is the major contributor to landings in the southeast region.

### **III. STATUS OF RESEARCH AND MONITORING**

Maine, Rhode Island, New York, Delaware, Pennsylvania, Maryland, South Carolina and Georgia have implemented or expanded research and monitoring measures since development of the plan. Those states which have ongoing projects involving American shad and river herring are achieving the plan's objectives and developing baseline data through YOY indices and determination of exploitation rates. The Committee is working to establish information on exploitation rates of American shad in 11 different river systems. However, some states with stable or increasing stocks have not seen a need to dedicate funding and manpower for data gathering purposes.

Except for North Carolina, there is a clear lack of activity in gathering information on hickory shad throughout the entire range of this species. Little data is available -- outside North Carolina -- on the basic life history of the species and little effort is expended on gathering recreational/commercial landings data.

### **IV. STATUS OF MANAGEMENT MEASURES**

Objective No. 1 -- There has been slow implementation of this objective with respect to coastal intercept fisheries because of lack of knowledge of the origin of these stocks. Recent tag/recapture studies undertaken by South Carolina indicate that a high proportion of coastal catches may be originating from South Carolina rivers or rivers to the south of South Carolina. An emerging ocean fishery in the Cape Fear area may be exploiting more northerly shad stocks. North Carolina intends to initiate an ocean tagging program in this area to attempt to determine sources of stock in this fishery. However, the timely ASMFC involvement in the Mid-Atlantic Council plans for allocation of mackerel to foreign fisheries has averted a serious potential problem for recovery of Chesapeake Bay alosid stocks.

Objective No. 2 -- Improvement in habitat quality (water quality and establishment of instream minimum flows), fish protection devices (downstream migrant facilities and screens to prevent impingement/entrainment mortalities), and improvement in habitat accessibility (upstream fish passages), has been particularly successful in New England and is gaining momentum in the middle Atlantic states. However, Chesapeake Bay stocks have not yet demonstrated any signs of significant recovery from the precipitous declines of the early 1980's.

Objective No. 3 -- Efforts to restore alosid stocks to historical spawning areas, and to rehabilitate depressed stocks are showing progress in New England and selected areas of the mid-Atlantic (e.g., Delaware River, James River, and Potomac River).

Objective No. 4 -- Support for research to produce essential management/restoration data is being undertaken by a number of states, especially with respect to American shad and, to a lesser degree, with river herring. Little or no effort is currently being expended on hickory shad.

## **V. RECOMMENDATIONS**

1. Investigate the feasibility of expanding cooperative river basin studies and programs (similar to the northeast and mid-Atlantic programs) in the southeast to address habitat and resource needs of southeastern alosid stocks.
2. Continue program coordination through annual meetings of the Board and S&S Committees.
3. Provide funding support to expand the coastal shad tagging programs in North and South Carolina to determine origin of stocks in these fisheries.
4. Sponsor and support a stock assessment workshop on shad and river herring.
5. Carry out a state-by-state review of water quality standards and provide a current status report on habitat and water quality.
6. Add to research needs the following item: studies to determine the age at first maturity for American shad.
7. Determine the existence and extent of intercept fisheries for Maryland shad and river herring in the lower Chesapeake Bay.
8. Encourage studies of life history of hickory shad by individual states, universities, or private research groups.
9. Increase effort to collect recreational catch data on American shad, hickory shad, and river herring.
10. Initiate studies concerning the impacts of anadromous alosid restoration programs on water quality and resident inland species.

REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION'S  
FISHERY MANAGEMENT PLAN FOR SPOTTED SEATROUT

Prepared by:

David Cupka, SC  
Linda Mercer, NC  
Charlie Wenner, SC



## SUMMARY

### 1984 SPOTTED SEATROUT FISHERY MANAGEMENT PLAN REVIEW

The goal of the plan is "to perpetuate the spotted seatrout resource in fishable abundance throughout its range and generate the greatest possible economic and social benefits from its harvest and utilization over time." The Advisory Committee feels that the goals and objectives of the plan are still valid but full implementation of the FMP has not yet been achieved.

State biologists have expressed the opinion that spotted seatrout stocks are down from the levels observed in the early 1970's. With the recent advent of Wallop-Breaux funds for marine fisheries work, many states have initiated activities to obtain improved data bases on the status of stocks and life history aspects. Information from these activities should be available within the next few years at which time the information can be incorporated into a revised FMP.

All states, except North Carolina, have established the minimum 12 inch total length called for in the FMP. Collection of improved catch and effort data from the commercial and recreational fisheries has been initiated. One state, South Carolina, has declared spotted seatrout a gamefish and imposed a creel limit of 20 fish per angler per day.

#### Recommendations:

1. Efforts should be continued towards achieving full implementation of the FMP.
2. Collection of commercial and recreational landings data should be continued and increased emphasis should be placed on obtaining complimentary effort data.
3. Development and implementation of methodology to obtain pre-recruit indices to monitor stock status should be undertaken.
4. Coordinated research and monitoring activities involving spotted seatrout should be encouraged at the state and regional level.
5. The spotted seatrout FMP should be reviewed periodically and updated to incorporate new data and research findings and to assess the status of stocks and the fisheries. In addition, the appropriateness of the FMP and the specific measures called for in the FMP should be reviewed at regular intervals.

## FISHERY MANAGEMENT PLAN REVIEW - SPOTTED SEATROUT

### I. STATUS OF THE FISHERY MANAGEMENT PLAN

The goal of the FMP is to perpetuate the spotted seatrout resource in fishable abundance throughout its range and generate the greatest possible economic and social benefits from its harvest and utilization over time. The specific management objectives of the plan are:

1. Attain over time optimum yield
2. Maintain a spawning stock sufficient to minimize the possibility of recruitment failure
3. Promote conservation of the stocks in order to reduce interannual variation in availability and increase yield per recruit
4. Promote the collection of economic, social and biological data required to effectively monitor and assess management efforts relative to the overall goal
5. Promote research that improves understanding of the biology and fisheries of spotted seatrout
6. Promote harmonious use of the resource among various components of the fishery through coordination of management efforts among the various political entities having jurisdiction over the spotted seatrout resource
7. Promote determination and adoption of standards of environmental quality and provide habitat protection necessary for the maximum natural production of spotted seatrout

It is felt by the Committee that the goal and the objectives of the plan are still valid and that while progress has been made in regards to meeting the plan objectives, full implementation of the FMP has not been achieved to date.

Stocks of spotted seatrout are felt to have not recovered to the pre-plan levels and several of the specific management measures called for in the plan have not been implemented. In addition, many of the recommended monitoring and research activities called for in the FMP have not been initiated in those states which declared an interest in the spotted seatrout fishery management plan. These deficiencies will be outlined in the appropriate following sections.

### II. STATUS OF THE STOCK

Spotted seatrout commercial landings are presented in Table 1 for the years 1977 through 1986. Table 2 presents the recreational catches of this species for the years 1979 through 1986. Fluctuations in landings have varied considerably during these periods in both the commercial and the recreational fishing sectors. The major commercial producers of spotted seatrout are North Carolina and the east coast of Florida. Commercial landings are considerably less in the other states but the species is very important in the recreational fisheries of these states.

These landings data should be considered to be very gross indicators of stock conditions since the amount of effort expended in making these landings is generally unknown. The amount of recreational fishing effort has increased during those years according to the National Marine Recreational Fisheries Survey but comparable data for the commercial effort are lacking. The one exception to this is that in 1985, Florida began collecting data on the number of commercial trips as a part of their newly initiated trip ticket system.

In several states, biologists have expressed the opinion that stocks are down from those levels observed in the early 1970's. However, the data to support these assessments are lacking.

One of the research activities recommended in the FMP is the development of a pre-recruit index. This type of data would provide insight into the status of the spotted seatrout stocks but very little progress has been made in implementing this activity. Research was initiated in South Carolina last year, utilizing Wallop-Breaux funds, to derive an index of juvenile abundance specifically for this species but the other states which declared an interest in this species are currently not conducting similar specific research. Since spotted seatrout appear to be composed of several stocks throughout its range, pre-recruit indices derived for one geographical area or specific estuarine system are not transferable to other systems.

### III. STATUS OF RESEARCH AND MONITORING

Specific monitoring and research activities recommended in the spotted seatrout fishery management plan include:

1. Stock identification
2. Mortality estimates and yield modeling
3. Habitat requirements
4. Effects of environmental factors on stock size
5. Development of a pre-recruit index
6. Mesh size selectivity
7. Social and economic analyses

No directed research on spotted seatrout is currently being carried out in Maryland. An annual survey of index stations is conducted as part of an ongoing crab survey during which data on juvenile finfish, including spotted seatrout, are taken. Maryland biologists are also initiating a monthly trawl assessment survey in Chesapeake Bay in cooperation with the state of Virginia. This is a general finfish/survey and data on any spotted seatrout taken will be incorporated into the survey data base.

Virginia currently has no directed research on spotted seatrout. A stock identification laboratory has been established in VIMS which could examine the stock structure of spotted seatrout. Their cooperative trawl assessment survey was alluded to earlier.

No new research focused specifically on spotted seatrout has been initiated in North Carolina. An open water estuarine trawl assessment survey in inshore waters has recently been initiated and data on spotted seatrout taken during the survey are entered into the survey data base.

South Carolina is conducting research on this species through a multi-year project being funded with Wallop-Breaux funds. Specific objectives of the project are: (1) to determine the life history (age and growth, reproduction, food habits) of spotted seatrout; (2) to determine movements and rates of utilization through tagging studies; (3) to derive indices of juvenile abundance and attempt to correlate these data with future abundance estimates of adults; and (4) to obtain data on the size and age composition of spotted seatrout landings during recreational fishing tournaments.

Biologists in Georgia are conducting a monthly assessment survey utilizing gill nets. The major emphasis in this effort is directed towards red drum (*Sciaenops ocellatus*) but information on spotted seatrout is also obtained. They are also tagging trout in order to obtain data on growth rates and movements in coastal waters.

Florida began life history studies on spotted seatrout in 1986. They are collecting data on age and growth, reproduction, and mortality estimates from both the commercial and recreational fishing sectors.

#### IV. STATUS OF MANAGEMENT MEASURES

Specific management measures recommended in the fishery management plan include:

1. A minimum size limit of 12 inches total length (TL) with comparable mesh size regulations in directed fisheries;
2. Collection of improved catch and effort data from the commercial and recreational fisheries, including size composition of the catch along with socio-economic data.

Recognition is also made of the fact that additional measures, such as creel limits, catch quotas, area closures and gear restrictions, may be implemented in the future.

Maryland passed legislation this year (effective July 1, 1987) raising the minimum size limit on spotted seatrout from 9 inches total length to 12 inches total length. North Carolina still has no minimum size limit on this species. The other four states currently have a 12 inch minimum length although Georgia's may expire on March 31, 1988, under their sunset law. Efforts are underway to see that this sunset provision is repealed.

All states are collecting fisheries landings data on spotted seatrout as a function of their ongoing commercial fisheries statistics program. Since Maryland passed legislation this year establishing a minimum size limit on spotted seatrout, there is a good possibility that gray seatrout and spotted seatrout landings will be reported separately in the future instead of being lumped into one seatrout category.

Several of the states (including Georgia, North Carolina and South Carolina) are now utilizing part of their Wallop-Breaux funds to supplement the ongoing National Marine Recreational Fishery Survey. The objective is to supplement the existing survey in order to obtain more meaningful catch statistics at the state level on important species taken recreationally. Additionally, socio-economic data are being collected in some instances as a part of the expanded state efforts.

Considerable legislative changes occurred in South Carolina during the past legislative session. Spotted seatrout has been declared a gamefish in South Carolina which means that fish can not be sold commercially and all fish must be taken on hook and line or by gigging (except the latter is prohibited during January and February when they are extremely susceptible to gigging). In addition, a creel limit of 20 spotted seatrout per angler per day was established. Both pieces of legislation resulted from concerns expressed by the recreational fishing community.

## **V. RECOMMENDATIONS**

The Committee makes the following recommendations relative to the spotted seatrout fishery management plan:

1. Efforts should be continued towards achieving full implementation of the FMP.
2. Collection of commercial and recreational landings data should be continued and increased emphasis should be placed on obtaining complimentary effort data.
3. Development and implementation of methodology to obtain pre-recruit indices to monitor stock status should be undertaken.
4. Coordinated research and monitoring activities involving spotted seatrout should be encouraged at the state and regional level.
5. The spotted seatrout FMP should be reviewed periodically and updated to incorporate new data and research findings and to assess the status of the stock and the fisheries. In addition, the appropriateness of the FMP and the specific measures called for in the plan should be reviewed at appropriate intervals.

Table 1. Spotted seatrout commercial landings (in pounds) reported for the period 1977 through 1986 for those states declaring an interest in the ASMFC spotted seatrout fishery management plan. (Source: State Fisheries Landings Bulletins).

|      | MARYLAND        | VIRGINIA | NORTH CAROLINA          |
|------|-----------------|----------|-------------------------|
| 1977 | NA <sup>1</sup> | 3,935    | 323,408                 |
| 1978 | NA              | 6,152    | 97,304                  |
| 1979 | NA              | 3,733    | 105,034                 |
| 1980 | NA              | 7,067    | 171,334                 |
| 1981 | NA              | 4,090    | 113,304                 |
| 1982 | NA              | 3,396    | 83,847                  |
| 1983 | NA              | 4,447    | 165,360                 |
| 1984 | NA              | 3,114    | 152,934                 |
| 1985 | NA              | 8,507    | 109,048                 |
| 1986 | NA              | 18,051   | 191,514                 |
|      | SOUTH CAROLINA  | GEORGIA  | FLORIDA<br>(East Coast) |
| 1977 | 523             | 15,906   | 493,796                 |
| 1978 | 119             | 2,470    | 402,954                 |
| 1979 | 2,977           | 4,987    | 475,809                 |
| 1980 | 8,137           | 4,250    | 558,817                 |
| 1981 | 430             | 629      | 736,026                 |
| 1982 | 1,944           | 4,994    | 728,000                 |
| 1983 | 4,479           | 5,795    | 481,535                 |
| 1984 | 2,374           | 4,348    | 367,541                 |
| 1985 | 1,770           | 7,149    | 316,406 <sup>2</sup>    |
| 1986 | 7,014           | 8,691    | 270,000 <sup>2</sup>    |

<sup>1</sup>NA- Not Available - Lumped into seatrout category, of which more than 99% are grey seatrout (weakfish) landings.

<sup>2</sup>-Preliminary data

Table 2. Spotted seatrout recreational landings (in thousands of fish) reported for the period 1979 through 1986 by regions comprised of those states declaring an interest in the ASMFC spotted seatrout fishery management plan.  
(Source: National Marine Recreational Fishery Survey).

|      | MID-ATLANTIC    | SOUTH ATLANTIC |
|------|-----------------|----------------|
| 1979 | 435             | 3,367          |
| 1980 | NR <sup>1</sup> | 1,978          |
| 1981 | 323             | 980            |
| 1982 | 100             | 1,676          |
| 1983 | 118             | 1,436          |
| 1984 | <30             | 1,295          |
| 1985 | <30             | 2,024          |
| 1986 | 179             | 1,958          |

<sup>1</sup>Denotes none reported.



**REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION'S  
FISHERY MANAGEMENT PLAN.  
FOR  
SUMMER FLOUNDER**

**Prepared By:**

**Richard Sisson, RI  
Tom Hoff, MAFMC  
Jack Musick, VIMS  
Paul Scarlett, NJ**



## SUMMARY

### 1982 SUMMER FLOUNDER FISHERY MANAGEMENT PLAN REVIEW

In 1982 the Atlantic States Marine Fisheries Commission prepared a Fishery Management Plan for summer flounder which provided a comprehensive description of the stocks including habitat, general biological data, a description of fishing activity, the economic characteristics of the fishery, and recommendations for management.

The objectives of the plan are to:

1. Promote optimum yield from the fishery and reduce the probability of recruitment failure.
2. Insure that the management strategies implemented to achieve these objectives are equitable to recreational and commercial components of the fishery.
3. Improve understanding of the factors that interact to control the condition of the stocks.
4. Promote compatible management regulations to achieve the above management objectives.

The plan was reviewed in 1987, and was found to have attainable objectives consistent with those presented in the Mid-Atlantic Fishery Management Council Plan (1987). The plan is still appropriate if we are to accomplish management goals within the plan's jurisdiction since the condition of the stocks is basically the same as when the ASMFC plan was first prepared and many of the research goals have not been attained.

The 1982 plan has been updated to include current landings, catch per unit of effort data, and results of mesh selectivity studies. From the current data, the following recommendations have been formulated.

#### Recommendations:

1. It is imperative that the management recommendations of the 1982 plan be implemented, specifically option 3A which allows U.S. fishermen unrestricted catches of summer flounder, but imposes a 14-inch total length size limit. If warranted, following completion of stock discrimination studies, mesh regulations may be appropriate in a directed summer flounder fishery.
2. Complimentary to recommendation one (1) is the need for regional council agreement on minimum size of fish and mesh which will accomplish this goal.
3. Research needs of the 1982 plan should be accomplished, especially those involving stock identification in Virginia and North Carolina definition of the socio-economic complexities of the fishery, long-term monitoring of juvenile abundance, and analyses of age/length samples and catch/effort data from the commercial and recreational fisheries.
4. The summer flounder plan should be updated once the draft summer flounder management plan prepared by the Mid-Atlantic Fishery Management Council is adopted.

## FISHERY MANAGEMENT PLAN REVIEW - SUMMER FLOUNDER

### I. STATUS OF THE FISHERY MANAGEMENT PLAN

The management objectives of the ASMFC plan are to:

1. Promote optimum yield of the fishery and reduce the probability of recruitment failure by protecting juvenile fish.
2. Insure that management strategies implemented to achieve objective No. 1 above are equitable to the major recreational and commercial components presently engaged in the fishery.
3. Improve understanding of the factors that interact to control the condition of the stocks.
4. Promote compatible management regulations between the territorial seas and the Fishery Conservation Zone.
5. Minimize regulations to achieve the management objectives recognized above.

We have determined that the objectives of both plans address similar issues, that the objectives are attainable, and that both plans are complimentary and necessary to accomplish plan goals in both jurisdictions. Support for our conclusion is based on present knowledge that the condition of the stock is basically the same as when the plan (ASMFC) was drafted, the effort in the recreational and commercial fisheries is still concentrated on a small percentage of the year classes, and because management measures recommended by the plan have not been fully implemented. In addition, conditions in the fishery are not improving and the stocks could benefit from a reduction in  $F$  which is currently felt to be .65 - .70 for the sexes combined (MAFMC, 1987). Landings in the southern portion of the range (Virginia and North Carolina) have decreased over the past several years, probably the results of exceeding the predicted  $F$  max level of .35 (Tables 1, 2, 3 MAFMC, 1987).

### II. STATUS OF THE STOCK

Summer flounder landings for 1979-1986 are summarized in Tables 1, 2, and 3. Data indicate that landings in the northern portion of the range are greater now than they were in 1981, but from New Jersey south, landings have declined, especially in Virginia and North Carolina. In addition, the greatest percentage of the commercial catch continues to be harvested in the zone from 3-200 miles offshore. In the recreational fishery, catch including discards in millions of pounds of summer flounder have, since 1981, comprised as much as 13 percent of the total recreational catch of all species, but from 1979-1986, it represented a mean of 7.5 percent -- second to the catch of bluefish.

The Review Committee, recognizing that one of the objectives of ASMFC Plan was to set the optimum level of fishing at  $F_{0.1}$  (the rate of fishing at which the 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) feels this is still an appropriate, but conservative, level of fishing.

Current best estimates of the instantaneous rate of fishing mortality (F) are on the order of 0.65 to 0.70 for both sexes of summer flounder combined. 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 live span) is estimated to occur at an  $F=0.26$  for females,  $F=0.44$  for males (MAFMC, 1987). Assuming a 1:1 sex ratio in summer flounder for all ages, allows averaging the two F max estimates for a combined estimate of .35. In reality, however, as fish get older, the sex ratio moves away from 1:1. The current instantaneous rate of fishing mortality is nearly double the rate which would produce the maximum yield from a single year class. The Committee feels that establishing an F max may be a better approach than utilizing an optimum level of fishing at  $F_{0.1}$ . Without question, long-term yield from the fishery can be increased by reducing fishing mortality (MAFMC, 1987). It is evident that more than one year class is needed to sustain a fishery, since compressing the age class composition increases the risk of year class failure. The Committee feels the differences in age and length at maturity presented by Morse (1981), Smith and Caiber (1977) for Delaware Bay, and in North Carolina (Gillikin and Holland, 1983) needs resolution.  $L_{50}$  was estimated by Morse (1981) at 9.7" for males and 12.7" for females, while information presented by Gillikin indicates a larger size at maturity.

### Young of the Year Indices

Musick (Pers. comm.) reported that during 1986 and 1987 in Pamlico Sound, there were no small fish available for tagging. He also reported that results of shallow water trawling and seine sampling in Virginia indicate that the recruitment of the 1985 year class into estuaries was good in 1986, but that young-of-the-year data collected from the 1986 spawn does not look promising. Musick (Pers. comm.) indicated that Dr. Brenda Norcross is currently developing a quantitative prediction of year class strength for the many species and oceanographic conditions using the NMFS 20-year index.

### Catch Per Unit of Effort Indices

Bottom trawl surveys conducted by NMFS during the spring are used to provide indicators of abundance for species captured in their experimental gear. Stratified mean catch per tow for both weight and numbers was relatively low during the late 1960's and early 1970's, increased during the mid-1970's, and then declined again during the late 1970's and early 1980's (MAFMC, 1986). 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 1984. the CPUE remains relatively constant from 1977 through 1982, increasing slightly in 1983 and 1984, and then declined to its lowest level since 1982 in 1985 (MAFMC, 1987 -- Table 4). No consistent pattern is discernible in the recreational catch of summer flounder. Prior to 1981, the annual mean catch by recreational anglers was 27.6 million pounds, representing about 6 percent of the substitutable species caught by marine recreational anglers, while from 1982 through 1987, the catch was 37.3 million pounds or 9 percent of the substitutable species caught (MAFMC, 1987 -- Table 3).

In summary, summer flounder are characterized by apparent large fluctuations in year class strength. The 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. In addition, the age composition of the

catch is becoming greatly compressed around very young fish. Because of the reproductive strategy which tends to maximize reproductive potential, the current high levels of fishing do not appear to have adversely impacted the stock (MAFMC, 1987). A stock recruitment relationship has not been detected. Without question, yield per recruit and long-term yield can be increased significantly by increasing the minimum size of fish caught and by reducing fishing mortality. Biological benefits accrued from increasing the mean size of fish could include a reduction in mortality, an increase in yield per recruit and an increase in the long term yield which would provide stability to the fishery, through inclusion of more than one-year class in the catch. Economically, the fishery benefits from larger, more valuable fish in both the commercial and recreational fisheries.

### **III. STATUS OF RESEARCH AND MONITORING**

Several ongoing studies will provide new or continuing data necessary for future management of summer flounder. Gear selectivity and discard mortality studies have been completed in North Carolina, New York, and New Jersey (Gillikin, J.W., 1982, Gillikin, et al 1981, Murawski, 1985). Studies are summarized in Tables 7 and 8. Stock identification via meristics, morphometrics, biochemical research, and tagging is ongoing in Virginia and North Carolina. In addition, Fogarty, et al (1983) reported on stock discrimination work in the middle and south Atlantic bight.

Several studies are now underway in North Carolina and Virginia, and should be continued. Included are morphometric and meristic studies (masters thesis research), a meristic study in Virginia and tagging studies underway in North Carolina and Virginia. Studies of muscle proteins and isozyme data are being conducted at the Virginia Institute of Marine Science. An extensive juvenile data base developed from long-term monitoring similar to that begun in Virginia should be encouraged in North Carolina to provide data on the age composition of the catch, and to provide scales for ageing purposes. Monitoring should include indices of juvenile abundance. Development of catchability coefficients for different gear-types should be developed to allow comparisons of data from different sampling schemes.

### **IV. RECOMMENDATIONS:**

It is the feeling of the plan review sub-committee that the summer flounder plan should be updated once the draft summer flounder management plan prepared by the Mid-Atlantic Fishery Management Council is accepted.

However, prior to a major re-write of the summer flounder plan, the management recommendations of the original plan (1982) should be implemented. Specifically option 3A which allows U.S. fishermen unrestricted catches of summer flounder but imposes a 14-inch total length size limit (and if warranted following completion of stock discrimination studies) and 3C which imposes a mesh regulation in a directed summer flounder fishery, the size of which shall allow undersize summer flounder to escape according to the size limit options listed in the plan (ASMFC). Complimentary to this is the need for regional council agreement on minimum size of fish and mesh which will accomplish the above.

In addition, the research needs of the 1982 plan have not been completed. Specifically, information currently being collected may be important in determining the presence of more than one stock of summer flounder in the Mid-Atlantic Bight during some times of the year. If two or more stocks exist, and

basic biological characteristics are different, uniform management regulations based on one stock may not be appropriate over the entire range of the species.

Every effort should be made to provide encouragement to scientists to accomplish the research goals of the 1982 FMP, especially those involving stock identification in Virginia and North Carolina, definition of the socio-economic complexities of the summer flounder fisheries, and continuation of long-term monitoring of juvenile abundance, and collection and analysis of age/length samples and catch/effort data from the commercial and recreational fisheries.

Socio-economic data are now available (MAFMC, 1987) and should be incorporated into the ASMFC plan. "It is necessary to clearly define the socio-economic complexities of the summer flounder fisheries in order to aid in the refinement of the management recommendation of this plan, and/or select other management tools that may be available in the future (MAFMC, 1987)."

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

| <u>Year</u> | <u>ME</u> | <u>NH</u> | <u>MA</u> | <u>RI</u> | <u>CT</u> | <u>NY</u> | <u>NJ</u> | <u>DE</u> | <u>MD +</u> | <u>VA +</u> | <u>NC +</u> | <u>Total</u> |
|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------|-------------|-------------|--------------|
| 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        |
| 1986        | 0         | 0         | 2844      | 7044      | 206       | 2737      | 4016      | 4         | 346         | 3657        | 8953        | 29807        |

\* = 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.

NOTE: numbers may not total due to rounding.

Source: MAFMC - 1987, USDC.

**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**

| <u>Year</u>    | <u>Distance</u> | <u>ME</u> | <u>NH</u> | <u>MA</u> | <u>RI</u> | <u>CT</u> | <u>NY</u> | <u>NJ</u> | <u>DE</u> | <u>MD</u> | <u>VA</u> | <u>NC*</u> | <u>Total</u> |
|----------------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|--------------|
| 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<br>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**

|         | <u>Summer<br/>Flounder</u> |          | <u>Bluefish</u> |          | <u>Weakfish<br/>and<br/>Seatrout</u> |          | <u>Striped<br/>Bass</u> |          | <u>Scup/<br/>Porgies</u> |          | <u>Sea<br/>Bass/<br/>Groupers</u> |          | <u>Total<br/>Weight of<br/>Recreational<br/>Total</u> |          |
|---------|----------------------------|----------|-----------------|----------|--------------------------------------|----------|-------------------------|----------|--------------------------|----------|-----------------------------------|----------|-------------------------------------------------------|----------|
|         | <u>lbs</u>                 | <u>%</u> | <u>lbs</u>      | <u>%</u> | <u>lbs</u>                           | <u>%</u> | <u>lbs</u>              | <u>%</u> | <u>lbs</u>               | <u>%</u> | <u>lbs</u>                        | <u>%</u> | <u>lbs</u>                                            | <u>%</u> |
| 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      |
| 1986    | 35.5                       | 9        |                 |          |                                      |          |                         |          |                          |          |                                   |          |                                                       |          |
| 1979-86 |                            |          |                 |          |                                      |          |                         |          |                          |          |                                   |          |                                                       |          |
| Mean    | 32.3                       | 7        | 120.8           | 27       | 19.4                                 | 4        | 5.8                     | 1        | 11.0                     | 2        | 14.1                              | 3        | 441.5                                                 | 46       |

\* = less than 0.5%.

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. 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.**

| <u>Year</u> | <u>Commercial CPUE (lbs/trip)</u>   |                                       |                                        |
|-------------|-------------------------------------|---------------------------------------|----------------------------------------|
|             | <u>Class 2</u><br><u>(5-50 GRT)</u> | <u>Class 3</u><br><u>(51-150 GRT)</u> | <u>Class 4</u><br><u>(151-500 GRT)</u> |
| 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 5. 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).**

| <u>Year</u> | <u>Georges Bank</u><br><u>Mean</u> | <u>S. New England</u><br><u>Mean</u> | <u>Mid-Atlantic</u><br><u>Mean</u> | <u>Mean</u> | <u>All</u><br><u>S.D.</u> | <u>C.V.</u> |
|-------------|------------------------------------|--------------------------------------|------------------------------------|-------------|---------------------------|-------------|
| 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 6. 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).**

| <u>Year</u> | <u>Georges Bank</u><br><u>Mean</u> | <u>S. New England</u><br><u>Mean</u> | <u>Mid-Atlantic</u><br><u>Mean</u> | <u>Mean</u> | <u>All</u><br><u>S.D.</u> | <u>C.V.</u> |
|-------------|------------------------------------|--------------------------------------|------------------------------------|-------------|---------------------------|-------------|
| 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 7. Summer Flounder Mesh Selectivity Studies

| Size  | Study       | Month    | ICES Guage Mesh Size Retention |     |     |      |      | Selection<br>Factor | Total<br>Fluke | < 14"  |      | ≥ 14"  |      | Fluke |            |
|-------|-------------|----------|--------------------------------|-----|-----|------|------|---------------------|----------------|--------|------|--------|------|-------|------------|
|       |             |          | Ave                            | Dry | Wet | L50  | SD   |                     |                | 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" | LIS (a)     | May      | 2.3                            | -   | -   | -    | -    | -                   | 1,983          | 1,092  | 55.1 | 891    | 44.9 | 2,110 | 10,989 lbs |
| 2.5"  | LIM (a)     | May      | 2.6                            | -   | -   | -    | -    | -                   | 170            | 29     | 17.1 | 141    | 82.9 | 262   | 6,042 lbs  |
|       | LIM (b)     | May      | 2.5                            | -   | -   | -    | -    | -                   | 1,492          | 482    | 32.3 | 1,010  | 67.7 | 1,992 | 25,301 lbs |
|       | LIS (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 |
|       | LIM (a)     | May      | 5.8                            | -   | -   | 14.7 | 0.24 | 2.52                | 136            | 6      | 4.4  | 130    | 95.6 | 223   | 2,741 lbs  |
|       | LIM (b)     | May      | 5.7                            | -   | -   | 14.9 | 0.10 | 2.62                | 671            | 53     | 7.9  | 618    | 92.1 | 1,125 | 6,045 lbs  |
|       | LIS (a)     | May      | 5.6                            | -   | -   | 12.8 | 0.08 | 2.29                | 1,872          | 760    | 40.6 | 1,112  | 59.4 | 2,255 | 8,823 lbs  |
|       | LIS (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 8. Summer Flounder Retention Level by Mesh Size**

| <u>Retention<br/>Percent</u> | <u>Mesh Size</u> |             |             | <u>Mesh<br/>Selection<br/>Factors*</u> | <u>Adjusted<br/>R<sup>2</sup></u> | <u>Durban-<br/>Watson</u> |
|------------------------------|------------------|-------------|-------------|----------------------------------------|-----------------------------------|---------------------------|
|                              | <u>4.5"</u>      | <u>5.0"</u> | <u>5.5"</u> |                                        |                                   |                           |
| 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                      |

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

## REFERENCES

- Fogarty, M. J., G. Delaney, J. W. Gillikin, J. C. Poole, D. E. Ralph, P. G. Scarlett, R. W. Smith and S. J. Wilk, 1983. Stock discrimination of summer flounder (Paralichtys dentatus) in the middle and south Atlantic bight: Results of a workshop. NOAA. NMFS F/NEC-18. 14 p.
- Gillikin, J. W., B. F. Holland, Jr. and Captain R. O. Guthrie, 1981. Net mesh selectivity in North Carolina's winter trawl fishery. North Carolina Department of Natural Resources and Community Development. SSR No. 37. 65p.
- Gillikin, J. W., 1982. Evaluation of trawl mesh selectivity and summer flounder in North Carolina. North Carolina Department of Natural Resources and Community Development. 10 p.
- Mid-Atlantic Fishery Management Council, 1987. Draft Fishery Management Plan for the Summer Flounder Fishery. 155 p.
- Morse, W. W., 1981. Reproduction of the Summer Flounder, Paralichtys dentatus(L). J. Fish Biol. 19 (1): 189-203.
- Murawski, S. A., 1985. A brief outline of the estimation and importance of fishery discards to assessment calculations. ICES Assessment Methods Working Group. Copenhagen. 5 p.
- Musick, J., 1987. Personal communication. Virginia Institute of Marine Sciences.

**REVIEW OF THE  
ATLANTIC STATES MARINE FISHERIES COMMISSION'S  
FISHERY MANAGEMENT PLAN  
FOR  
WEAKFISH**

**Prepared By:**

**Paul Perra, ASMFC  
Alice Weber, NY  
Rich Seagraves, DE  
Herb Austin, VA  
Jess Hawkins, NC  
John Merriner, NMFS**



## SUMMARY

### 1984 WEAKFISH FISHERY MANAGEMENT PLAN

The goal of the plan is to perpetuate the weakfish resource in fishable abundance throughout its range and generate the greatest economic and social benefits from its commercial and recreational harvest and utilization over time. The major provisions of the plan recommended that the states in northern areas (RI to VA) delay entry of weakfish into fisheries at least to age one, and that the use of Trawl Efficiency Devices (TEDs) be promoted in southern shrimp fisheries. The plan also calls for cooperative interstate research to understand the coastal fisheries and biology of weakfish.

The Advisory Committee feels that the goal of the plan and its management objectives continue to be valid but, since full implementation of the plan is lacking, its present effectiveness in improving coastal stock status is minimal.

Total coastwide landings of weakfish have been relatively stable for the past ten years. However NMFS has recorded a recent drop in juvenile abundance and qualitative reports from individual states have noted a decline in some northern sportfisheries. Additionally, increases in yields should result if the states fully implemented the FMP.

A number of states are conducting individual studies on weakfish. However, as of yet, no coordinated coastwide study to understand the overall biology and movements of the species is underway.

Some states in the northeast have instituted the FMP's recommended size limits. However, Rhode Island and Virginia have not yet put in effect any size limits on weakfish, and Connecticut and New Jersey have size limits only on commercially caught weakfish.

TEDs have been promoted in the southern range of the species (NC-FL). However, recent mandatory regulations for their use to protect sea turtles has overshadowed efforts to promote their usefulness for reducing bycatch of finfish. Commercial shrimp fishermen's present resentment of the NMFS mandatory regulations may increase the difficulty of promoting TEDs as devices to exclude finfishes.

#### Recommendations:

1. Efforts should continue towards full implementation of the FMP.
2. TEDs should continue to be promoted. Their usefulness in reducing finfish bycatch should be highlighted and incorporated into NMFS' mandatory TED requirements for turtles.
3. A more coordinated coastwide research program on weakfish should be developed. Sampling programs (especially stock ID work) on the species should be expanded and new data collected by the states should be incorporated into a NMFS stock assessment of the species.
4. ASMFC should hold annual workshops to coordinate nearshore state and federal finfish surveys on this species and others.

## FISHERY MANAGEMENT PLAN REVIEW - WEAKFISH

### I. STATUS OF THE FISHERY MANAGEMENT PLAN

The ASMFC Weakfish Fishery Management Plan was developed through ASMFC's Interstate Management Program and adopted by ASMFC's member states in October, 1985. The major provisions of the plan recommended that the states in northern areas (RI to VA) delay entry of weakfish into fisheries at least to age one, and that the use of TEDs be promoted in southern shrimp fisheries. The plan also calls for cooperative interstate research to understand the coastal fisheries and biology of weakfish.

### II. STATUS OF THE STOCK

Total landings (commercial and recreational) for weakfish have been relatively stable for the past ten years at around 30 million pounds. However, NMFS' northeast inshore fall juvenile trawl survey has recorded somewhat of a drop in the abundance of juvenile weakfish (Figure 1). Moreover, in recent years qualitative reports on sport fishery catches have shown an apparent decline. However, present sport fisheries data and the NMFS inshore trawl index are not considered very accurate data bases for predicting weakfish stock status because of their limited sampling schedule.

Total coastal commercial landings have historically fluctuated widely (Table 1). North Carolina has contributed over 60 percent of the total Atlantic coast landings since 1980. North Carolina landings have fluctuated similarly to coastwide totals. The major fisheries during 1982-86 harvesting weakfish in North Carolina were the winter trawl (30-40%), sink gill net (7-40%), long haul seine (8-9%), and pound net (2-3%) fisheries. A shift in the predominant weakfish fisheries has been observed during the 1980's, with the winter trawl and sink net fisheries landing the majority of weakfish in North Carolina. The most dramatic increase in landings is noted in the sink net fishery, rising from 28 mt in 1977 to 2,687 mt in 1986. While the FMP states that the shift in weakfish landings to North Carolina was probably due to the increased mobility of fishermen, it appears the shift may have been due to the development of the sink net fishery off the coast of North Carolina. Long haul and pound net landings appear to be declining fisheries, not just in terms of weakfish landings, but also spot and croaker catches.

A 1984 (NMFS-DE) stock assessment on this species determined that present  $F$ 's are greater than  $F_{max}$  from Maryland south. Most fisheries on weakfish begin to take fish at about age one (1). The assessment demonstrated that both yield and egg-per-recruit for this species would greatly increase by delaying the age of entry. Increases in yield would be increasingly beneficial until catch at age four.

ASMFC's Sciaenid Technical Committee considered the assessment findings during development of the Plan for Weakfish. The assessment was based, in part, on NMFS' fall trawl survey data. The assessment data on abundance and sizes of weakfish were not accepted as truly representative of the East Coast weakfish population. The assessment assumed a single stock of weakfish. However, differences in age at maturity, fecundity, and size at age occurring along the coastline suggest that there may be more than one stock. This factor, as well as

lack of understanding of weakfish population dynamics and coastal migratory behavior, confounded attempts to agree upon possible spawner recruit relationships. Therefore, ASMFC did not use the assessment as a factor in recommending management measures for weakfish.

### III. STATUS OF RESEARCH AND MONITORING

Specific monitoring and research activities recommended in the weakfish plan include:

1. Identify stocks and determine coastal movements and the extent of stock mixing.
2. Collect catch and effort data including size and age composition of the catch, determine stock mortality throughout the range, and define gear characteristics.
3. Develop a recruitment index and examine the relations between parental stock size and environmental factors on year-class strength.
4. Define reproductive biology of weakfish, including size at sexual maturity, fecundity, and spawning periodicity.

Several initiatives are underway by ASMFC states which may in time, if expanded and coordinated, address some of the research needs in the weakfish plan. Virginia's Institute of Marine Science (VIMS) is conducting a small pilot program to determine if weakfish stocks can be differentiated through mitochondrial DNA analysis. A number of states have recently improved sport fisheries data collection and have expanded their collections of fisheries independent data for marine waters. These surveys should improve the quality of weakfish data on a state-by-state basis. Maryland and the NMFS have purchased computer hardware and software which show promise for use in stock identification by analyzing optical patterns of scales and otoliths (some weakfish samples may be run). North Carolina has been carrying out an estuarine juvenile finfish survey. Catch per effort data for weakfish (1981 to present) are available. The data are just being analyzed.

Delaware is conducting an ambitious program through the University of Delaware on the life history of weakfish in western Delaware Bay. No comprehensive, successful coastwide tagging of weakfish has been done. Recently, Georgia tagged a small number of weakfish using internal anchor tags and did receive some returns. New York is anticipating a pilot research program to determine proper handling and tagging methods for young-of-the-year weakfish.

Georgia conducts a juvenile finfish survey which monitors sciaenids. In addition, an opportunity to expand collections of weakfish data exists through the estuarine shrimp trawl surveys conducted by Georgia and South Carolina. These shrimp surveys collect many juvenile sciaenids but do not monitor for abundance.

#### IV. STATUS OF MANAGEMENT MEASURES

As of August 1987, size limits for weakfish are listed below by state:

| State | Commercial Limit | Sport Fishery Limit |
|-------|------------------|---------------------|
| CT    | 12"              | --                  |
| NY    | 12"              | 12"                 |
| NJ    | 9"               | --                  |
| DE    | 10"              | 10"                 |
| MD    | 10"              | 10"                 |

Delaware and New Jersey are presently contemplating raising their size limits.

The promotion of Trawl Efficiency Devices (TEDs) has been carried out in all southeastern states with demonstration projects. Some southern states also have instituted programs to provide free TEDs to some shrimp fishermen. However, recent NMFS mandatory regulations for TEDs used to protect turtles have overshadowed efforts to promote TEDs usefulness for reducing bycatch of finfish. Commercial shrimp fishermen's resentment of NMFS mandatory regulations may increase the difficulty of promoting devices to exclude finfishes.

#### V. RECOMMENDATIONS:

ASMFC's weakfish plan goal and objectives were deemed adequate at the present by the review team. The full implementation of the conservation measures called for in the present ASMFC plan should be carried out. Specifically, Rhode Island and Virginia should institute size limits on this species and states which only have commercial size limits should institute limits in their sport fisheries.

TEDs should still be promoted in the southern shrimp fisheries. Their promotion should highlight their usefulness in reducing bycatch of finfish. Research to continue improvement and development of TEDs should be carried out so they can be made more acceptable to shrimp fishermen. In addition, NMFS' approved models of TEDs to protect sea turtles should encompass the latest modifications to reduce finfish bycatch.

A more coordinated coastwide research program on weakfish should be developed through ASMFC. States should expand their sampling programs on weakfish to supplement the stock ID work in Virginia, either through collecting samples for the Virginia program or analyzing additional data from the Virginia program samples, such as Maryland's or NMFS' scale and otolith work. Any tagging program on weakfish should be coastwide in nature.

North Carolina's data on weakfish should be analyzed and integrated into a new coastwide stock assessment for this species. Southern shrimp surveys should be looked at closely as a means of obtaining more comprehensive juvenile indices. Moreover, ASMFC should sponsor a workshop to develop a coordinated and integrated state/federal nearshore finfish survey.

Table 1. Historic record of weakfish landings on the Atlantic coast by region and total landings from 1880 to 1981 (metric tons).

| Year | Region      |                 |            |                | Total  |
|------|-------------|-----------------|------------|----------------|--------|
|      | New England | Middle Atlantic | Chesapeake | South Atlantic |        |
| 1880 | -           | 5,019           | 699        | 829            | 6,546  |
| 1887 | 181         | 2,839           | 743        | -              | 3,763  |
| 1888 | 203         | 3,054           | 755        | -              | 4,012  |
| 1889 | -           | *               | -          | 1,116          | 1,116  |
| 1890 | -           | -               | 2,159      | 1,185          | 3,344  |
| 1891 | -           | -               | 2,123      | -              | 2,123  |
| 1896 | -           | -               | -          | -              | -      |
| 1897 | -           | 5,753           | 3,231      | 1,735          | 10,718 |
| 1901 | -           | 6,825           | 3,833      | -              | 10,658 |
| 1902 | 3,328       | -               | -          | 2,292          | 5,619  |
| 1904 | -           | 8,079           | 3,509      | -              | 11,588 |
| 1908 | 2,077       | 11,597          | 2,577      | 3,914          | 20,165 |
| 1909 | -           | -               | -          | -              | *      |
| 1915 | -           | -               | -          | -              | *      |
| 1918 | -           | -               | -          | 2,316          | 2,316  |
| 1919 | 174         | -               | -          | -              | 174    |
| 1920 | -           | -               | 6,893      | -              | 6,893  |
| 1921 | -           | 6,667           | *          | -              | 6,667  |
| 1923 | -           | -               | -          | 2,385          | 2,385  |
| 1924 | 46          | -               | -          | -              | 46     |
| 1925 | -           | -               | 6,316      | -              | 6,316  |
| 1926 | -           | 4,264           | -          | -              | 4,264  |
| 1927 | -           | -               | -          | 2,483          | 2,483  |
| 1928 | 52          | -               | -          | 2,904          | 2,956  |
| 1929 | 73          | 4,964           | 5,166      | 2,805          | 13,009 |
| 1930 | 84          | 6,025           | 8,739      | 1,337          | 16,186 |
| 1931 | 104         | 6,147           | 5,642      | 1,364          | 13,257 |
| 1932 | 60          | 4,122           | 6,251      | 1,656          | 12,089 |
| 1933 | 167         | 3,572           | 6,107      | -              | 9,846  |
| 1934 | -           | -               | 6,751      | 3,512          | 10,263 |
| 1935 | 148         | 4,599           | 6,693      | -              | 11,441 |
| 1936 | -           | -               | 5,302      | 4,070          | 9,372  |
| 1937 | 91          | 5,563           | 6,213      | 3,416          | 15,283 |
| 1938 | 154         | 3,421           | 6,177      | 2,313          | 12,065 |
| 1939 | 87          | 3,596           | 6,150      | 1,290          | 11,123 |
| 1940 | 70          | 2,173           | 6,202      | 1,647          | 10,092 |
| 1941 | -           | -               | 3,833      | -              | 3,833  |
| 1942 | 34          | 2,804           | 3,445      | -              | 6,282  |
| 1943 | 42          | 3,349           | -          | -              | 3,392  |
| 1944 | 146         | 2,948           | 5,616      | -              | 8,710  |
| 1945 | 174         | 5,225           | 11,226     | 2,164          | 18,788 |
| 1946 | 269         | *               | 9,325      | -              | 9,594  |
| 1947 | 206         | 3,546           | 8,762      | -              | 12,514 |
| 1948 | 116         | 2,244           | 5,880      | -              | 8,240  |
| 1949 | 9           | 1,820           | 3,028      | -              | 4,857  |
| 1950 | 2           | 816             | 2,088      | 716            | 3,622  |

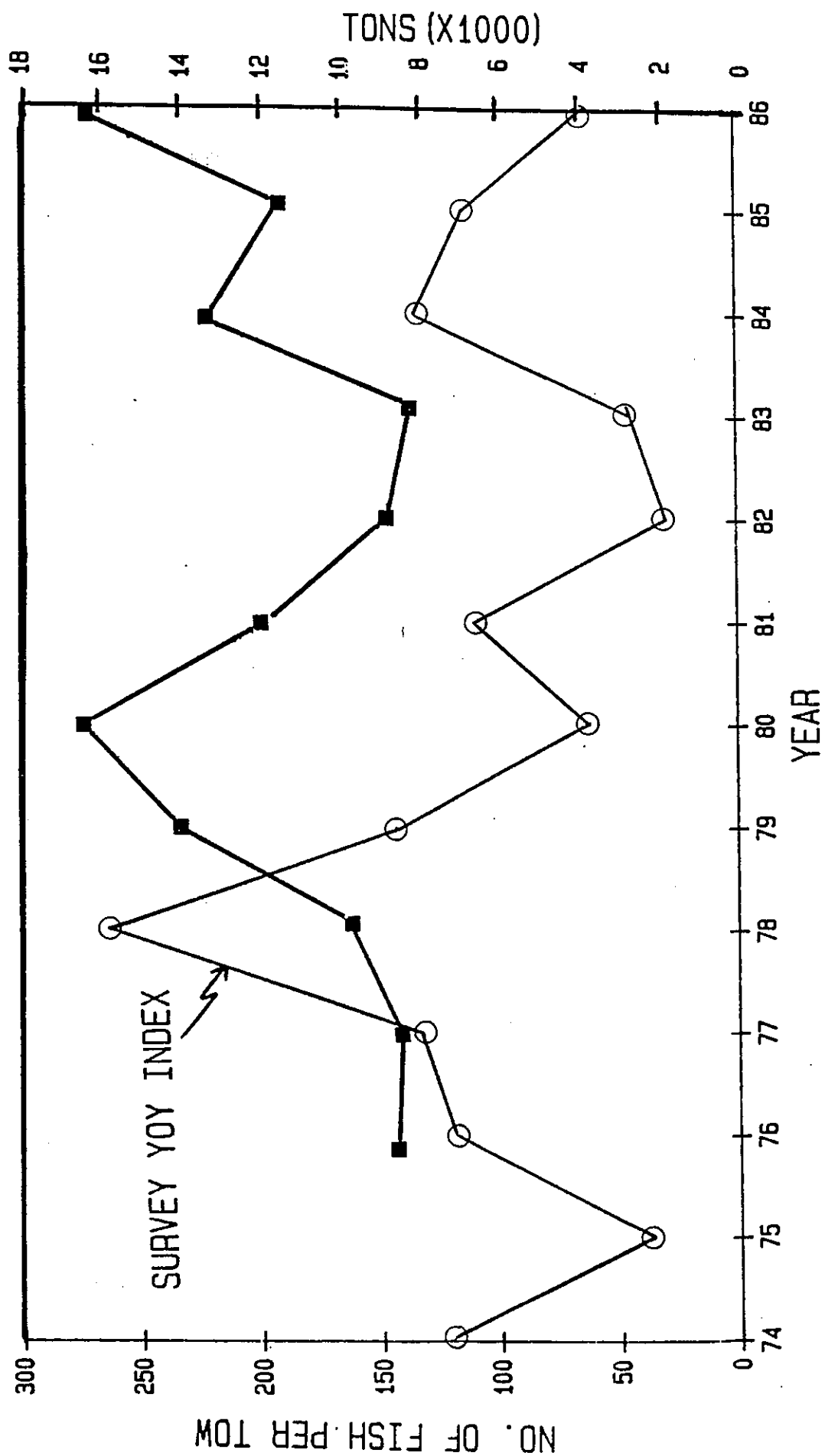
Table 1. (continued)

| Year | Region      |                 |            |                | Total  |
|------|-------------|-----------------|------------|----------------|--------|
|      | New England | Middle Atlantic | Chesapeake | South Atlantic |        |
| 1951 | 1           | 1,262           | 1,003      | 610            | 2,877  |
| 1952 | 3           | 1,190           | 811        | 757            | 2,761  |
| 1953 | 11          | 1,362           | 1,036      | 870            | 3,278  |
| 1954 | 5           | 1,134           | 1,082      | 1,119          | 3,339  |
| 1955 | 5           | 1,661           | 1,925      | 622            | 4,213  |
| 1956 | 10          | 1,438           | 1,694      | 839            | 3,982  |
| 1957 | 20          | 1,590           | 1,070      | 1,016          | 3,697  |
| 1958 | 5           | 435             | 806        | 1,744          | 2,990  |
| 1959 | 1           | 272             | 359        | 1,340          | 1,971  |
| 1960 | 1           | 283             | 490        | 1,046          | 1,821  |
| 1961 | 1           | 274             | 668        | 1,084          | 2,028  |
| 1962 | 5           | 381             | 763        | 997            | 2,146  |
| 1963 | 1           | 257             | 541        | 834            | 1,633  |
| 1964 | *           | 330             | 801        | 943            | 2,075  |
| 1965 | 2           | 404             | 1,023      | 1,035          | 2,463  |
| 1966 | *           | 209             | 540        | 957            | 1,706  |
| 1967 | 1           | 224             | 311        | 862            | 1,398  |
| 1968 | 1           | 272             | 577        | 1,137          | 1,988  |
| 1969 | 6           | 908             | 474        | 767            | 2,155  |
| 1970 | 10          | 1,090           | 1,118      | 1,241          | 3,460  |
| 1971 | 91          | 2,082           | 1,243      | 1,719          | 5,136  |
| 1972 | 83          | 2,455           | 1,329      | 3,424          | 7,291  |
| 1973 | 85          | 1,889           | 2,558      | 2,917          | 7,449  |
| 1974 | 236         | 1,993           | 1,575      | 2,806          | 6,611  |
| 1975 | 224         | 2,734           | 2,258      | 3,104          | 8,319  |
| 1976 | 160         | 3,312           | 2,001      | 3,993          | 9,466  |
| 1977 | 158         | 2,386           | 2,063      | 3,977          | 8,585  |
| 1978 | 134         | 2,638           | 2,004      | 4,976          | 9,751  |
| 1979 | 220         | 3,854           | 3,126      | 6,745          | 13,946 |
| 1980 | 123         | 3,765           | 3,089      | 9,334          | 16,312 |
| 1981 | 140         | 2,794           | 1,275      | 7,750          | 11,959 |
| 1982 | 102         | 2,098           | 1,088      | 5,547          | 8,835  |
| 1983 | 97          | 1,780           | 1,353      | 4,697          | 7,926  |
| 1984 | 93          | 1,823           | 1,104      | 5,950          | 8,969  |
| 1985 | 88          | 1,999           | 1,088      | 4,510          | 7,685  |
| 1986 | 60          | 1,947           | 863        | 6,541          | 9,411  |

- information not available

\* &lt;1 mt reported

FIGURE 1. NMFS INSHORE FALL SURVEY YOY INDEX VS. TOTAL  
WEAKFISH LANDINGS, 1974-1986.





LISTS OF ASMFC ADVISORY COMMITTEE AND ATLANTIC MENHADEN ADVISORY COMMITTEE MEMBERS



ADVISORY COMMITTEE

Mr. Lewis Flagg  
Dept. of Marine Resources  
State House-Station 21  
Augusta, ME 04333

Mr. Thomas Squiers  
Dept. of Marine Resources  
State House-Station 21  
Augusta, ME 04333

Mr. John I. Nelson, Jr.  
State Fish & Game Dept.  
34 Bridge Street  
Concord, NH 03301

Ms. Sandra Dunlop  
State Fish & Game Dept.  
34 Bridge Street  
Concord, NH 03301

Mr. W. Leigh Bridges  
Div. of Marine Fisheries  
100 Cambridge Street  
Boston, MA 02202

Mr. Randall Fairbanks  
Div. of Marine Fisheries  
100 Cambridge Street  
Boston, MA 02202

Mr. John Stolgitis  
Div. of Fish & Wildlife  
Wash. County Govt. Center  
Tower Hill Road  
Wakefield, RI 02879

Mr. Richard T. Sisson  
Div. of Fish & Wildlife  
150 Flower Street  
N. Kingston, RI 02852

Mr. Eric M. Smith  
Dept. of Environ. Protection  
P.O. Box 248  
Waterford, CT 06385

Ms. Penny Howell  
CT DEP  
P.O. Box 248  
Waterford, CT 06385

Mr. John C. Poole  
Dept. of Environ. Conservation  
SUNY, Building 40  
Stony Brook, NY 11794

Mr. Chester Zawacki  
Dept. of Environ. Conservation  
SUNY, Building 40  
Stony Brook, NY 11794

Mr. Bruce Halgren  
Nacote Creek Research Station  
Star Route 9  
Absecon, NJ 08201

Mr. Robert Hesser  
PA Fish Commission  
450 Robinson Lane  
Bellefonte, PA 16823-9616

Mr. Leroy M. Young  
PA Fish Commission  
P.O. Box 1673  
Harrisburg, PA 17120

Mr. Charles Lesser  
Div. of Fish & Wildlife  
P.O. Box 1401  
Dover, DE 19901

Mr. Rich Seagraves  
Div. of Fish & Wildlife  
P.O. Box 1401  
Dover, DE 19901

ADVISORY COMMITTEE (Con't)

Mr. Charles Frisbie  
Fisheries Administration  
Tawes State Off. Bldg., C-2  
Annapolis, MD 21401

Mr. Gary Edwards  
Asst. Director, Fisheries  
U.S. Fish & Wildlife Service  
Washington, DC 20240

Dr. Jack Musick  
VIMS  
Gloucester Point, VA 23602

Mr. Austin Magill  
F/M11  
NMFS  
Washington, DC 20235

Dr. Herbert Austin  
VIMS  
Gloucester Point, VA 23602

Mr. James L. Music  
GA Coastal Resources  
1200 Glynn Avenue  
Brunswick, GA 31520-9990

Mr. Michael Street  
Div. Marine Fisheries  
P.O. Box 769  
Morehead City, NC 28557-0769

Mr. Harry Mears  
F/NER73  
NMFS-NE Region  
State Federal Relations  
2 State Fish Pier  
Gloucester, MA 01930-3097

Mr. Terry Sholar  
Div. Marine Fisheries  
P.O. Box 769  
Morehead City, NC 28557-0769

Mr. Stuart Wilk  
NMFS-NEC  
Sandy Hook Marine Lab  
P.O. Box 428  
Highlands, NJ 07732

Mr. David Cupka  
Marine Res. Division  
P.O. Box 12559  
Charleston, SC 29412

Mr. I. B. Byrd  
NMFS-SERO Region 2  
9450 Koger Boulevard  
St. Petersburg, FL 33702

Ms. Susan Shipman  
Coastal Resources Division  
1200 Glynn Avenue  
Brunswick, GA 31520

Mr. James Weaver  
USFWS-Fishery Resources  
One Gateway Center #700  
Newton Corner, MA 02158

Mr. Jack Pons  
Dept. of Natural Resources  
3900 Commonwealth Boulevard  
Tallahassee, FL 32303

Mr. Charles Futch  
FL DNR  
3900 Commonwealth Boulevard  
Tallahassee, FL 32303

Mr. Frank Richardson  
USFWS - Fishery Resources  
Richard B. Russell Federal Bldg.  
75 Spring Street, SW  
Atlanta, GA 30303

**ADVISORY COMMITTEE — EXOFICO MEMBERS**

Mr. Irwin M. Alperin  
Executive Director  
Atlantic States Marine  
Fisheries Commission  
1717 Massachusetts Avenue, NW  
Washington, DC 20036

Mr. Paul Perra  
ASMFC, Suite 703  
1717 Massachusetts Avenue, NW  
Washington, DC 20036

Mr. Joseph McGurrin  
ASMFC, Suite 703  
1717 Massachusetts Avenue, NW  
Washington, DC 20036

ATLANTIC MENHADEN ADVISORY COMMITTEE

Mr. John Merriner, Doug Vaughan  
NMFS, SEFC  
Beaufort Lab.  
Beaufort, NC 28516

Mr. Ben Humphrey, Daniel Cook  
Standard Products Co., Inc.  
P.O. Box 1389  
Kilmarnock, VA 22482

Mr. Joseph Loesch  
VIMS  
Gloucester Point, VA 23062

Mr. Jule Wheatley  
Beaufort Fisheries, Inc.  
P.O. Box 240  
Beaufort, NC 28516

Mr. Michael Street  
NC Div. Marine Fisheries  
P.O. Box 769  
Morehead City, NC 28557

Mr. Thor Lassen  
National Fisheries Institute  
2000 M Street, NW, #703  
Washington, DC 20036

Mr. William C. Lunsford, Jr.  
Zapata Haynie Corp.  
1913 Knollton Road  
Timonium, MD 21093

Mr. Paul Perra  
ASMFC, Suite 703  
1717 Massachusetts Avenue, NW  
Washington, DC 20036

Mr. Peter J. Himchak  
Nacote Creek Research Station  
Star Route 9  
Absecon, NJ 08201



